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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present specification describes the protocol for the T8 reference point between the SCEF and the SCS/AS. The T8 reference point and the related stage 2 functional requirements are defined in 3GPP TS 23.682 [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2]   3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[3]   3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[4]   IETF RFC 5246, "The Transport Layer Security (TLS) Protocol Version 1.2".

[5]   IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[6]   Hypertext Transfer Protocol (HTTP) Status Code Registry at IANA, http://www.iana.org/assignments/http-status-codes.

[7]   IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

[8]   IETF RFC 7807: "Problem Details for HTTP APIs".

[9]   3GPP TS 29.154: "Service capability exposure functionality over Nt reference point".

[10]   3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[11]   3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications".

[12]   3GPP TS 29.128: "Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) interfaces for interworking with packet data networks and applications".

[13]   3GPP TS 29.201: "Representational State Transfer (REST) reference point between Application Function (AF) and Protocol Converter (PC)".

[14]   3GPP TS 23.003: "Numbering, addressing and identification".

[15]   IETF RFC 3339: "Date and Time on the Internet: Timestamps".

[16]   IETF RFC 7230: "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing".

[17]   IETF RFC 7231: "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content".

[18]   IETF RFC 7232: "Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests".

[19]   IETF RFC 7233: "Hypertext Transfer Protocol (HTTP/1.1): Range Requests".

[20]   IETF RFC 7234: "Hypertext Transfer Protocol (HTTP/1.1): Caching".

[21]   IETF RFC 7235: "Hypertext Transfer Protocol (HTTP/1.1): Authentication".

[22]   IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

[23]   3GPP TS 29.155: "Traffic steering control; Representational state transfer (REST) over St reference point".

[24]   3GPP TS 29.368: "Tsp interface protocol between the MTC Interworking Function (MTC-IWF) and Service Capability Server (SCS)".

[25]   3GPP TS 29.337: "Diameter-based T4 interface for communications with packet data networks and applications".

[26]   3GPP TS 29.250: "Nu reference point between SCEF and PFDF for sponsored data connectivity".

[27]   Open API Initiative, "OpenAPI 3.0.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md.

[28]   IETF RFC 1166: "Internet Numbers".

[29]   IETF RFC 5952: "A recommendation for Ipv6 address text representation".

[30]   3GPP TS 29.153: "Service capability exposure functionality over Ns reference point".

[31]   3GPP TS 24.250: "Protocol for Reliable Data Service; Stage 3".

[32]   IETF RFC 6455: "The Websocket Protocol".

[33]   3GPP TS 29.272: "Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".

[34]   3GPP TS 29.338: "Diameter based protocols to support Short Message Service (SMS) capable Mobile Management Entities (MMEs)".

[35]   3GPP TS 33.187: "Security aspects of Machine-Type Communications (MTC) and other mobile data applications communications enhancements".

[36]   3GPP TS 29.468: "Group Communication System Enablers for LTE (GCSE_LTE);MB2 Reference Point;Stage 3".

[37]   3GPP TS 29.116: "Presentational state transfer over xMB reference point between Content Provider and BM-SC".

[38]   IETF RFC 5789: "PATCH method for HTTP".

[39]   IETF RFC 7396: "JSON Merge Patch".

[40]   IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[41]   YAML (10/2009): "YAML Ain't Markup Language (YAML™) Version 1.2", http://www.yaml.org/spec/1.2/spec.html.

[42]   3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[43]   3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[44]   3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[45]   3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[46]   IETF RFC 6733: "Diameter Base Protocol".

[47]   3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[48]   3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

[49]   3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[50]   3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[51]   IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[52]   3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[53]   3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

[54]   3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[55]   3GPP TS 23.468: "Group Communication System Enablers for LTE (GCSE_LTE); stage 2".

[56]   3GPP TS 26.348, "Northbound Application Programming Interface (API) for Multimedia Broadcast/Multicast Service (MBMS) at the xMB reference point".

[57]   3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[58]   3GPP TR 21.900: "Technical Specification Group working methods".

[59]   3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[60]   3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[61]   3GPP TS 29.675: "User Equipment (UE) radio capability provisioning service; Stage 3".

[62]   3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[63]   3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[64]   3GPP TS 24.526: "User Equipment (UE) policies for 5G System (5GS); Stage 3".

[65]   3GPP TS 29.515: "5G System; Gateway Mobile Location Services; Stage 3".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AF	Application Function
AS	Application Server
ASP	Application Service Provider
BDT	Background Data Transfer
CAPIF	Common API Framework
CP	Communication Pattern
DDN	Downlink Data Notification
DL	Downlink
eNB	Evolved Node B
GMD	Group Message Delivery
IMEI-TAC	Type Allocation Code part of an IMEI
IWK-SCEF	Interworking SCEF
JSON	JavaScript Object Notation

MIME	Multipurpose Internet Mail Extensions
MT	Mobile Terminated
MTC	Machine Type Communications
MT-LR	Mobile Terminated Location Request
NEF	Network Exposure Function
NIDD	Non-IP Data Delivery
NP	Network Parameter
PCRF	Policy and Charging Rule Function
PDN	Packet Data Network
PFD	Packet Flow Description
PFDF	Packet Flow Description Function
RCAF	RAN Congestion Awareness Function
REST	Representational State Transfer
SACH	Service Announcement Channel
SCEF	Service Capability Exposure Function
SCS	Services Capability Server
TAI	Tracking Area Identity
TLTRI	T8 Long Term Transaction Reference ID
WB	Wide Band
YAML	YAML Ain't Markup Language

4 T8 reference point

4.1 Overview

The T8 reference point is between the SCS/AS and the SCEF. It specifies APIs that allow the SCS/AS to access the services and capabilities provided by 3GPP network entities and securely exposed by the SCEF.

This document also specifies the procedures triggered at the SCEF by API requests from the SCS/AS and by event notifications received from 3GPP network entities.

The stage 2 level requirements and signalling flows for the T8 reference point are defined in 3GPP TS 23.682 [2].

The T8 reference point supports the following procedures:

- Monitoring Procedures

- Procedures for resource management of Background Data Transfer

- Procedures for changing the chargeable party

- Procedures for Non-IP Data Delivery

- Procedures for Device Triggering

- Procedures for Group Message Delivery

- Procedures for Reporting of Network Status

- Procedures for Communication Pattern Parameters Provisioning

- Procedures for PFD Management

- Procedures for Enhanced Coverage Restriction Control

- Procedures for Network Parameter Configuration

- Procedures for setting up an AS session with required QoS

- Procedures for MSISDN-less Mobile Originated SMS

- Procedures for RACS Parameter Provisioning

4.2   Reference model

The T8 reference point resides between the SCEF and the SCS/AS as depicted in figure 4.2.1. The overall SCEF architecture is depicted in subclause 4.2 of 3GPP TS 23.682 [2].

   NOTE: The SCS/AS can be provided by a third party.
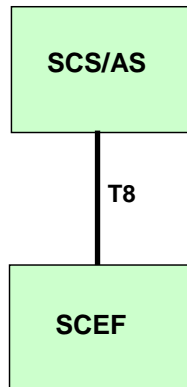
Figure 4.2.1: T8 reference model

4.3   Functional elements

4.3.1   SCEF

The SCEF is a functional element which provides means to securely expose the services and capabilities provided by 3GPP network interfaces. The SCEF provides access to network capabilities through homogenous application programming interfaces.

Individual instances of SCEF may vary depending on what service capabilities are exposed and what API features are supported.

The SCEF shall protect the other PLMN entities (e.g. HSS, MME) from requests exceeding the permission arranged in the SLA with the third-party service provider.

When needed, the SCEF supports mapping between information exchanged with SCS/AS (e.g. geographical identifiers) and information exchanged with internal PLMN functions (e.g. cell-Id, eNB-Id, TAI, MBMS SAI, etc.). This mapping is assumed to be provided by the SCEF based on local configuration data.

4.3.2   SCS/AS

The SCS is the entity which connects MTC application servers to the 3GPP network to enable them to communicate through specific 3GPP defined services with UEs used for MTC and with the SCEF in the HPLMN. The SCS offers capabilities for use by one or multiple MTC application servers. The MTC applications in the external network are hosted on one or more ASs.

An SCS/AS can get services from multiple SCEFs, and an SCEF can provide services to multiple SCS/ASs.

The SCS is controlled by the operator of the HPLMN or by a MTC Service Provider.

The AS can be controlled by a 3rd party.

4.4 Procedures over T8 reference point

4.4.1 Introduction

All procedures that operate across the T8 reference point, as specified in 3GPP TS 23.682 [2], are specified in the following subclauses.

4.4.2 Monitoring Procedures

4.4.2.1 General

These procedures are used to perform event monitoring functions via the T8 interface, which include:

- Monitoring event configuration as specified in subclause 4.4.2.2;

- Reporting of monitoring event as specified in subclause 4.4.2.3;

- Network initiated notifications of monitoring event cancellation, as specified in subclause 4.4.2.4 ; and

- Network initiated notifications of applied parameter configuration, as specified in subclause 4.4.2.5.

4.4.2.2 Monitoring Events Configuration

4.4.2.2.1 General

In order to subscribe to a new monitoring event configuration, the SCS/AS shall send an HTTP POST message to the SCEF targeting the resource "Monitoring Event Subscriptions". The body of the HTTP POST message shall include:

- SCS/AS Identifier;

- Monitoring Type;

- Notification Destination Address; and

- One of External Identifier, MSISDN or External Group Identifier. The External Identifier or the MSISDN identifies the subscription of an individual UE and the External Group Identifier points to a group of UEs.

- In addition, the HTTP POST request may include:

  - Maximum Number of Reports;

  - Monitoring Duration indicated by the property "monitorExpireTime";

  - Group Reporting Guard Time.

If the Subscription_modification feature is supported, the SCS/AS may send an HTTP PUT message in order to update an existing monitoring event subscription. The HTTP PUT request targets the resource "Individual Monitoring Event Subscription" replacing all properties in the existing configuration.

For one-time monitoring type of requests, the SCS/AS shall include the Maximum Number of Reports with a value set to 1 and not include the Monitoring Duration in the HTTP request message sent to the SCEF.

Upon receipt of the HTTP POST or PUT request message, if the SCS/AS is authorized to perform such request, the SCEF shall check whether the parameters (e.g. Maximum Number of Reports, Monitoring Duration, Maximum Latency, Maximum Response Time, Suggested number of downlink packets) in the HTTP request body are within the range defined by operator policies. If one or more of these parameters are not within the range, the SCEF shall:

- either reject the request message by sending an HTTP response to the SCS/AS with a status code set to 403 Forbidden and may include the "PARAMETER_OUT_OF_RANGE" error in the "cause" attribute of the "ProblemDetails" structure and indicate which parameters are out of the range in the "invalidParams" attribute of the "ProblemDetails" structure; or

- modify the parameters which are not within the range by selecting different values which are in the range.

For individual UE configuration requests, the SCEF shall also check whether the Idle Status Indication is included for UE reachability event. If the Idle Status Indication is received in the request but not supported by the network, the SCEF may reject the request message by sending an HTTP response to the SCS/AS with a status code set to 403 Forbidden and may include the "IDLE_STATUS_UNSUPPORTED" error in the "cause" attribute of the "ProblemDetails" structure.

If the SCEF receives an HTTP POST request to create a subscription resource for a monitoring event, but without an indication of the support for the feature corresponding to the requested monitoring event, the SCEF shall reject the request by sending a "400 Bad Request" HTTP error response with the application error "EVENT_FEATURE_MISMATCH".

If the SCEF receives an HTTP POST request to create a subscription resource for a monitoring event that it does not support, the SCEF shall reject the request by sending a "500 Internal Server Error" HTTP error response with the application error "EVENT_UNSUPPORTED".

After validation, the SCEF shall store the parameters and

- may assign an SCEF Reference ID related to the created monitoring event subscription resource; and based on operator policies, shall

    - map the accuracy into permissible granularity for location reporting event;

    - map the location area into a list of cells, eNodeB(s) and/or RAI(s)/TAI(s) and derive the corresponding MME(s)/SGSN(s), for number of UEs present in a geographic area event.

In order to delete a previous active configured monitoring event subscription at the SCEF, the SCS/AS shall send an HTTP DELETE message to the SCEF targeting the resource "Individual Monitoring Event Subscription" which is previously received in the response to the request that has created the monitoring events subscription resource. The SCEF shall detemine the SCEF Reference ID related to the active monitoring subscription resource.

4.4.2.2.2 Monitoring Events Configuration via HSS

4.4.2.2.2.1 General

The following monitoring events are applicable for the monitoring event configuration via HSS for an individual UE or a group of UEs:

- Loss of connectivity;

- UE reachability;

- Location Reporting;

- Change of IMSI-IMEI(SV) Association;

- Roaming Status;

- Communication Failure;

- PDN connectivity status;

- Availability after DDN Failure; and

- API support capability.

Only one-time reporting is supported if the "reachabilityType" attribute sets to "SMS" for the event "UE reachability" or if the "locationType" attribute sets to "LAST_KNOWN_LOCATION" for the event "Location Reporting" in the monitoring event request.

4.4.2.2.2.2 Configuration Request for an individual UE

Upon receipt of a configuration request from the SCS/AS for an individual UE, the SCEF shall interact with the HSS via S6t, as specified in 3GPP TS 29.336 [11].

Upon receipt of a successful response from the HSS,

- if it is a one-time monitoring request and the monitoring event report is received, the SCEF shall delete the associated configuration, send an HTTP response message to the SCS/AS with a "200 OK" status code and including the received monitoring event report.

- otherwise, the SCEF shall,

   - for an HTTP POST request, create a new "Individual Monitoring Event Subscription" resource addressed by the URI that contains the SCS/AS identifier and an SCEF-created subscription identifier, and send an HTTP response to the SCS/AS with a "201 Created" status code, containing the final suggested configuration parameter(s) (if modified), indication(s) of the discarded parameter(s) (if discarded), the monitoring event report, if received, and a location header field containing the URI of the created resource.

   - for an HTTP PUT request, update the active "Individual Monitoring Event Subscription" resource addressed by the request URI and send an HTTP response to the SCS/AS with a "200 OK" status code, containing the final suggested configuration parameter(s) (if modified), indication(s) of the discarded parameter(s) (if discarded) and the monitoring event report, if received.

   - for an HTTP DELETE request, delete the active "Individual Monitoring Event Subscription" resource addressed by the request URI and send an HTTP response to the SCS/AS with a "204 No Content" status code, or a "200 OK" status code and including the monitoring event report, if received.

If the SCEF receives a response with an error code from the HSS, the SCEF shall not create, update nor delete the concerned resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.2.2.2.3   Configuration Request for a group of UEs

Upon receipt of a request from the SCS/AS including an External Group Identifier, then the monitoring configuration is for a group of UEs. The SCEF shall interact with the HSS via S6t as specified in 3GPP TS 29.336 [11].

Upon receipt of a successful response from the HSS indicating that group processing is in progress and before beginning the processing of individual UEs, the SCEF shall,

- for an HTTP POST request, create a new "Individual Monitoring Event Subscription" resource addressed by a URI that contains the SCS/AS identity and an SCEF-created subscription identifier, store the number of UEs received in the response message from the HSS within the resource and send an HTTP response to the SCS/AS with "201 Created" status code and a location header field containing the URI of the created resource, in order to acknowledge the SCS/AS of the successful group processing request.

- for an HTTP PUT request, update the active "Individual Monitoring Event Subscription" resource addressed by the request URL and send an HTTP response with "200 OK" status code to acknowledge the SCS/AS of the successful group processing request.

- for an HTTP DELETE request, delete the active "Individual Monitoring Event Subscription" resource addressed by the request URI and send an HTTP response to the SCS/AS with "204 No Content" status code.

If the SCEF receives a response with an error code from the HSS, the SCEF shall not create, update nor delete the concerned resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

Upon receipt of the processing result of the individual UEs from the HSS, the SCEF shall behave as follows:

- if no Group Reporting Guard Time is received, the SCEF shall send an HTTP POST request message to the SCS/AS including a reference to the related monitoring subscription, a list of configuration failure result if received for the group members, and the "monitoringEventReports" attribute including a list of monitoring event reports if received for the group members;

- otherwise, the SCEF shall accumulate all of the configuration results and/or monitoring event reports received from the HSS for the group members until the Group Reporting Guard Time expires. Then the SCEF shall send an HTTP POST request message to the SCS/AS including a reference to the related monitoring subscription, and a list of configuration failure result if received for the group members, and the "monitoringEventReports" attribute including a list of monitoring event reports at the Group Reporting Guard Time.

The SCS/AS shall send an HTTP response to acknowledge the SCEF about the handling result of the received HTTP POST request.

4.4.2.2.3   Monitoring Events Configuration directly via MME/SGSN

The monitoring event "Number of UEs in a geographic area" is applicable for the monitoring event configuration via MME/SGSN. Only one-time reporting is supported for this event with the value of Maximum Number of Reports indicated by "maximumNumberOfReports" set to 1.

Upon receipt of an HTTP POST request from the SCS/AS, the SCEF shall

- resolve the location area to the involved SGSN(s)/MME(s) by local configuration;

- interact with the HSS via the S6t interface as specified in 3GPP TS 29.336 [11] if the External Group ID(s) is included; and

- interact with the SGSN(s)/MME(s) via the T6a/b inteface as specified in 3GPP TS 29.128 [12].

   NOTE: The SCEF uses local configuration to resolve the involved SGSN(s)/MME(s) if the location area is not received.

After collecting responses from the SGSN(s)/MME(s), if the SCEF does not receive any successful response from the involved SGSN(s)/MME(s), the SCEF shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6; otherwise the SCEF should send a response with 200 OK status code to acknowledge the SCS/AS with one aggregated report in the requested area by including the total count of the number of UEs in the "ueCount" attribute and the External Identifier(s) (if available) or the MSISDN(s) (if available) associated with the External Group ID.

   NOTE: It is possible that the number of UEs does not reflect the actual number of UEs in the designated area (e.g. some SGSN(s)/MME(s) do not respond successfully). The SCEF still provides the result to the SCS/AS if at least one SGSN/MME returns a successful response.

4.4.2.2.4   Monitoring Events Configuration via PCRF

4.4.2.2.4.1   General

The following monitoring events: the location reporting event and communication failure event are applicable for the monitoring event configuration via PCRF for an individual UE.

If monitoring event configuration via PCRF is used for a subscription resource, the Subscription_modification feature cannot be supported.

Only the location reporting event is applicabe for the monitoring event configuration via PCRF for a group of UEs.

Only one-time reporting is supported for the monitoring event configuration via PCRF.

HTTP PUT is not supported for the monitoring event configuration via PCRF. If it is received, the SCEF shall reject the HTTP PUT message with 403 Forbidden during monitoring and may indicate the "OPERATION_PROHIBITED" error in the "cause" attribute of the "ProblemDetails" structure.

4.4.2.2.4.2   Configuration Request for an individual UE

Upon receipt of an HTTP POST request from the SCS/AS for an individual UE, the SCEF shall:

- interact with the PCRF via the Rx inteface by using an existing AF session or establishing a new AF session as specified in 3GPP TS 29.214 [10];

   NOTE 1: The SCEF can derive the service information over the Rx interface based on SCS/AS ID for communication failure event.

- after receiving the AAA message from the PCRF, create a resource which represents the monitoring event configuration addressed by a URI that contains the SCS/AS identifier and an SCEF-created subscription identifier; and

- send a corresponding status code to acknowledge the SCS/AS of the successful processing of the request in the HTTP response message.

Then the SCEF shall wait for the reporting from the PCRF as specified in 3GPP TS 29.214 [10].

NOTE 2: Different events can be reported in different messages according to 3GPP TS 29.214 [10], e.g. STR/RAR for communication failure.

During configuration resource deletion, the SCEF shall also terminate the AF session if it was established and used only for event monitoring.

4.4.2.2.4.3 Configuration Request for a group of UEs

Upon receipt of an HTTP POST request from the SCS/AS for a group of UEs, the SCEF shall:

- interact with all PCRFs in the same PLMN via Nta application of Nt interface as specified in 3GPP TS 29.154 [9];

- after collecting ECA message from all PCRFs, create a resource which represents the monitoring event configuration addressed by a URI that contains the SCS/AS identifier and an SCEF-created subscription identifier; and

- send a corresponding status code to acknowledge the SCS/AS of the successful processing of the request in the HTTP response message.

Then the SCEF shall wait for the reporting from the PCRF(s) as specified in 3GPP TS 29.154 [9].

4.4.2.3 Reporting of Monitoring Event Procedure

Upon receipt of a Monitoring Event Report from the HSS or the MME/SGSN as defined in subclause 5.6.3 or subclause 5.6.8 of 3GPP TS 23.682 [2], from the PCRF as defined in subclause 5.6.5 or from the IWK-SCEF as defined in subclause 5.6.8 of 3GPP TS 23.682 [2], the SCEF shall determine the monitoring event subscription associated with the corresponding Monitoring Event Report.

If the monitoring event subscription refers to a Monitoring Event Configuration for a single UE or to a group-based Monitoring Event configuration, and no Group Reporting Guard Time was set, then the SCEF shall send an HTTP POST message including a link to the SCEF-created subscription resource and the received Monitoring Event Report to the identified destination. If the monitoring event subscription refers to a group-based Monitoring Event Configuration and Group Reporting Guard Time was provided during the Monitoring Event configuration procedure, then the SCEF shall accumulate all of the received Monitoring Event reports for the group of UEs until the Group Reporting Guard Time expires or the monitoring duration indicated by the property "monitorExpireTime" is reached.

Upon expiration of Group Reporting Guard Time or expiration of the monitoring duration, the SCEF shall send an HTTP POST message to the identified destination including a link to the SCEF-created subscription resource and the list of accumulated Monitoring Event Reports for each UE identified by either its External Identifier or MSISDN. The destination URL of the HTTP POST message is provided by the SCS/AS during the Monitoring Event Configuration procedure.

If the monitoring event subscription refers to a one-time monitoring request or a continuous monitoring request, but the maximum number of reports is reached, the SCEF shall consider the reporting as completed and delete the corresponding "Individual Monitoring Event Subscription" resource. In addition, the SCEF shall interact with the HSS to delete the event configuration if the latter was performed via the HSS whereas event reports were performed via the SGSN/MME. The SCEF determines that the reporting for a group is completed by comparing the total number of received reports with the number of UEs of the group (received from the HSS during event configuration for a group of UEs) multiplied by the maximum number of reports.

When the monitoring duration indicated by the property "monitorExpireTime" is reached, the SCEF shall delete the related event subscription and event configuration locally. The SCS/AS shall no longer address the corresponding "Individual Monitoring Event Subscription" resource.

4.4.2.4 Network-initiated Explicit Monitoring Event Deletion Procedure

Upon receipt of an identifier for the event to be deleted from the HSS as defined in 3GPP TS 29.336 [11], the SCEF shall determine the subscription identifier associated with the indicated active monitoring subscription. Then the SCEF shall delete the related resource "Individual Monitoring Event Subscription", send an HTTP POST message including the subscription identifier and a cancellation indication to the identified destination. The cancellation indication shall set to "true" indicating to cancel the configured monitoring subscription. The destination URL of the HTTP POST is provided by the SCS/AS during the Monitoring Event Configuration procedure.

NOTE: The above procedure can be triggered from the HSS due to parameter overwritten by Network Parameter Configuration.

4.4.2.5 Network initiated notification of applied parameter configuration

For "LOSS_OF_CONNECTIVITY" and "UE_REACHABILITY" events, if the "Enhanced_param_config" feature is supported and the SCEF receives the currently applied parameter configuration from the HSS, the SCEF shall notify the SCS/AS via an HTTP POST message including the parameter changes in the "appliedParam" attribute.

4.4.3 Procedures for resource management of Background Data Transfer

These procedures are used by an SCS/AS to perform the resource management of background data transfer (BDT) to a set of UEs, i.e. the SCS/AS requests a time window and related conditions from the SCEF via the T8 interface.

In order to create a resource for the background data transfer policy, the SCS/AS shall send an HTTP POST message to the SCEF for the "BDT Subscriptions" resource to negotiate the transfer policy. The body of the HTTP POST message shall include SCS/AS Identifier, Volume per UE (total volume for both DL and UL or separate volume for DL and/or UL), Number of UEs, Desired Time Window and optionally a location area information.

After receiving the HTTP POST message, if the SCS/AS is authorized, the SCEF shall map the SCS/AS Identifier to ASP Identifier and negotiate the transfer policy with the PCRF as defined in 3GPP TS 29.154 [9]. After receiving the response including the determined transfer policies from the PCRF, the SCEF shall create a resource "Individual BDT Subscription" which represents the BDT subscription, addressed by a URI that contains the SCS/AS identifier and an SCEF-created subscription identifier, and shall respond to the SCS/AS with a 201 Created message, including a Location header field containing the URI for the created resource and a message body, which may also include Reference ID and a set of transfer policies. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this background data transfer subscription. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not create the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

The SCS/AS may also send an HTTP PUT message to the SCEF for the "Individual BDT Subscription" resource to request starting an update for negotiation of background data transfer policy. The body of the HTTP PUT message shall include data as described in the POST message. The external group identifier shall remain unchanged from previously provided value. After receiving such request, if the SCS/AS is authorized, the SCEF shall negotiate the transfer policy with the PCRF as defined in 3GPP TS 29.154 [9]. After receiving the response including the determined transfer policies from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and may include Reference ID and a set of transfer policies. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

NOTE 1: The SCEF starts a new BDT policy negotiation in the Nt interface by sending the request to the PCRF without the previously associated BDT Reference ID.

If more than one policy is included in the HTTP response, the SCS/AS shall send an HTTP PATCH message to inform the SCEF for the "Individual BDT Subscription" resource of the transfer policy selected by the SCS/AS. After receiving the HTTP PATCH message, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and interact with the PCRF as defined in 3GPP TS 29.154 [9]. If the SCEF identifies any error (e.g. selected policy is not within the set of transfer policies), the SCEF shall not update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

The SCS/AS may also send an HTTP DELETE message to the SCEF for the "Individual BDT Subscription" resource requesting to remove an individual resource identified by the URI received in the response to the request that has created resource a URI. After receiving such request, the SCEF shall delete the resource and send an HTTP response to the SCS/AS with a corresponding status code.

NOTE 2: The SCEF can also remove the resource when the last window end time in transfer policies expires.

4.4.4 Procedures for changing the chargeable party at session set up or during the session

This procedure is used by an SCS/AS to either request to sponsor the traffic from the beginning or to request becoming the chargeable party at a later point in time via the T8 interface.

When setting up the connection between the AS and the UE via the SCEF, the SCS/AS shall send an HTTP POST request to the SCEF, targeting the "Chargeable Party Transactions" resource, to become the chargeable party for the session to be set up. The body of the HTTP POST message shall include the SCS/AS Identifier, UE IP address, IP Flow description, Sponsor ID, ASP ID, Sponsoring Status, notification destination URI identifying the recipient of notifications within the "notificationDestination" attribute and may include the time period and/or traffic volume used for sponsoring. The SCS/AS may also request to activate a previously selected policy of background data transfer by including the associated Reference ID in the body of the HTTP POST message.

After receiving the HTTP POST request, if the authorization performed by the SCEF is successful, the SCEF shall act as an AF and interact with the PCRF via the Rx interface, as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13], to trigger a PCRF initiated IP-CAN Session Modification. The SCEF may map the SCS/AS Identifier to AF Application Identifier and may request to be notified about the traffic plane status. If the time period and/or traffic volume are received from the AF, the SCEF should subscribe with the PCRF to the USAGE_REPORT event.

> NOTE 1: In this release of current specification, the SCS/AS Identifier can only be mapped to one AF Application Identifier based on operator policy and/or local configuration in the SCEF.

After receiving a successful response from the PCRF, the SCEF shall create a new "Individual Chargeable Party Transaction" resource, which represents the chargeable party transaction, addressed by a URI that contains the SCS/AS identity and an SCEF-created transaction identifier, and shall respond to the SCS/AS with a 201 Created status code, including a Location header field containing the URI of the created resource. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this chargeable party transaction. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not create a resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

In order to update the sponsoring status of an established AS session, the SCS/AS shall send an HTTP PATCH message to the SCEF targeting the associated "Individual Chargeable Party Transaction" resource requesting to partial update a chargeable party transaction resource (e.g. change the Sponsoring Status). When receiving the HTTP PATCH message, the SCEF shall make the change and interact with the PCRF to modify the Rx session as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13]. After receiving a response with successful result code from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a 200 OK status code and the result in the body of the HTTP response. The accumulated usage received from the PCRF shall be included if the SCS/AS requested to disable the sponsoring. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not update the resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

If the SCEF receives a traffic plane notification (e.g. the usage threshold is reached or transmission resource lost) or gets informed that the Rx session is terminated (e.g. due to the release of PDN connection), the SCEF shall send an HTTP POST message including the notified event (e.g. session terminated) and the accumulated usage to the SCS/AS identified by the notification destination URI received during session set up. The SCS/AS shall respond with an HTTP response to confirm the received notification.

> NOTE 2: The SCS/AS can assume a successful resource allocation upon receipt of the POST/PATCH response until the FAILED_RESOURCES_ALLOCATION event is received.

In order to remove an established AS session, the SCS/AS shall send an HTTP DELETE message to the SCEF targeting the associated "Individual Chargeable Party Transaction" resource. After receiving the HTTP DELETE message, the SCEF shall remove all properties of the resource and interact with the PCRF to terminate the Rx session (as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13]). After receiving the response from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and the accumulated usage (if received from the PCRF).

4.4.5 Procedures for Non-IP Data Delivery

4.4.5.1 General

This procedure is used by an SCS/AS to support the Non-IP Data Delivery (NIDD) via SCEF. It performs the NIDD configuration via the T8 interface. It also includes the mobile terminated (MT) and mobile originated (MO) communication with UEs via the T8 interface. It also includes the group message delivery via MT NIDD via the T8 interface and management of port numbers on UE and SCEF and their dynamic association with different applications.

Error handling for the procedures in this subclause shall be handled based on subclause 5.2.6.

4.4.5.2 NIDD Configuration

4.4.5.2.1 NIDD Configuration for a single UE

For a NIDD configuration creation, the SCS/AS shall send an HTTP POST message to the SCEF for the "NIDD configurations" resource. The body of the HTTP POST message shall include External Identifier or MSISDN, SCS/AS Identifier, notification destination URI identifying the recipient of notification within the "notificationDestination" attribute and may include NIDD Duration, PDN Connection Establishment Option and Reliable Data Service Configuration. In addition, the SCS/AS may send non-IP data and its associated parameters (e.g. Priority) as described in subsclause 4.4.5.3.1 in the NIDD configuration creation request. The Reliable Data Service Configuration includes port numbers on UE and SCEF that are used to identify specific applications for data transfer between UE and SCS/AS and an indication if reliable data service acknowledgement is enabled or not.

Upon receipt of the HTTP POST request from the SCS/AS to create a NIDD configuration, the SCEF shall check whether the SCS/AS is authenticated and authorized to create NIDD configuration, and also authorize the NIDD configuration. If authorization is successful, the SCEF shall interact with the HSS via S6t as specified in 3GPP TS 29.336 [11]. Upon receipt of the successful response from the HSS, the SCEF shall store the UE identity (IMSI and External Identifier or MSISDN) which is associated with the External Identifier or MSISDN and create a resource "Individual NIDD configuration", which represents the NIDD configuration, addressed by a URI that contains the SCS/AS identity and an SCEF-created NIDD configuration identifier, and shall respond to the SCS/AS with a 201 Created message, including a Location header field containing the URI for the created resource. The body of the response message shall include Maximum Packet Size and may include Reliable Data Service Indication. When the SCS/AS receives the URI in the Location header, it shall use this URI in subsequent requests to the SCEF to refer to this NIDD configuration.

If the SCS/AS includes an downlink non-IP data together with the NIDD configuration creation, the SCEF shall also create an "Individual NIDD downlink data delivery" sub-resource and send each of the sub-resouce within the "self" attribute in the "niddDownlinkDataTransfers" attribute together with the created resource "Individual NIDD configuration" which included in the Location header field in the HTTP POST response. When the SCS/AS receives the URI the "self" attribute in the "niddDownlinkDataTransfers" attribute, it shall use this URI in subsequent requests to the SCEF to refer to this downlink data delivery transfer.

After sending the HTTP response to NIDD configuration request, the SCEF shall perform the procedure for individual MT NIDD as described in subclause 4.4.5.3.1.

NOTE: Any further interaction with the SCS/AS for the piggybacked individual MT NIDD is performed by the notification of NIDD downlink data delivery status.

For a NIDD configuration modification, the SCS/AS shall send an HTTP PATCH message to the SCEF for the "Individual NIDD configuration" resource, using the URI received in the response to the request that has created the NIDD configuration resource. Upon receipt of the HTTP PATCH request from the SCS/AS to update the parameters of the NIDD configuration, the SCEF shall check whether the SCS/AS is authenticated and authorized to update NIDD configuration. If the authorization is successful, the SCEF shall verify that the resource to be modified already exists as identified by the URI. If the NIDD configuration resource is found, the SCEF shall update the NIDD configuration as requested. Upon successful update of the requested NIDD configuration including the interaction with the HSS via S6t as specified in 3GPP TS 29.336 [11], the SCEF shall respond to the SCS/AS with a 200 OK success message indicating that the NIDD configuration resource was successfully updated, or with a 204 No Content success message if the NIDD configuration modification is successful updated with no content in the PATCH response message body.

For a NIDD configuration cancellation, the SCS/AS shall send an HTTP DELETE message to the SCEF for the "Individual NIDD configuration" resource, using the URI received in the response to the request that has created the

NIDD configuration resource. Upon receipt of the HTTP DELETE message from the SCS/AS, the SCEF shall check whether the SCS/AS is authenticated and authorized to delete NIDD configuration. If the authorization is successful, the SCEF shall verify that the NIDD configuration resource identified by the URI already exists. If the configuration resource exists, the SCEF shall delete the requested configuration, and perform related NIDD procedure to EPC network elements if applicable. Upon successful deletion of requested NIDD configuration, the SCEF shall respond to the SCS/AS with a 200 OK success message indicating that the NIDD configuration was successfully cancelled. As an alternative to the 200 OK success message, the SCEF may send a 204 No Content success message without any message content to the SCS/AS.

When the NIDD Duration expires, the SCEF may remove the associated NIDD configuration resource and all individual downlink data delivery resources under such NIDD configuration.

4.4.5.2.2 NIDD Configuration for a group of UEs

The NIDD configuration procedure for a single UE as described in subclause 4.4.5.2.1 shall be applicable for a group of UEs with the following differences:

- The External Group Identifier shall be included in the POST request instead of MSISDN or External Identifier.

- After receiving the response message from the HSS, the SCEF shall store the list of UE identifiers (IMSI and External Identifier or MSISDN) which are associated with the External Group Identifier.

- The downlink non-IP data is not supported to be handled together with the NIDD configuration.

4.4.5.3 Mobile Terminated NIDD procedure

4.4.5.3.1 Mobile Terminated NIDD for a single UE

If the SCS/AS needs to perform a downlink non-IP data delivery for a single UE, the SCS/AS shall send an HTTP POST message to the SCEF for the "NIDD downlink data deliveries" resource, identifying an existing NIDD configuration resource as parent resource. The body of the HTTP POST message shall include External Identifier or MSISDN and non-IP data and may include PDN Connection Establishment Option, Reliable Data Service Configuration, Maximum Latency and Priority. The Reliable Data Service Configuration includes port numbers on UE and SCEF that are used to identify a specific application for data transfer between UE and SCS/AS and an indication if reliable data service acknowledgement is enabled or not.

Upon receipt of a HTTP POST request from the SCS/AS for a downlink data delivery for a single UE, the SCEF shall:

- verify the NIDD configuration resource already exists based on the URI passed, if the configuration resource does not exist, the SCEF shall respond a 404 Not Found response to reject the downlink data delivery, and

- check whether the SCS/AS is authorised to send NIDD requests, if not authorized, the SCEF shall respond a 401 Unauthorized response to reject the downlink data delivery, and

- check whether the non-IP packet size is larger than the Maximum Packet Size that was provided to the SCS/AS during NIDD Configuration. If the packet is oversized, the SCEF shall respond a 403 Forbidden response with a cause value "DATA_TOO_LARGE" in the "cause" attribute of the "ProblemDetails" structure indicating received non-IP packet size is larger than "maximumPacketSize" of the NIDD configuration.

- if the Rds_port_verification feature is supported, check whether the RDS port numbers are within the configured RDS port list. If the RDS port numbers are unknown in the SCEF, the SCEF shall respond a 403 Forbidden response with a cause value "RDS_PORT_UNKNOWN" in the "cause" attribute of the "ProblemDetails" structure.

If all above checks are successful, the SCEF shall determine the EPS Bearer Context based on the APN associated with the NIDD configuration and the User Identity. If the SCEF EPS bearer context is not found in the SCEF, depending on PDN Connection Establishment Option received in the POST request or from NIDD configuration, the SCEF may:

- reject the request with an error message to the SCS/AS;

- send a Device Trigger to the UE as described in subclause 4.4.6 without buffering the non-IP data and respond the SCS/AS with a 500 Internal Server Error response; or

- buffer the non-IP data and create the "Individual NIDD downlink data delivery" sub-resource, then send a 201 Created response to the SCS/AS. The response message also includes an indication of whether the Device Trigger procedure (as described in subclause 4.4.6) was performed by the SCEF. A Location header shall be included in the response message that provides the URI of the resource identifying this individual downlink data delivery. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this individual downlink data delivery for possible replacement or cancellation. The non-IP data shall be delivered when the non-IP PDN connection is established.

If the SCEF EPS bearer context is found in the SCEF, the SCEF shall check if the SCS/AS has exceeded the quota or rate of data submission considering the number of existing buffered non-IP data and restriction in APN and serving PLMN rate control. If quota is reached, the SCEF shall respond the SCS/AS with a 403 Forbidden response and a cause value "QUOTA_EXCEEDED" in the "cause" attribute of the "ProblemDetails" structure indicating the reason for the failure condition. If rate limit is reached, the SCEF shall respond the SCS/AS with 429 Too Many Requests.

If the check is passed, the SCEF shall continue the downlink non-IP data delivery procedure as the defined 3GPP TS 29.128 [12].

If the non-IP data delivery was successful, the SCEF shall send a 200 OK response to the HTTP POST request indicating the downlink non-IP data delivery is successful along with the acknowledge information; otherwise the SCEF may:

- send a 500 Internal Server Error and a cause value indicating the reason for the delivery failure; or

- if the MME/SGSN indicates UE is temporary not reachable, either:

  1. buffer the non-IP data and and create the "Individual NIDD downlink data delivery" sub-resource, then send a 201 Created response to the SCS/AS. The response may include a Requested Re-Transmission time to indicate the SCS/AS when the UE is expected to be reachable so that the SCEF re-transmits the buffered non-IP data; or

  2. send a 500 Internal Server Error response without buffering the non-IP data, and include a cause value "TEMPORARILY_NOT_REACHABLE" in the "cause" attribute of the "ProblemDetails" structure indicating the downlink non-IP data delivery is perfomed but stopped since UE is temporarily unreachable. The response may include a Requested Re-Transmission time to indicate the SCS/AS when the UE is expected to be reachable so that the SCS/AS may prepare any re-transmission;

If the MT_NIDD_modification_cancellation feature is supported and the SCS/AS decides to replace the pending downlink data delivery in the SCEF, the SCS/AS shall send an HTTP PUT message to the SCEF, using the URI received in the response to the request that has created the individual downlink data delivery resource. The External Identifier or MSISDN shall remain unchanged from previous values. Upon receipt of the HTTP PUT request from the SCS/AS, the SCEF shall check whether a pending non-IP data exists with the same URI (i.e. resource exists). If it is found, the SCEF shall replace it with the new non-IP data and continue waiting for any message from the MME/SGSN for the UE indicating either the non-IP PDN connection is being established or the UE is reachable (such message may be an MO NIDD); otherwise the SCEF shall respond 409 Conflict with a cause value "SENDING" in the "cause" attribute of the "ProblemDetails" structure indicating replacement failure. If the buffered data is already delivered, the SCEF shall respond with 404 Not Found and include a cause value a cause value "ALREADY_DELIVERED" in the "cause" attribute of the "ProblemDetails" structure indicating replacement failure.

If the MT_NIDD_modification_cancellation feature is supported and the SCS/AS decides to cancel the pending downlink data delivery in the SCEF, the SCS/AS shall send an HTTP DELETE message to the SCEF, using the URI received in the response to the request that has created the individual downlink data delivery resource. Upon receipt of the HTTP DELETE request from the SCS/AS, the SCEF shall check whether a pending request exists with the same URI. If such non-IP data has not been delivered, the SCEF shall remove the individual downlink data delivery resource and respond with an HTTP 204 No Content response; otherwise the SCEF shall respond with 404 Not Found (i.e. data already delivered) with a cause value "ALREADY_DELIVERED" in the "cause" attribute of the "ProblemDetails" structure or 409 Conflict (i.e. data delivery ongoing) response with a cause value "SENDING" in the "cause" attribute of the "ProblemDetails" structure, and include a cause value indicating cancellation failure.

If a pending non-IP data is delivered by the SCEF (e.g. due to non-IP PDN connection establishment), and the SCEF gets the delivery result from the MME/SGSN, the SCEF shall remove the "Individual NIDD downlink data delivery" sub-resource and send an HTTP POST message to the SCS/AS, identified by the notification destination URI received during the NIDD configuration, to notify the delivery result for the pending non-IP data. Upon receipt of the request, the SCS/AS shall acknowledge the notification with an HTTP 200 OK or 204 No Content response.

During MT NIDD delivery, if the UE indicates no support for RDS and the SCEF previously indicated RDS is enabled to the SCS/AS, the SCEF shall stop sending the non-IP data and send MT NIDD delivery notification with "FAILURE_RDS_DISABLED" delivery status.

4.4.5.3.2 Mobile Terminated NIDD for a group of UEs

If the SCS/AS needs to perform a downlink non-IP data delivery to a group of UEs and if both the SCS/AS and the SCEF support GroupMesageDelivery feature as defined in sublcause 5.6.4, the SCS/AS shall send an HTTP POST request message to the SCEF for the "NIDD downlink data deliveries" resource, identifying an existing NIDD configuration resource as parent resource. The body of the HTTP POST request message shall include the External Group Identifier and the non-IP data, and may include Reliable Data Service Configuration, PDN Connection Establishment Option and Maximum Latency.

Upon receipt of such an HTTP POST request from the SCS/AS requesting the group message delivery, the SCEF checks whether the SCS/AS is authorised to send NIDD requests, whether the non-IP packet size is larger than the Maximum Packet Size that was provided to the SCS/AS during NIDD Configuration and if the Rds_port_verification feature is supported whether the RDS port numbers are recognized. If any of those checks fails, the SCEF shall respond a HTTP response with a cause value indicating the reason for the failure condition. If all checks are successful, the SCEF shall create an "Individual NIDD downlink data delivery" resource and sends a 201 Created response to the SCS/AS to acknowledge acceptance of the HTTP POST request.

Then for each authorized External Identifier associated to the External Group Identifier which is retrieved from the HSS during preceding NIDD configuration procedure (as specified in subclause 4.4.5.2.2), the SCEF shall determine the EPS Bearer Context based on the APN associated with the NIDD configuration and the User Identity and continue the procedure as described for MT NIDD for a single UE in subclause 4.4.5.3.1 without sending downlink data delivery status notification for any individual UE to the SCS/AS.

At the end of buffering (duration determined by the Maximum Latency or local policy) or after processing data delivery for all UEs in the group, the SCEF shall send an HTTP POST message to SCS/AS to indicate the aggregated result of data delivery of each UE. The body of the HTTP POST request message shall include MSISDN or External Identifier, Retransmission Time (optional) and delivery result for each UE. Upon receipt of the request, the SCS/AS shall acknowledge the request with an HTTP 200 OK or 204 No Content response.

The MT_NIDD_modification_cancellation feature is not supported for the group message delivery via NIDD. If a PUT or DELETE request is received for the "Individual NIDD downlink data delivery" resource which was created for a group of UEs, the SCEF shall reject the message with 403 Forbidden response with a cause value "OPERATION_PROHIBITED" in the "cause" attribute of the "ProblemDetails" structure.

During MT NIDD delivery, if the UE indicates no support for RDS and the SCEF previously indicated RDS is enabled to the SCS/AS, the SCEF shall stop sending the non-IP data for the indicated UE. In the aggregated MT NIDD delivery notification, the SCEF shall send "FAILURE_RDS_DISABLED" delivery status for each failed UE.

4.4.5.4 Mobile Originated NIDD procedure

When the SCEF receives the non-IP data from MME/SGSN (or IWK-SCEF) as defined in 3GPP TS 29.128 [12], and finds an SCEF EPS bearer context and the associated NIDD configuration, the SCEF shall determine the SCS/AS by the corresponding NIDD configuration, and send an HTTP POST request to the SCS/AS identified by the Notification Destination Address received in the NIDD configuration to notify the uplink non-IP data. The body of the HTTP POST message shall include External Identifier or MSISDN, non-IP data, NIDD configuration identifier, Reliable Data Service Configuration (if available). The Reliable Data Service Configuration includes port numbers on UE and SCEF that are used to identify a specific application for data transfer between UE and SCS/AS and an indication if reliable data service acknowledgement is enabled or not.

Upon receipt of the request, if the SCS/AS knows the NIDD configuration identified by the NIDD configuration identifier, the SCS/AS shall acknowledge a 200 OK or 204 No Content message to the SCEF.

4.4.5.5 NIDD Authorisation Update procedure

When the SCEF receives a NIDD Authorisation Update Request message from HSS to update a user's NIDD authorisation as defined in 3GPP TS 29.336 [11], the SCEF shall determine the SCS/AS with the corresponding NIDD Configuration, and send an HTTP POST message to the SCS/AS to notify it of the NIDD Authorisation Update. The

body of the HTTP POST message shall include External Identifier or MSISDN, NIDD configuration identifier and the NIDD configuration status.

Upon receipt of the request, if the SCS/AS knows the corresponding NIDD configuration, then the SCS/AS shall acknowledge the request with an HTTP 200 OK or 204 No Content response.

If the NIDD configuration is revoked by the HSS within the received NIDD Authorisation Update Request, the SCEF shall release the corresponding T6a/b PDN connection as specified in 3GPP TS 29.128 [12]. In this case, the SCEF shall reject any subsequent MT NIDD deliveries with a 403 Forbidden response. Or 404 Not Found is returned, if the SCEF locally removed the associated NIDD configuration resource when the configuration was revoked.

If the RDS capability is changed, e.g. when the T6a/b PDN connection is etablished, the UE indicates no support for RDS but the SCEF previously indicated RDS is supported to the SCS/AS in the NIDD configuration procedure, the SCEF shall send an HTTP POST message to notify the SCS/AS that the NIDD status is active and RDS capability indication. The SCS/AS shall acknowledge the request with an HTTP 200 OK or 204 No Content response.

If the Rds_port_verification feature is supported, before sending the MO NIDD to the SCS/AS as specified in subclause 4.4.5.4, the SCEF shall check RDS port numbers (decoded from the uplink non-IP data according to 3GPP TS 24.250 [31]). If the RDS port numbers are not within the configured RDS port list, the SCEF shall notify the SCS/AS with NIDD status set to "RDS_PORT_UNKNOWN" and the unknown RDS port numbers. The SCS/AS shall acknowledge the request with an HTTP 200 OK or 204 No Content response.

4.4.5.6 Port Management Configuration

4.4.5.6.1 Port Reservation and Release

As part of the Port Management configuration, operations to reserve a combination of port numbers, release a combination of port numbers, query the list of port numbers that are reserved and notification of reservation of a port number may be performed, if the Rds_dynamic_port feature is supported.

If the SCS/AS needs to reserve port numbers and associate them with an application, the SCS/AS shall send an HTTP PUT message to the SCEF, using the URI received in the response to the request that has created the NIDD configuration resource and the specific part of "/rds-ports/{portId}" as described in subclause 5.6.3.9.2. The SCS/AS may use this operation to reserve port numbers on the UE and SCEF and associate them with an application. Upon receipt of the HTTP PUT request from the SCS/AS,

- if the "skipUeInquiry" is set to "false" and if the "individual ManagePort Configuration" resource already exists in the same NIDD configuration, the SCEF shall respond with 403 Forbidden response with a cause value "PORT_NOT_FREE" in the "cause" attribute of the "ProblemDetails" structure; otherwise, the SCEF shall interact with the UE via the SGSN/MME to reserve the port by using RDS protocol as specified in 3GPP TS 24.250 [31] and return 202 Accept to the SCS/AS if successful response is received from the SGSN/MME. Then if the SCEF receives successful UE response, the SCEF shall create the "individual ManagePort Configuration" resource and notify the SCS/AS with the reserved port as specified in subclause 4.4.5.6.2, the SCEF shall also mark the resource is created by the SCS/AS; otherwise, the SCEF shall notify the SCS/AS about the currently reserved ports as specified in subclause 4.4.5.6.2.

- if the "skipUeInquiry" is set to "true" and if the requested SCEF port already exists in an NIDD configuration within the same APN, the SCEF shall respond with 403 Forbidden response with a cause value "PORT_NOT_FREE" in the "cause" attribute of the "ProblemDetails" structure; otherwise, the SCEF shall create the "individual ManagePort Configuration" resource and send an HTTP 201 Created response to the SCS/AS, the SCEF shall also mark the resource is created by the SCS/AS and notify the UE by using RDS protocol as specified in 3GPP TS 24.250 [31].

If the SCS/AS needs to release port numbers associated with an application, the SCS/AS shall send an HTTP DELETE message to the SCEF, using the URI received in the response to the request that has created the "individual ManagePort Configuration" resource. Upon receipt of of the HTTP DELETE request from the SCS/AS, if the "individual ManagePort Configuration" resource does not exist in the same NIDD configuration, the SCEF shall respond with 404 Not Found with a cause value "PORT_NOT_ASSOC_WITH_APP" in the "cause" attribute of the "ProblemDetails" structure; otherwise if the the "individual ManagePort Configuration" resource was created by the SCS/AS and

- if the "skipUeInquiry" is set to "false", the SCEF shall interact with the UE via the SGSN/MME to release the port by using RDS protocol as specified in 3GPP TS 24.250 [31] and return 202 Accept to the SCS/AS if

successful response is received from the SGSN/MME. Then upon receipt of the UE response, the SCEF shall notify the SCS/AS with the currently reserved ports as specified in subclause 4.4.5.6.2.

- if the "skipUeInquiry" is set to "true", the SCEF shall delete the individual ManagePort Configuration resource and respond with an HTTP 204 No Content response to the SCS/AS. The SCEF shall also notify the UE by using RDS protocol as specified in 3GPP TS 24.250 [31].

If the HTTP DELETE request is received for the "Individual ManagePort Configuration" resource which was created by the UE, the SCEF shall reject the message with 403 Forbidden response with a cause value "OPERATION_PROHIBITED" in the "cause" attribute of the "ProblemDetails" structure.

If the "skipUeInquiry" is set to "false" and the SCEF is not able to interact with the UE because:

- PDN connection is not established, the SCEF shall reject the HTTP PUT/DELETE request with a 500 Internal Server Error response with a cause value "NO_PDN_CONNECTION";

- UE is not reachable, the SCEF shall reject the HTTP PUT/DELETE request with a 500 Internal Server Error response with a cause value "TEMPORARILY_NOT_REACHABLE". The response may include a Requested Re-Transmission time to indicate the SCS/AS when the UE is expected to be reachable so that the SCS/AS may prepare any re-configuration for the RDS port; or

- the interaction with the SGSN/MME is not successful, the SCEF shall reject the HTTP PUT/DELETE request with a 500 Internal Server Error and a proper cause value indicating the reason for the delivery failure.

4.4.5.6.2 Port Notification

If the SCEF needs to send the information about reserved ports and their configuration to the SCS/AS (e.g. due to 3GPP network created or released "individual ManagePort Configuration" resource upon UE triggered RDS port management procedures as specified in 3GPP TS 24.250 [31]), the SCEF shall send an HTTP POST message to the SCS/AS, using the URI received within the "notificationDestination" attribute in the NiddConfiguration resource. The body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.9-1. The SCS/AS shall acknowledge the HTTP POST request with an HTTP 200 OK or 204 No Content response.

4.4.6 Procedures for Device Triggering

The procedures are used by the SCS/AS to deliver the device trigger via T8 interface.

In order to create a new device trigger, the SCS/AS shall send an HTTP POST message to the SCEF for the "Device Triggering Transactions" resource. The body of the HTTP POST message shall include the External Identifier or MSISDN, validity period, priority, Application Port ID and trigger payload.

Upon receipt of the corresponding HTTP POST message, the SCEF shall check if the SCS/AS is authorised to send a trigger request and if the SCS/AS has exceeded its quota or rate of trigger submission. The SCEF shall also resolve the External Identifier or MSISDN to IMSI and retrieve the "Routing Information" from HSS for the triggering delivery. If the authorisation check fails, or if the quota or rate of trigger submission was exceeded, or if there is no valid subscription information or if the "Routing Information" cannot be found, then the SCEF shall reject the request with an error message to the SCS/AS. Otherwise, the SCEF shall perform the device trigger procedure over Tsp as defined in 3GPP TS 29.368 [24] and T4 as defined in 3GPP TS 29.337 [25]. Upon completion of this procedure, the SCEF shall create a resource "Individual Device Triggering Transaction" which represents the triggering transaction, addressed by a URI that contains the SCS/AS identity and an SCEF-created transaction identifier, and shall respond to the SCS/AS with a 201 Created message, including the trigger and a Location header field containing the URI for the created resource. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this device triggering transaction.

In order to replace an existing device trigger, the SCS/AS shall send an HTTP PUT message to the SCEF for the "Individual Device Triggering Transaction" resource, using the URI received in the response to the request that has created the device triggering transaction resource. The body of the HTTP PUT message shall include External Identifier or MSISDN, validity period, priority, Application Port ID and trigger payload.

After receiving the corresponding HTTP PUT message from the SCS/AS, the SCEF shall check if the SCS/AS is authorised to replace an existing device trigger and if the SCS/AS has not exceeded its quota or rate of trigger submission. If any of these checks fail, then the SCEF shall reject the message with an error. Otherwise, the SCEF shall replace the device triggering with the SMS-SC by performing the device trigger replace procedure over Tsp as defined

in 3GPP TS 29.368 [24] and T4 as defined in 3GPP TS 29.337 [25]. Upon completion of this procedure, the SCEF shall send an HTTP response to the SCS/AS to indicate trigger replace success or failure.

In order to recall an existing device trigger, the SCS/AS shall send an HTTP DELETE message to the SCEF for the "Individual Device Triggering Transaction" resource, using the URI received in the response to the request that has created the device triggering transaction resource.

After receiving the corresponding HTTP DELETE message from the SCS/AS, the SCEF shall check if the SCS/AS is authorised to send a recall trigger request and if the SCS/AS has not exceeded its quota or rate of trigger submission. The SCEF shall also check if the device triggering transaction resource referenced by the URI exists. If any of these checks fail, then the SCEF shall reject the message with an error. Otherwise, the SCEF shall recall the device triggering with the SMS-SC by performing the device trigger recall procedure over Tsp as defined in 3GPP TS 29.368 [24] and T4 as defined in 3GPP TS 29.337 [25]. Upon completion of this procedure, the SCEF shall send an HTTP response to the SCS/AS to indicate trigger recall success or failure.

When it receives the Message Delivery Report from the SMS/SC, the SCEF shall send an HTTP POST message to the SCS/AS to report the trigger delivery result. The body of the HTTP POST message shall include the identifier if the transaction and cause. The SCS/AS shall respond with an HTTP 200 OK or 204 No Content response.

4.4.7 Procedures for Group Message Delivery

4.4.7.1 General

This procedure is used by an SCS/AS to deliver a payload to a group of UEs. Two methods of Group Message Delivery via the T8 are specified:

- Group Message Delivery via MBMS which is intended to efficiently distribute the same content to the members of a group that are located in a particular geographical area when MBMS is used. This method further includes two varieties:

  - the MB2 interface (see stage 2 in 3GPP TS 23.468 [55] and stage 3 in 3GPP TS 29.468 [36]) is used as southbound interface;

  - the xMB interface (see stage 2 in 3GPP TS 26.348 [56] and stage 3 in 3GPP TS 29.116 [37]) is used as southbound interface.

- Group Message Delivery via unicast MT NIDD for UEs which are part of the same External Group Identifier.

  NOTE: Group Message Delivery via MT NIDD is defined in subclause 4.4.5.3.2.

Error handling for the procedures in the subsequent subclauses shall be handled based on subclause 5.2.6.

4.4.7.2 Group Message Delivery via MBMS

4.4.7.2.1 General

This procedure is used by an SCS/AS to deliver a payload to a group of UEs via the T8 interface. The SCEF use the Group Message Delivery via MBMS to efficiently distribute the same content to the members of a group that are located in a particular geographical area when MBMS is used.

The procedure of Group message Delivery via MBMS and MB2 used as southbound interface is described in subcaluse 4.4.7.2.2 and the procedure of Group message Delivery via MBMS and xMB used as southbound interface is described in subcaluse 4.4.7.2.3.

4.4.7.2.2 Group Message Delivery via MBMS by MB2

4.4.7.2.2.1 TMGI Allocation

If the SCS/AS acts as a GCS AS in the application level and if there is no assigned TMGI for an External Group Identifier, the SCS/AS shall send an HTTP message to the SCEF to the resource "TMGI Allocation". The body of the HTTP POST request message shall include the External Group Identifier. The SCS/AS may also include the location information in the body.

Upon receipt of the HTTP POST request from the SCS/AS to allocate a TMGI, the SCEF shall check whether the SCS/AS is authorized to request TMGI allocation. If authorization is successful, the SCEF shall initiate TMGI allocation by the BM-SC as defined in subclause 5.2.1 of 3GPP TS 29.468 [36]. Upon successful allocation of a TMGI, the SCEF shall create the resource which represents the TMGI allocation, addressed by a URI that contains the SCS identity and TMGI, and shall respond to the SCS/AS with a 201 Created message including the TMGI and the TMGI expiration time.

In order to renew the TMGI expiration time, the SCS/AS shall send an HTTP PUT or PATCH message to the SCEF to the resource "Individual TMGI Allocation". Upon receipt of the HTTP PUT or PATCH request from the SCS/AS to renew TMGI expiration time, the SCEF shall initiate TMGI expiration time renewal to the BM-SC as defined in subclause 5.2.1 of 3GPP TS 29.468 [36]. Upon successful result, the SCEF shall update the resource and respond to the SCS/AS by sending an HTTP response with 200 OK including the new TMGI expiration time.

If the SCEF receives the response with an error code from the BM-SC for the allocation of TMGI or renewal of expiration time for the existing TMGI, the SCEF shall not create or update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

Upon the TMGI expiration, the SCEF may delete the resource of the TMGI locally.

Upon receipt of the notification of TMGI expiration by the BM-SC as defined in subclause 5.2.3 of 3GPP TS 29.468 [36], the SCEF shall delete the resource if not yet deleted.

4.4.7.2.2.2 TMGI Deallocation

In order to deallocate the TMGI, the SCS/AS shall send an HTTP DELETE message to the SCEF to the resource "Individual TMGI Allocation". Upon receipt of the HTTP DELETE request from the SCS/AS to deallocate the TMGI, the SCEF shall initiate TMGI deallocation by the BM-SC as defined in subclause 5.2.2 of 3GPP TS 29.468 [36]. Upon successful deallocation of a TMGI, the SCEF shall delete the resource "Individual TMGI Allocation" together with all sub-resouces "GMD via MBMS by MB2" if available,and shall respond to the SCS/AS by sending an HTTP response with 204 No Content.

4.4.7.2.2.3 Creation of group message delivery

If the SCS/AS acts as a GCS AS in the application level and if the SCS/AS has an assigned TMGI for the External Group Identifier, in order to perform the group message delivery, the SCS/AS shall sends an HTTP POST request message to the SCEF to the resource "GMD via MBMS by MB2". The body of the HTTP POST request message shall include the External Group Identifier and notification destination URI identifying the recipient of notification within the "notificationDestination" attribute. The SCS/AS may also include the Group Message Payload, the location information and a Message Delivery Start Time in the body.

The SCS/AS may also send an HTTP POST message to the SCEF directly to the resource "TMGI Allocation" without previously requesting TMGI allocation as defined in subclause 4.4.7.2.2. The SCEF shall create the resource "Individual TMGI Allocation" and perform the procedure as define in subclause 4.4.7.2.2, and shall also create resource "GMD via MBMS by MB2" and perform the procedure as mentioned in this subclause for MBMS bearer creation.

Upon receipt of the HTTP POST request from the SCS/AS to deliver the group message, the SCEF shall check whether the SCS/AS is authorized to send a group message request. It also checks to see if the Message Delivery Start Time does not start after the TMGI expiration. If authorization is successful, the SCEF shall initiate the Active MBMS Bearer procedure as defined in subclause 5.3.2 of 3GPP TS 29.468 [36] with the difference that the SCEF acts as a GCS AS. The SCEF shall include the location information based on the local configuration if the location information is not provided in the HTTP POST request message.

Upon successful activation of MBMS bearer, the SCEF shall create resource which represents "Individual GMD via MBMS by MB2", addressed by a URI that contains Transaction Id allocated by the SCEF and respond to the SCS/AS by sending an HTTP response with a 201 Created status code, including a Location header field containing the URI for the created resource. When the SCS/AS receives the URI in the Location header, it shall use this URI in subsequent requests to the SCEF to refer to this active MBMS bearer. If the Group Message Payload was not include in the HTTP POST above, the HTTP response sent from the SCEF shall also include the SCEF message delivery Ipv4 address or Ipv6 address and port number.

If the SCEF receives the response with an error code from the BM-SC for the activation of MBMS bearer, the SCEF shall not create the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

If the Group Message Payload was included the HTTP POST above, the SCEF shall deliver to BM-SC the Group Message Payload(s) as defined in 3GPP TS 29.468 [36] at Message Delivery Start Time.

If the Group Message Payload was not include in the HTTP POST above, the SCEF shall transfer the contents received from the SCS/AS to the BM-CS at or after the requested Group Message Start Time, but before the TMGI Expiration time. In this case, when the SCEF detects the group message delivery was triggered successful, the SCEF shall send an HTTP POST request message to the SCS/AS.

NOTE: If Group Message Payload was included, then at Message Delivery Start Time, the SCEF delivers to BM-SC the Group Message Payload(s) to corresponding to MB2-U IP address and port number associated with respective TMGI.

4.4.7.2.2.4 Modification of previous submitted group message delivery

If the SCS/AS determines that modification of previous accepted Group Message Delivery Request is required, the SCS/AS shall send an HTTP PATCH or HTTP PUT request message to the SCEF to the resource "Individual GMD via MBMS by MB2". The body of the HTTP PATCH request message shall include the Message Delivery Start Time. The SCS/AS may also include the External Group Identifier, the Group Message Payload and the location information in the body. The body of the HTTP PUT request message shall include the information as the information provided in the HTTP POST in subclause 4.4.7.2.2.2.3. The body of the HTTP PATCH request message shall include the information defined in the data type of GMDViaMBMSByMb2Patch as defined in subclause 5.8.2.1.1.6.

Upon receipt of the HTTP PATCH or HTTP PUT request from the SCS/AS to modify the previous group message delivery subscription, the SCEF shall check whether the SCS/AS is authenticated and authorized to modify the submitted group message delivery. If the authorization is successful, the SCEF shall initiate the Modify MBMS Bearer procedure as defined in subclause 5.3.4 of 3GPP TS 29.468 [36] with the difference that the SCEF acts as a GCS AS. The SCEF shall include the location information based on the local configuration if the location information is not provided in the HTTP PATCH or HTTP PUT request message.

Upon successful modification of MBMS bearer, the SCEF shall update the resource and respond to the SCS/AS with a 200 OK success message indicating that previous group message delivery subscription is successfully updated.

If the SCEF receives the response with an error code from the BM-SC for the modification of MBMS bearer, the SCEF shall not update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.7.2.2.5 Cancellation of previous submitted group message delivery

If the SCS/AS determines that deletion of previous accepted Group Message Delivery Request is required, the SCS/AS shall send an HTTP DELETE request message to the SCEF.

Upon receipt of the HTTP DELETE request from the SCS/AS to delete the previous group message delivery, the SCEF shall check whether the SCS/AS is authenticated and authorized to delete an existing group message delivery subscription. If the authorization is successful, the SCEF shall initiate the Delete MBMS Bearer procedure as defined in subclause 5.3.3 of 3GPP TS 29.468 [36] with the difference that the SCEF acts as a GCS AS.

Upon successful deletion of MBMS bearer, the SCEF shall respond to the SCS/AS with a 204 No Content message indicating that submitted group message delivery is successfully deleted.

4.4.7.2.3 Group message Delivery via MBMS by xMB

4.4.7.2.3.1 Service Creation

If the SCS/AS acts as a content provider in the application level and if there is no assigned Service ID for an External Group Identifier, the SCS/AS shall send an HTTP POST message to the SCEF to the resource "xMB Services". The body of the HTTP POST request message shall include the External Group Identifier.

Upon receipt of the HTTP POST request from the SCS/AS to create a service, the SCEF shall check whether the SCS/AS is authorized to request service creation. If authorization is successful, the SCEF shall initiate service creation by the BM-SC as defined in subclause 5.2.1.2.2 of 3GPP TS 29.116 [37]. Upon successful service creation, the SCEF shall create the resource which represents the service creation, addressed by a URI that contains the SCS identity and Service Id, and shall respond to the SCS/AS with a 201 Created message which may include the service announcement information.

If the SCEF receives the response with an error status code from the BM-SC for the service creation, the SCEF shall not create or update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.7.2.3.2 Service Deletion

In order to delete the service, the SCS/AS shall send an HTTP DELETE message to the SCEF to the resource "Individual xMB Service". Upon receipt of the HTTP DELETE request from the SCS/AS to delete the service, the SCEF shall initiate service deletion by the BM-SC as defined in subclause 5.2.1.2.4 of 3GPP TS 29.116 [37]. Upon successful deletion of a service, the SCEF shall delete the resource "Individual xMB Service" together with all sub-resouces "GMD via MBMS by xMB" if available, and shall respond to the SCS/AS by sending an HTTP response with 204 No Content.

4.4.7.2.3.3 Creation of group message delivery

If the SCS/AS acts as a content provider in the application level, the SCS/AS may sends an HTTP POST request message to the SCEF to the resource "GMD via MBMS by xMB". The body of the HTTP POST request message shall include the External Group Identifier and notification destination URI identifying the recipient of notification within the "notificationDestination" attribute. The SCS/AS may also include the Group Message Payload, the location information, a Message Delivery Start Time and Message Delivery Stop Time in the body.

Upon receipt of the HTTP POST request from the SCS/AS to deliver the group message, the SCEF shall check whether the SCS/AS is authorized to send a group message request. It also checks to see if the Message Delivery Start Time doesn't start after the Message Delivery Stop Time. If authorization is successful, the SCEF shall initiate the Create Session procedure as defined in subclause 4.4.5.2 of 3GPP TS 29.116 [37] and the Update Session procedure as defined in subclause 4.4.5.3 of 3GPP TS 29.116 [37] with the difference that the SCEF acts as a Content Provider, Session Start is set accordiong to the Message Delivery Start Time and the Session Stop is set according to the Message Delivery Stop Time. The SCEF shall include the location information based on the local configuration if the location information is not provided and include the session type set to "Files" in the HTTP POST request message.

Upon successful activation of MBMS bearer, the SCEF shall create resource which represents "Individual GMD via MBMS by xMB ", addressed by a URI that contains Transaction Id allocated by the SCEF and respond to the SCS/AS by sending an HTTP response with a 201 Created status code, including a Location header field containing the URI for the created resource. When the SCS/AS receives the URI in the Location header, it shall use this URI in subsequent requests to the SCEF to refer to this active MBMS bearer. If the Group Message Payload was not included in the HTTP POST above, the HTTP response sent from the SCEF shall also include the SCEF message delivery Ipv4 address or Ipv6 address and port number.

If the SCEF receives the response with an error code from the BM-SC for the activation of MBMS bearer, the SCEF shall not create the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

If the Group Message Payload was included the HTTP POST above, the SCEF shall deliver to BM-SC the Group Message Payload(s) as defined in 3GPP TS 29.468 [36] at Message Delivery Start Time.

If the Group Message Payload was not included in the HTTP POST above, the SCEF shall transfer the contents received from the SCS/AS to the BM-CS at or after the requested Message Delivery Start Time, but before the Message Delivery Stop Time. In this case, when the SCEF detects the group message delivery was triggered successful, the SCEF shall send an HTTP POST request message to the SCS/AS.

4.4.7.2.3.4 Modification of previous submitted group message delivery

If the SCS/AS determines that modification of previous accepted Group Message Delivery Request is required, the SCS/AS shall send an HTTP PATCH or HTTP PUT request message to the SCEF to the resource "Individual GMD via MBMS by xMB ". The body of the HTTP PATCH request message shall include the Message Delivery Start Time and Message Delivery Stop Time. The SCS/AS may also include the External Group Identifier, the Group Message Payload and the location information in the body. The body of the HTTP PUT request message shall include the information as the information provided in the HTTP POST in subclause 4.4.7.2.3.3. The body of the HTTP PATCH request message shall include the information defined in the data type of GMDViaMBMSByxMBPatch as defined in subclause 5.8.3.1.1.4.

Upon receipt of the HTTP PATCH or HTTP PUT request from the SCS/AS to modify the previous group message delivery subscription, the SCEF shall check whether the SCS/AS is authenticated and authorized to modify the

submitted group message delivery. If the authorization is successful, the SCEF shall initiate the Update Session procedure as defined in subclause 4.4.5.3 of 3GPP TS 29.116 [37] with the difference that the SCEF acts as a Content Provider, Session Start is set accordiong to the Message Delivery Start Time and the Session Stop is set according to the Message Delivery Stop Time. The SCEF shall include the location information based on the local configuration if the location information is not provided in the HTTP PATCH or HTTP PUT request message.

Upon successful modification of MBMS bearer, the SCEF shall respond to the SCS/AS with a 200 OK success message indicating that previous group message delivery subscription is successfully updated.

If the SCEF receives the response with an error code from the BM-SC for the modification of MBMS bearer, the SCEF shall not update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.7.2.3.5 Cancellation of previous submitted group message delivery

If the SCS/AS determines that deletion of previous accepted Group Message Delivery Request is required, the SCS/AS shall send an HTTP DELETE request message to the SCEF.

Upon receipt of the HTTP DELETE request from the SCS/AS to delete the previous group message delivery, the SCEF shall check whether the SCS/AS is authenticated and authorized to delete an existing group message delivery subscription. If the authorization is successful, the SCEF shall initiate the Delete Session procedure as defined in subclause 4.4.5.4 of 3GPP TS 29.116 [37] with the difference that the SCEF acts as a Content Provider.

Upon successful deletion of MBMS bearer, the SCEF shall respond to the SCS/AS with a 204 No Content message indicating that submitted group message delivery is successfully deleted.

4.4.8 Procedures for Reporting of Network Status

4.4.8.1 General

These procedures are used by an SCS/AS to perform reporting of network status via the T8 interface in one time or continuous reporting cases. The SCEF uses the reporting procedures based on the network status information from one or more RCAF(s). These procedures can also be used by the SCS/AS to indicate the removal of a previously subscribed reporting request.

4.4.8.2 Network Status Reporting Subscription

In order to create a new subscription to request for notification about the network status, the SCS/AS shall send an HTTP POST message to the SCEF for the "Network Status Reporting Subscriptions" resource. The body of HTTP POST message shall include a Notification destination address and Location area, and may include time duration and threshold (s).

Upon receiving the HTTP POST message from the SCS/AS, the SCEF shall check:

- if the SCS/AS is authorized to perform the request. If not the SCEF shall respond to the SCS/AS with a status code set to 401 Unauthorized.

- if the SCS/AS has exceeded its quota of submitting requests. If so the SCEF shall respond to the SCS/AS with a status code set to 403 Forbidden and may indicate the failure reason "QUOTA_EXCEEDED" (i.e. the quota exceeded) within the "cause" attribute of the "ProblemDetails" structure in the HTTP POST response.

- if the SCS/AS has exceeded its rate of submitting requests. If so the SCEF shall respond to the SCS/AS with a status code set to 429 Too Many Requests in the HTTP POST response.

After the SCEF authorized the HTTP request message, the SCEF shall create a resource "Individual Network Status Reporting Subscription" which represents the subscription, addressed by a URI that contains the SCS/AS identity and an SCEF-created subscription identifier, and shall respond to the SCS/AS with a 201 Created message, including a Location header field containing the URI for the created resource, to acknowledge to the SCS/AS the successful subscription. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this network status reporting subscription. Then, the SCEF shall perform request of network status reporting procedure with the RCAF over Ns interface as defined in 3GPP TS 29.153 [30].

In order to update an existing subscription of continuous network status reporting, the SCS/AS shall send an HTTP PUT message to the SCEF for the "Individual Network Status Reporting Subscription" resource, using the URI received in the response to the request that has created the network status reporting subscription resource. After receiving the HTTP PUT message, the SCEF shall send an HTTP response to the SCS/AS with a 200 OKstatus code and include the result in the body of the HTTP response. Then, the SCEF shall make the change and interact with the RCAF as defined in 3GPP TS 29.153 [30].

> NOTE: In order to update an existing subscription, the SCEF needs to send a cancellation to the previously associated RCAF(s) to remove the related SCEF instructions and then send a new request with updated parameters.

In order to remove an existing subscription of continuous network status reporting, the SCS/AS shall send an HTTP DELETE message to the SCEF for the "Individual Network Status Reporting Subscription" resource, using the URI received in the response to the request that has created the network status reporting subscription resource. Upon receipt of the HTTP DELETE message, the SCEF shall send an HTTP response to the SCS/AS with a 204 No Content status code. Then, the SCEF shall interact with the RCAF to terminate the continuous reporting of network status as defined in 3GPP TS 29.153 [30].

4.4.8.3 Network Status Reporting Notification

After receiving reports from all the involved RCAF(s) as defined in 3GPP TS 29.153 [30], the SCEF shall send an HTTP POST message to the SCS/AS using the identified destination URL, which is provided by the SCS/AS during the network status reporting subscription. The body of HTTP POST message shall include the NSI.

4.4.9 Procedures for Communication Pattern Parameters Provisioning

One or more set of CP parameters may be provisioned by the SCS/AS for a single UE or a group of UEs.

In order to create resources for one or more CP parameter set(s), the SCS/AS shall send an HTTP POST message to the SCEF for the "CP Provisioning Subscriptions" resource, including one or more new provisioned CP parameter set(s). The body of HTTP POST message shall include External Identifier or MSISDN for a single UE or External Group ID for a group of UEs, SCS/AS Identifier and one or more set of CP information associated with CP parameter set Id(s).

After receiving the HTTP POST message, the SCEF shall check if the SCS/AS is authorised. The SCEF may also check if the number of CP parameter sets(s) reaches the limitation based on operator policy or configuration.

After validation, the SCEF shall for each received CP parameter set Id, assign an SCEF Reference ID which may be derived from the CP parameter set Id, and send Update CP Parameter Request message to the HSS for delivering the CP parameter set(s) as specified in 3GPP TS 29.336 [11].

After receiving result from the HSS, if the result is successful, the SCEF shall create a resource "Individual CP Provisioning Subscription" and the corresponding sub-resources "Individual CP Set Provisioning" each represents a successfully provisioned CP parameter set indicated by the HSS and respond to the SCS/AS with a 201 Created including Location header field containing the URI for the created subscription resource "Individual CP Provisioning Subscription" and the sub-resource(s) "Individual CP Set Provisioning" corresponding to each successful CP parameter set within the "self" attribute in the "cpParameterSet" attribute; otherwise, the SCEF shall not create any resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6. If not all CP parameters sets are provisioned successfully (i.e. the HSS indicates failure for some or all CP parameter sets and/or the SCEF does not accept the CP parameter provisioning (e.g. one or more CP Set Identifiers in the request are already present in existing subscriptions)), the SCEF shall also include CP report(s) within attribute "cpReports" with a list of failed CP Set Identifier(s) and the corresponding failure code as specified in table 5.10.2.3.5-1 in the body of the HTTP response.

In order to add new CP parameter set(s), update and/or remove the existing CP parameter set(s) for one or more CP parameter set Id(s), the SCS/AS may send an HTTP PUT message to the SCEF for the "Individual CP Provisioning Subscription" resource requesting to add new CP parameter set(s) by creating new resource(s), change some created properties (e.g. Validity Time) of the existing resource(s), and/or remove some or entire properties of the existing resource(s). After receiving the HTTP PUT message, the SCEF shall send the CP parameter changes to the HSS as specified in 3GPP TS 29.336 [11]. After receiving the response from the HSS with a successful code, if the HSS indicates all CP parameter sets or some CP parameter sets are provisioned successfully, the SCEF shall create or update the corresponding sub-resource(s) "Individual CP Set Provisioning" each represents a successfully provisioned CP parameter set indicated by the HSS and send an HTTP response to the SCS/AS with a 200 OK status code and include a list of successful CP parameter set(s) in the body of the HTTP response. Otherwise, the SCEF shall not create or update

the resource(s) and shall send an HTTP response to the SCS/AS with a corresponding failure code as described in subclause 5.2.6. If not all CP parameters sets are provisioned successfully (i.e. the HSS indicates failure for some or all CP parameter sets and/or the SCEF does not accept the CP parameter provisioning (e.g. one or more CP Set Identifiers in the request are already present in existing subscriptions)), the SCEF shall also include CP report(s) within attribute "cpReports" with a list of failed CP Set Identifier(s) and the corresponding failure code as specified in table 5.10.2.3.5-1 in the body of the HTTP response.

The SCS/AS may send a HTTP PUT message to the SCEF for the "Individual CP Set Provisioning" resource requesting to replace an individual resource identified by the CP parameter set Id. The body of the HTTP PUT message shall include set of CP information. After receiving such request, the SCEF shall interact with the HSS as specified in 3GPP TS 29.336 [11]. After receiving the response from the HSS with a successful code, the SCEF shall update the resource and send an HTTP response to the SCS/AS with a 200 OK status code; otherwise, the SCEF shall not update the resource and shall send an HTTP response to the SCS/AS with a corresponding failure code as described in subclause 5.2.6. If the provisioning of the CP set fails (i.e. the HSS returns failure for the CP set or the SCEF does not accept the CP set provisioning), the SCEF shall reject the request with a corresponding status code, and include the attribute "cpReports" with the corresponding failure code as specified in table 5.10.2.3.5-1 and the CP Set Identifier for which the provisioning has failed.

The SCS/AS may send an HTTP DELETE message to the SCEF requesting to delete an individual CP set resource "Individual CP Set Provisioning". After receiving such request, the SCEF shall determine the SCEF Reference ID for Deletion associated with the CP parameter set Id, and interact with the HSS as specified in 3GPP TS 29.336 [11]. After receiving the response from the HSS, the SCEF shall delete the addressed resource and send an HTTP response to the SCS/AS with a 204 No Content status code.

The SCS/AS may send an HTTP DELETE message to the SCEF requesting to delete an individual subscription resource "Individual CP Provisioning Subscription". After receiving such request, the SCEF shall determine the SCEF Reference ID (s) for Deletion associated with the CP parameter set Id(s) and interact with the HSS as specified in 3GPP TS 29.336 [11]. After receiving the response from the HSS, the SCEF shall delete the addressed resource and its sub-resources addressed by "Individual CP Set Provisioning" and send an HTTP response to the SCS/AS with a 204 No Content status code.

4.4.10 Procedures for PFD Management

The PFDs associated with application identifier(s) may be created, updated or removed by the third party SCS/AS as defined in 3GPP TS 23.682 [2].

In order to create PFDs resources for one or more external Application Identifier(s), the SCS/AS shall send an HTTP POST message to the request URI of the resource "PFD Management Transactions" including one or more set of PFDs for external Application Identifier(s). The body of the HTTP POST message shall include external Application Identifier(s) and PFDs associated with its PFD Identifier(s), an Allowed Delay may be included for the external Application Identifier(s) as well.

After receiving the HTTP POST message, if the SCS/AS is authorized, the SCEF shall provision the PFDs to the PFDF as defined in 3GPP TS 29.250 [26]. When receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code. If one or more external application identifiers are provisioned successfully, the SCEF shall create an "Individual PFD Management Transaction" resource for the request and he corresponding sub-resources "Individual Application PFD Management" each represents a successfully provisioned external application identifier. The SCEF shall respond to the SCS/AS with a 201 Created including Location header field containing the URI for the created transaction resource "Individual PFD Management Transaction" and the sub-resource(s) "Individual Application PFD Management" corresponding to each external application identifier within the "self" attribute in the "PfdData" data type, the SCEF shall also include PFD report(s) with a list of external Application Identifier(s) and result(s) in the body of the HTTP response if some application(s) are not provisioned successfully (i.e. the PFDF returns failure and/or the SCEF does not accept the PFD provisioning (e.g. one or more external Application Identifiers in the request are already present in existing transactions)).

In order to update the PFDs for an existing individual transaction, the SCS/AS shall send an HTTP PUT message to URI of the resource "Individual PFD Management Transaction" including one or more set of PFDs for external Application Identifier(s). After receiving the HTTP PUT message, the SCEF shall make the change and send the change to the PFDF (i.e. add/update/remove PFDs) as defined in 3GPP TS 29.250 [26]. After receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code. The SCEF shall create or update the corresponding sub-resource(s) "Individual Application PFD Management" each represents a successfully provisioned external application identifier, and also include PFD report(s) with a list of external Application

Identifier(s) and result(s) in the body of the HTTP response if some application(s) are not provisioned successfully (i.e. the PFDF returns failure and/or the SCEF does not accept the PFD provisioning (e.g. one or more external Application Identifiers in the request are already present in existing transactions)).

NOTE 1: When the PUT for "Individual PFD Management Transaction" is received in the SCEF, SCEF can use partial update or full update towards the PFDF.

In order to remove the PFDs for an existing individual transaction, the SCS/AS shall send an HTTP DELETE message to the URI of the resource "Individual PFD Management Transaction". After receiving such request, the SCEF shall delete the "Individual PFD Management Transaction" resource and its "Individual Application PFD Management" sub-resouce(s), and shall interact with the PFDF as defined in 3GPP TS 29.250 [26]. After receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code.

For the POST message to the resource "PFD Management Transactions" or the PUT message to the resource "Individual PFD Management Transaction", if the provisioning of all application(s) fails (i.e. the PFDF returns failure and/or the SCEF does not accept the PFD provisioning), the SCEF shall respond with 500 Internal Server Error status code, and include the attribute "pfdReports" with the corresponding failure reason as specified in table 5.11.2.2.3-1 and the external Application Identifier(s) for which the provisioning has failed.

In order to update the PFDs for an existing external Application Identifier, the SCS/AS shall send an HTTP PUT message to the resource "Individual Application PFD Management" to update the full set of PFDs of an existing resource. After receiving the HTTP PUT message, the SCEF shall make the change and send the change to the PFDF (i.e. add/update/remove PFDs) as defined in 3GPP TS 29.250 [26]. After receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code.

NOTE 2: When the PUT for "Individual Application PFD Management" is received in the SCEF, SCEF can use partial update or full update towards the PFDF.

In order to update the PFDs for an existing external Application Identifier, the SCS/AS may also send an HTTP PATCH message to URI of the resource "Individual Application PFD Management" to partially update PFDs. After receiving the HTTP PATCH message, the SCEF shall make the change and send the change to the PFDF (i.e. add/update/remove PFDs) as defined in 3GPP TS 29.250 [26]. After receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code.

In order to remove the PFDs for an existing individual application, the SCS/AS shall send an HTTP DELETE message to the resource "Individual Application PFD Management". After receiving such request, the SCEF shall delete the resource and interact with the PFDF as defined in 3GPP TS 29.250 [26]. After receiving the response from the PFDF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code.

For the PUT/PATCH message to the resource "Individual Application PFD Management", if the provisioning of the application fails (i.e. the PFDF returns failure or the SCEF does not accept the PFD provisioning), the SCEF shall reject the request with a corresponding status code, and include the attribute "pfdReports" with the corresponding failure code as specified in table 5.11.2.2.3-1 and the external Application Identifier for which the provisioning has failed.

If the SCEF receives PFD management notification including the PFD failure report from the PFDF (as defined in 3GPP TS 29.250 [26]) and if the feature PfdMgmtNotification is supported, the SCEF shall notify the SCS/AS with an HTTP POST message, identified by the notification destination URI received during the PFD provisioning, to notify the failure result for the PFD management by including the PfdReport data type in the body of the message. Within the PfdReport data type, the SCEF shall include the impacted application id(s) within the "externalAppIds" attribute, the "failureCode" attribute set to "PARTIAL_FAILURE". In addition, if the SCEF receives the location area(s) of PCEF/TDF(s) which are unable to enforce the PFD(s) from the PFDF, the SCEF shall include the location area(s) within the "locationArea" attribute of the PFD report(s). After receiving the HTTP POST message, the SCS/AS shall send a HTTP response with "204 No Content" status code.

NOTE 3: How the SCS/AS reacts to the failed PFD provisioning is left to implementation.

NOTE 4: The SCEF maps the 3GPP network area(s) to the geographic area(s) or civic address(es) if the 3GPP network area(s) is not allowed to be exposed to the 3rd party according to the operator policy.

4.4.11 Procedures for Enhanced Coverage Restriction Control

The procedures are used by an SCS/AS to query the status of, or to configure the enhanced coverage restriction for a UE via the T8 interface as defined in 3GPP TS 23.682 [2].

In order to query the current status of enhanced coverage restriction, the SCS/AS shall send an HTTP POST message to the SCEF using the query custom operation as defined in subclause 5.12.13.2. The body of the HTTP POST message shall include External Identifier or MSISDN.

In order to configure the enhanced coverage restriction, the SCS/AS shall send an HTTP POST message to the SCEF using the configure custom operation as defined in subclause 5.12.13.3. The body of the HTTP POST message shall include External Identifier or MSISDN and the Enhanced Coverage Restriction setting (i.e. allowed-PLMN-List or restricted-PLMN-List).

Upon receiving the HTTP POST message from the SCS/AS, the SCEF shall check:

- if the SCS/AS is authorized to perform the request. If not the SCEF shall respond to the SCS/AS with a status code set to 401 Unauthorized.

- if the request is malformed. If it is malformed, the SCEF shall respond to the SCS/AS with a status code set to 400 Bad Request.

- if the SCS/AS has exceeded its quota of submitting requests. If so the SCEF shall respond to the SCS/AS with a status code set to 403 Forbidden and may indicate the failure reason "QUOTA_EXCEEDED" (i.e. the quota exceeded) within the "cause" attribute of the "ProblemDetails" structure in the HTTP POST response.

- if the SCS/AS has exceeded its rate of submitting requests. If so the SCEF shall respond to the SCS/AS with a status code set to 429 Too Many Requests in the HTTP POST response.

The SCEF shall send a Configuration Information Request to the HSS to query or configure the setting of Enhanced Coverage Restriction as defined in 3GPP TS 29.336 [11].

Upon receipt of the response from the HSS, the SCEF shall send an HTTP response to the SCS/AS with a 200 OK message for query or configure custom operation and include the Enhanced Coverage Restriction Data from HSS into the HTTP response.

If the SCEF receives a response with an error code from the HSS, the SCEF shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.12 Procedures for Network Parameter Configuration

4.4.12.1 General

The procedures are used by an SCS/AS to request that the network consider setting the suggested network parameter values which can influence certain aspects of UE/network behaviour. The procedures are applicable for an individual UE or a group of UEs.

In order to create a new network parameter configuration to configure suggested network parameters, the SCS/AS shall send an HTTP POST request message to the SCEF to the resource "NP Configurations". The body of the HTTP request message shall include External Identifier or MSISDN or External Group Identifier, SCS/AS Identifier, and may include Maximum Latency, Maximum Response Time and Suggested Number of Downlink Packets and Group Reporting Guard Time, wherein, the External Identifier or MSISDN indicates the configuration for an individual UE and the External Group Identifier indicates for a group of UEs. If the External Group Identifier is included, the SCS/AS shall provide the Notification Destination Address in the request.

   NOTE: The Notification Delivery as described in subclause 5.2.5 is not supported for individual UE configuration case.

In order to update an existing Network Parameter Configuration, the SCS/AS may send an HTTP PUT message to the resource "Individual NP Configuration" requesting the SCEF to replace all properties in the existing resource.

The SCS/AS may also use an HTTP PATCH message to request to change some properties in the existing resource.

Upon receipt of the HTTP POST, PUT or PATCH message, if the SCS/AS is authorized to perform the request, the SCEF shall check whether the Maximum Latency, Maximum Response Time and/or Suggested Number of Downlink Packets in the HTTP request body are within the range defined by operator policies, if one or more of these parameters are not within the range, the SCEF shall:

- either reject the request message by sending an HTTP response to the SCS/AS with a status code set to "403 Forbidden" and may indicate the "PARAMETER_OUT_OF_RANGE" error in the "cause" attribute of the "ProblemDetails" structure and indicate which parameters are out of the range in the "invalidParams" attribute of the "ProblemDetails" structure; or

- modify the parameters which are not within the range by selecting different values which are in the range.

After validation, the SCEF shall perform the Network Parameter Configuration as described in subclause 4.4.12.2 for an individual UE or in subclause 4.4.12.3 for a group of UEs.

In order to delete an existing Network Parameter Configuration at the SCEF, the SCS/AS shall send an HTTP DELETE message to the corresponding resource "Individual NP Configuration" at the SCEF. The SCEF shall determine the SCEF Reference ID for deletion and interact with the HSS via S6t as defined in 3GPP TS 29.336 [11]. Upon receipt of the response from the HSS, the SCEF shall delete active resource "Individual NP Configuration" addressed by the URI and send an HTTP response to the SCS/AS with a "204 No Content" status code.

4.4.12.2 Configuration Request for an individual UE

If the configuration request from the SCS/AS is for an individual UE, the SCEF shall send the Configuration Information Request command to the HSS via S6t as defined in 3GPP TS 29.336 [11].

Upon receipt of the response from the HSS, the SCEF shall,

- for the HTTP POST message, create a new resource "Individual NP Configuration" addressed by a URI that contains the SCS/AS identifier and an SCEF-created configuration identifier, and send an HTTP POST response to the SCS/AS with "201 Created" status code, the final suggested configuration parameter(s) (if modified), the indication(s) for the discarded parameter(s) (if discarded), and a location header field containing the URI for the created resource.

- for the HTTP PUT or PATCH message, update the active resource "Individual NP Configuration", and send an HTTP response to the SCS/AS with "200 OK" status code, the final suggested network parameter(s) (if modified), the indication(s) for the discarded parameter(s) (if discarded).

If the SCEF receives a response with an error code from the HSS, the SCEF shall not create or update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

4.4.12.3 Configuration Request for a group of UEs

If the configuration request from the SCS/AS is for a group of UEs, the SCS/AS shall provide the Notification Destination Address, the SCEF shall send the Configuration Information Request command to the HSS via S6t as defined in 3GPP TS 29.336 [11].

Upon receipt of the successful response indicating that group processing is in progress from the HSS before beginning the processing of individual UEs, the SCEF shall,

- for the HTTP POST message, create a resource "Individual NP Configuration" addressed by a URI that contains the SCS/AS identity and an SCEF-created configuration identifier. The SCEF shall send an HTTP POST response to the SCS/AS including a location header field containing the URI for the created resource and a "201 Created" status code to acknowledge the SCS/AS of the successful group processing request.

- for the HTTP PUT or PATCH message, update the resource "Individual NP Configuration" addressed by the requested URL, and shall send "200 OK" status code to acknowledge the SCS/AS of the successful group processing request in the HTTP response message.

If the SCEF receives a response with an error code from the HSS, the SCEF shall not create or update the resource and shall respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

Upon receipt of the processing result of the individual UEs from the HSS, the SCEF shall send an HTTP POST request message with a reference to the related network parameter configuration and a list of processing result for the group members to the SCS/AS.

The SCS/AS shall send an HTTP response to acknowledge the SCEF about the handling result of the received request.

4.4.12.4 Notification of applied parameter configuration

If the Enhanced_param_config feature is supported and the SCEF receives currently applied parameter configuration from the HSS, the SCEF shall notify the SCS/AS by the HTTP POST message including the parameter changes in the "appliedParam" attribute.

4.4.13 Procedures for setting up an AS session with required QoS

This procedure is used to set up an AS session with required QoS for the service as defined in 3GPP TS 23.682 [2].

For initial AS session creation, the SCS/AS shall send an HTTP POST message to the SCEF for the "AS Session with Required QoS Subscriptions" resource. The body of HTTP POST message shall include SCS/AS Identifier, UE IP address, IP Flow description, QoS reference and notification destination address. And it may also include time period and/or traffic volume for sponsored data connectivity purpose.

After receiving the HTTP POST message, the SCEF shall authorize the request and may check if the total number of requested QoS reference has exceeded the limit for the SCS/AS. If the authorization is successful, the SCEF shall map the SCS/AS Identifier to AF Application Identifier, and if required, map the SCS/AS Identifier to ASP Identity and Sponsor Identity.

> NOTE 1: Before the QoS reference is mapped to Rx parameters, the SCEF can perform a mapping from the name space of the 3rd party SCS/AS to the name space of the operator.

> NOTE 2: The QoS reference referring to pre-defined QoS information in the SCEF can be mapped to media component descriptions (e.g. bandwidth, media type) according to SLA.

> NOTE 3: In this release of current specification, the SCS/AS Identifier can only be mapped to one AF Application Identifier based on operator policy and/or local configuration in the SCEF.

If the authorization performed by the SCEF is successful, then the SCEF shall act as an AF to interact with the PCRF via the Rx interface as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13] and trigger a PCRF initiated IP-CAN Session Modification. The SCEF shall also request to be notified about the transmission resource status, i.e. INDICATION_OF_SUCCESSFUL_RESOURCES_ALLOCATION, INDICATION_OF_RELEASE_OF_BEARER, INDICATION_OF_FAILED_RESOURCES_ALLOCATION, and optionally INDICATION_OF_LOSS_OF_BEARER and INDICATION_OF_RECOVERY_OF_BEARER. If the time period and/or traffic volume are received from the AF, the SCEF should subscribe to the PCRF on the USAGE_REPORT event.

The SCEF, after receiving the AAA message or HTTP 201 Created message over the Rx interface from the PCRF with successful result code, shall create a resource "Individual AS Session with Required QoS Subscription" which represents AS session, addressed by a URI that contains the SCS/AS identity and an SCEF-created AS session identifier, and shall respond to the SCS/AS with a 201 Created message, including the result in the body of the HTTP response and a Location header field containing the URI for the created resource. The SCS/AS shall use the URI received in the Location header in subsequent requests to the SCEF to refer to this AS session. Otherwise, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and include the result in the body of the HTTP response. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not create the resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

In order to update the established AS session, the SCS/AS may send an HTTP PUT message to the SCEF for the "Individual AS Session with Required QoS Subscription" resource requesting to replace all properties (e.g. new usage threshold, Flow Description) in the existing resource, addressed by the URI received in the response to the request that has created the resource. The UE IP or MAC address shall remain unchanged from previously provided values. After receiving such message, the SCEF shall make the change (e.g. if the usage threshold within the "usageThreshold" attribute is included in the HTTP PUT request and the accumulated usage report for the previously provided usage threshold is not received yet, the SCEF shall completely replace the previously provided one), and interact with the PCRF to modify the Rx session (as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13]). After receiving the response with successful result code from the PCRF, the SCEF shall replace all properties of the existing resource, send an HTTP response to the SCS/AS with a corresponding status code, and include the result in the body of the HTTP response. If the SCEF receives a response with an error code from the PCRF, the SCEF shall not update the resource and respond to the SCS/AS with a corresponding failure code as described in subclause 5.2.6.

The SCS/AS may also send an HTTP PATCH message to the SCEF for the "Individual AS Session with Required QoS Subscription" resource requesting to change some created properties (e.g. new usage threshold, Flow Description). After receiving the HTTP PATCH message, the SCEF shall make the change (e.g. if the usage threshold within the "usageThreshold" attribute is included in the HTTP PATCH request and the accumulated usage report for the previously provided usage threshold is not received yet, the SCEF shall completely replace the previously provided one), and interact with the PCRF to modify the Rx session (as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13]). After receiving the response from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and include the result in the body of the HTTP response.

NOTE 4: The SCS/AS can assume a successful resource allocation upon receipt of the POST/PUT/PATCH response, until the FAILED_RESOURCES_ALLOCATION event is received.

If the SCEF receives a traffic plane notification (e.g. the usage threshold is reached or transmission resource lost), or if the SCEF gets informed that the Rx session is terminated (e.g. due to a release of PDN connection), the SCEF shall send an HTTP POST message including the notified event (e.g. session terminated) and the accumulated usage (if received from the PCRF) to the callback URI "notificationUri" provided by the SCS/AS during the creation of individual AS Session with Required QoS Subscription. The SCS/AS shall respond with an HTTP response to confirm the received notification.

In order to remove the established AS session, the SCS/AS shall send an HTTP DELETE message to the SCEF for the "Individual AS Session with Required QoS Subscription" resource. After receiving the HTTP DELETE message, the SCEF shall remove all properties and interact with the PCRF to terminate the Rx session (as defined in 3GPP TS 29.214 [10] or 3GPP TS 29.201 [13]). After receiving the response from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a corresponding status code and include the accumulated usage (if received from the PCRF).

4.4.14 Procedures for MSISDN-less Mobile Originated SMS

4.4.14.1 General

The procedures are used by the SCEF to send the MSISDN-less MO-SMS to the SCS/AS via T8 interface.

4.4.14.2 Delivery of MSISDN-less MO SMS

If the SCEF receives an MSISDN-less MO-SMS via T4 including an destination SME address (long/short code of the SCS/AS), the SCEF will use the IMSI of the UE and application port ID received over T4 to query the HSS/HLR for an external ID, and the SCEF shall then determine the notification destination URL of an SCS/AS based on configured information on the mapping of SME addresses to destination URLs. The SCEF shall send to the determined destination URL an HTTP POST request that shall include an MsisdnLessMoSmsNotification data type with:

- the short message transfer protocol data unit as received on the T4 interface.

- the Application Port as received on the T4 interface, and

- the external identifier of the UE that send the SMS, as received from the HSS/HLR.

NOTE: The Notification Delivery using Websocket (see subclause 5.2.5.4) and the Notification Test Event (see subclause 5.2.5.3) are not supported for the present API.

4.4.15 Procedures for RACS Parameter Provisioning

The procedures are used by an SCS/AS to request that the network to provision manufacturer specific UE radio capability information.

In order to create a new parameter provisioning, the SCS/AS shall send an HTTP POST request message to the SCEF to the resource "RACS Parameter Provisionings". The body of the HTTP POST request message shall include a list of RACS IDs, and for each provided RACS ID, its radio capability parameters and the related UE model(s) IMEI-TAC value(s).

In order to fully replace an existing RACS Parameter Provisioning, the SCS/AS may send an HTTP PUT message to the resource "Individual RACS Parameter Provisioning" requesting the SCEF to change all properties in the existing

resource. The body of the HTTP PUT request message shall include a list of RACS IDs, and for each provided RACS ID, its radio capability parameters and the related UE model(s) IMEI-TAC value(s).

In order to partial update an existing RACS Parameter Provisioning, the SCS/AS may send an HTTP PATCH message to the resource "Individual RACS Parameter Provisioning" requesting the SCEF to change some properties in the existing resource.

Upon receipt of the HTTP POST, PUT or PATCH message, if the SCS/AS is authorized to perform the request, the SCEF shall interact with the UCMF as described in 3GPP TS 29.675 [61]. After receiving the response from the UCMF, if at least one RACS ID is succefully provisioned, the SCEF shall create or update the resource "Individual RACS Parameter Provisioning" and respond with 201 Created or 200 OK to the SCS/AS respectively with the successfully provisioned RACS information, the SCEF may include RACS report(s) within attribute "racsReports" with a list of RACS ID(s) and the corresponding failure code for which the provisioning has failed as specified in table 5.16.2.2.3-1 in the body of the HTTP response. Otherwise, the SCEF shall send an HTTP response to the SCS/AS with a corresponding failure code as described in subclause 5.16.5.

In order to delete an existing RACS Parameter Provisioning at the SCEF, the SCS/AS shall send an HTTP DELETE message to the corresponding resource "Individual RACS Parameter Provisioning" at the SCEF. Upon receipt of the DELETE request message, the SCEF shall interact with the UCMF as described in 3GPP TS 29.675 [61]. After receiving the response from the UCMF, the SCEF shall remove the resource and respond with 204 No Content to the SCS/AS.

5 T8 APIs

5.1 Introduction

The T8 APIs are a set of APIs defining the related procedures and resources for the interaction between the SCEF and the SCS/AS.

5.2 Information applicable to several APIs

5.2.1 Data Types

5.2.1.1 Introduction

This clause defines structured data types, simple data types and enumerations that are applicable to several APIs defined in the present specification and can be referenced from data structures defined in the subsequent clauses. In addition, data types that are defined in OpenAPI 3.0.0 Specification [27] can also be referenced from data structures defined in the subsequent clauses.

> NOTE: As a convention, data types in the present specification are written with an upper-case letter in the beginning. Parameters are written with a lower-case letter in the beginning. As an exception, data types that are also defined in OpenAPI 3.0.0 Specification [27] can use a lower-case case letter in the beginning for consistency.

5.2.1.2 Referenced structured data types

5.2.1.2.1 Type: SponsorInformation

This type represents a sponsor information. It shall comply with the provisions defined in table 5.2.1.2.1-1.

Table 5.2.1.2.1-1: Definition of the SponsorInformation data type

Attribute name	Data type	Cardinality	Description
sponsorId	string	1	It indicates Sponsor ID.
aspId	string	1	It indicates Application Service Provider ID.

5.2.1.2.2 Type: UsageThreshold

This type represents a usage threshold. It shall comply with the provisions defined in table 5.2.1.2.2-1.

Only one of DownlinkVolume, UplinkVolume and TotalVolume shall be provided. If the server supports both duration and volume, then the first threshold that has been reached will apply.

Table 5.2.1.2.2-1: Definition of the UsageThreshold data type

Attribute name	Data type	Cardinality	Description
duration	DurationSec	0..1	Indicates the length of time in seconds
totalVolume	Volume	0..1	Total data octets for both downlink and uplink
downlinkVolume	Volume	0..1	Downlink data octets
uplinkVolume	Volume	0..1	Uplink data octets

5.2.1.2.3 Type: TimeWindow

This type represents a start time and a stop time of a time window. It shall comply with the provisions defined in table 5.2.1.2.3-1.

Table 5.2.1.2.3-1: Definition of the TimeWindow data type

Attribute name	Data type	Cardinality	Description
startTime	DateTime	1	Indicates the absolute start time of the time window
stopTime	DateTime	1	Indicates the absolute stop time of the time window

5.2.1.2.4 Type: Acknowledgement

This type represents a successful acknowledgement for a notification.

Table 5.2.1.2.4-1: Definition of the Acknowledgement data type

Attribute name	Data type	Cardinality	Description
details	string	1	A human-readable explanation specific to this successful acknowledgement

5.2.1.2.5 Type: NotificationData

This type represents the parameters which shall be notify the SCS/AS for bearer level event(s).

Table 5.2.1.2.5-1: Definition of the NotificationData data type

Attribute name	Data type	Cardinality	Description
transaction	Link	1	Link to the transaction resource to which this notification is related.
eventReports	array(EventReport)	1..N	Contains the reported event and applicable information

5.2.1.2.6 Type: EventReport

This type represents an event report. It shall comply with the provisions defined in table 5.2.1.2.6-1.

Table 5.2.1.2.6-1: Definition of the EventReport data type

Attribute name	Data type	Cardinality	Description
event	Event	1	Indicates the event reported by the SCEF.
accumulatedUsage	AccumulatedUsage	0..1	Contains the applicable information corresponding to the event.
flowIds	array(integer)	0..N	Identifies the IP flows that were sent during event subscription

5.2.1.2.7 Type: AccumulatedUsage

This type represents an accumulated usage. It shall comply with the provisions defined in table 5.2.1.2.7-1.

Table 5.2.1.2.7-1: Definition of the AccumulatedUsage data type

Attribute name	Data type	Cardinality	Description
duration	DurationSec	0..1	Indicates the length of time in seconds
totalVolume	Volume	0..1	Total data octets for both downlink and uplink
downlinkVolume	Volume	0..1	Downlink data octets
uplinkVolume	Volume	0..1	Uplink data octets

5.2.1.2.8 Type: FlowInfo

This type represents flow information. It shall comply with the provisions defined in table 5.2.1.2.8-1.

Table 5.2.1.2.8-1: Definition of the FlowInfo data type

Attribute name	Data type	Cardinality	Description
flowId	integer	1	Indicates the IP flow.
flowDescriptions	array(string)	0..2	Indicates the packet filters of the IP flow. Refer to subclause 5.3.8 of 3GPP TS 29.214 [10] for encoding. It shall contain UL and/or DL IP flow description.

5.2.1.2.9 Type: TestNotification

This type represents a notification that can be sent to test whether a chosen notification mechanism works. It shall be supported if the feature "Notification_test_event", as defined for APIs that use notifications, is supported.

Table 5.2.1.2.9-1: Definition of the TestNotification data type

Attribute name	Data type	Cardinality	Description
subscription	Link	1	Link of the subscription resource to which the notification is related.

5.2.1.2.10 Type: WebsockNotifConfig

This type represents configuration for the delivery of notifications over Websockets. It shall be supported if the feature "Notification_websocket", as defined for APIs that use notifications, is supported.

Table 5.2.1.2.10-1: Definition of the WebsockNotifConfig data type

Attribute name	Data type	Cardinality	Description
websocketUri	Link	0..1	Set by the SCEF to indicate to the SCS/AS the Websocket URI to be used for delivering notifications. (NOTE 1)
requestWebsocket Uri	boolean	0..1	Set by the SCS/AS to indicate that the Websocket delivery is requested. (NOTE 2)
NOTE 1: A Websocket URI should use the scheme "wss" (Websocket Secure) for encrypted delivery and may use the scheme "ws" (Websocket) for unencrypted delivery. If the WebsockNotifConfig data type is used in an HTTP response, this attribute shall be present. If the WebsockNotifConfig data type is used in an HTTP request, this attribute shall not be set by the SCS/AS in a request to create a resource, and shall not be modified by the SCS/AS in a request to modify a resource.			
NOTE 2: In a request to create or update a resource, this attribute shall be set to true by the SCS/AS to request the SCEF to provide a Websocket URI for the delivery of notifications, and shall be absent otherwise. In any HTTP response, this attribute shall retain the value that was provided upon resource creation or update.			

5.2.1.2.11   Type: LocationArea

This data type represents the user location area which is sent from the SCS/AS to the SCEF.

Table 5.2.1.2.11-1: Definition of the LocationArea data Type

Attribute name	Data type	Cardinality	Description
cellIds	array(string)	0..N	Indicates a list of Cell Global Identities of the user which identifies the cell the UE is registered.
enodeBIds	array(string)	0..N	Indicates a list of eNodeB identities in which the UE is currently located.
routingAreaIds	array(string)	0..N	Identifies a list of Routing Area Identities of the user where the UE is located.
trackingAreaIds	array(string)	0..N	Identifies a list of Tracking Area Identities of the user where the UE is located.
geographicAreas	array(GeographicArea)	0..N	Identifies a list of geographic area of the user where the UE is located.
civicAddresses	array(CivicAddress)	0..N	Identifies a list of civic addresses of the user where the UE is located.

5.2.1.2.12   Type: ProblemDetails

Table 5.2.1.2.12-1: Definition of the ProblemDetails data type

Attribute name	Data type	Cardinality	Description
type	Uri	0..1	A URI reference according to IETF RFC 3986 [6] that identifies the problem type.
title	string	0..1	A short, human-readable summary of the problem type. It should not change from occurrence to occurrence of the problem.
status	integer	0..1	The HTTP status code for this occurrence of the problem.
detail	string	0..1	A human-readable explanation specific to this occurrence of the problem.
instance	Uri	0..1	A URI reference that identifies the specific occurrence of the problem.
cause	string	0..1	A machine-readable application error cause specific to this occurrence of the problem This IE should be present and provide application-related error information, if available.
invalidParams	array(InvalidParam)	0..N	Description of invalid parameters, for a request rejected due to invalid parameters.
NOTE 1: See IETF RFC 7807 [8] for detailed information and guidance for each attribute. NOTE 2: Additional attributes may be defined per API.			

5.2.1.2.13   Type: InvalidParam

Table 5.2.1.2.13-1: Definition of the InvalidParam data type

Attribute name	Data type	Cardinality	Description
param	string	1	Attribute's name encoded as a JSON Pointer, or header's name.
reason	string	0..1	A human-readable reason, e.g. "must be a positive integer".

5.2.1.2.14   Type: PlmnId

Table 5.2.1.2.14-1: Definition of the PlmnId data type

Attribute name	Data type	Cardinality	Description
mcc	Mcc	1	Mobile Country Code
mnc	Mnc	1	Mobile Network Code

5.2.1.2.15   Type: ConfigResult

This type represents one configuration processing result for the group members.

Table 5.2.1.2.15-1: Definition of the ConfigResult data type

Attribute name	Data type	Cardinality	Description
externalIds	array(ExternalId)	0..N	Each element indicates an external identifier of the UE. (NOTE)
msisdns	array(Msisdn)	0..N	Each element identifies the MS internal PSTN/ISDN number allocated for the UE (NOTE)
resultReason	ResultReason	1	Identifies the configuration failure reason for the group members.
NOTE: Either "externalId" or "msisdn" shall be included for a group member.			

5.2.1.2.16 Type: UsageThresholdRm

This type represents a usage threshold which is defined in subclause 5.2.1.2.2 but defined with "nullable: true" property so it can be removed in "JSON Merge Patch", as defined in IETF RFC 7396 [39]. It shall comply with the provisions defined in table 5.2.1.2.16-1.

Only one of "downlinkVolume", "uplinkVolume" and "totalVolume" shall be provided. Duration and volume are also removable in "JSON Merge Patch". If the server supports both duration and volume, then the first threshold that has been reached will apply.

Table 5.2.1.2.16-1: Definition of the UsageThresholdRm data type

Attribute name	Data type	Cardinality	Description
duration	DurationSecRm	0..1	Indicates the length of time in seconds
totalVolume	VolumeRm	0..1	Total data octets for both downlink and uplink
downlinkVolume	VolumeRm	0..1	Downlink data octets
uplinkVolume	VolumeRm	0..1	Uplink data octets

5.2.1.2.17 Type: LocationArea5G

This data type represents the user location area which is sent from the AF to the NEF.

Table 5.2.1.2.17-1: Definition of the LocationArea5G data Type

Attribute name	Data type	Cardinality	Description
geographicAreas	array(GeographicArea)	0..N	Identifies a list of geographic area of the user where the UE is located.
civicAddresses	array(CivicAddress)	0..N	Identifies a list of civic addresses of the user where the UE is located.
nwAreaInfo	NetworkAreaInfo	0..1	This IE represents the network area information of the user where the UE is located.

5.2.1.3 Referenced Simple data types and enumerations

5.2.1.3.1 Introduction

This clause defines simple data types and enumerations that are referenced from data structures.

5.2.1.3.2 Simple data types

The reused datatypes defined in OpenAPI Specification [27] listed in table 5.2.1.3.2-1 and the simple data types defined in table 5.2.1.3.2-2 apply to several T8 APIs.

Table 5.2.1.3.2-1: Reused OpenAPI data types

Type name	Description
boolean	As defined in OpenAPI Specification [27], i.e. either value "true" or value "false" as defined in IETF RFC 7159 [5].
integer	As defined in OpenAPI Specification [27].
number	As defined in OpenAPI Specification [27].
string	As defined in OpenAPI Specification [27].
NOTE: Data type names defined in OpenAPI Specification [27] do not follow the convention to start with capital letters otherwise used in this specification.	

Table 5.2.1.3.2-2: Simple data types applicable to several APIs

Type name	Description
Bandwidth	Integer indicating a bandwidth in bits per second.
BdtReferenceId	String identifying a BDT Reference ID as defined in subclause 5.3.3 of 3GPP TS 29.154 [9].
BdtReferenceIdRm	This data type is defined in the same way as the "BdtReferenceId" data type, but with the "nullable: true" property.
Binary	String with format "binary" as defined in OpenAPI Specification [27].
Bytes	String with format "byte" as defined in OpenAPI Specification [27], i.e, base64-encoded characters.
DayOfWeek	Integer between and including 1 and 7 denoting a weekday. "1" shall indicate "Monday", and the subsequent weekdays shall be indicated with the next higher numbers. "7" shall indicate "Sunday".
DateTime	String with format "date-time" as defined in OpenAPI Specification [27].
DateTimeRm	String with format "date-time" as defined in OpenAPI [27] with "nullable: true" property.
DateTimeRo	String with format "date-time" as defined in OpenAPI [27] with "readOnly: true" property.
DurationSec	Unsigned integer identifying a period of time in units of seconds.
DurationSecRm	Unsigned integer identifying a period of time in units of seconds with "nullable: true" property.
DurationSecRo	Unsigned integer identifying a period of time in units of seconds with "readOnly: true" property.
DurationMin	Unsigned integer identifying a period of time in units of minutes.
ExternalId	String containing a local identifier followed by "@" and a domain identifier. Both the local identifier and the domain identifier shall be encoded as strings that do not contain any "@" characters. See clause 4.6.2 of 3GPP TS 23.682 [2] for more information.
ExternalGroupId	String containing a local identifier followed by "@" and a domain identifier. Both the local identifier and the domain identifier shall be encoded as strings that do not contain any "@" characters. See clauses 4.6.2 and 4.6.3 of 3GPP TS 23.682 [2] for more information.
Ipv4Addr	String identifying an Ipv4 address formatted in the "dotted decimal" notation as defined in IETF RFC 1166 [28].
Ipv6Addr	String identifying an Ipv6 address formatted according to clause 4 in IETF RFC 5952 [29]. The mixed Ipv4 Ipv6 notation according to clause 5 of IETF RFC 5952 [29] shall not be used.
Ipv4AddrRo	String identifying an Ipv4 address formatted in the "dotted decimal" notation as defined in IETF RFC 1166 [28], with "readOnly: true" property.
Ipv6AddrRo	String identifying an Ipv6 address formatted according to clause 4 in IETF RFC 5952 [29], with "readOnly: true" property. The mixed Ipv4 Ipv6 notation according to clause 5 of IETF RFC 5952 [29] shall not be used.
Link	String formatted according to IETF RFC 3986 [7] identifying a referenced resource.
Mcc	String encoding a Mobile Country Code part of the PLMN, comprising 3 digits, as defined in 3GPP TS 38.413 [54].
Mnc	String encoding a Mobile Network Code part of the PLMN, comprising 2 or 3 digits, as defined in 3GPP TS 38.413 [54].
Msisdn	String formatted according to subclause 3.3 of 3GPP TS 23.003 [14] that describes an MSISDN.
Port	Unsigned integer with valid values between 0 and 65535.
PortRo	Unsigned integer with valid values between 0 and 65535, with "readOnly: true" property.
ResourceId	String chosen by the SCEF to serve as an identifier in a resource URI.
ScsAsId	String that identifies an SCS/AS.
TimeOfDay	String with format "partial-time" or "full-time" as defined in subclause 5.6 of IETF RFC 3339 [15]. Examples: "20:15:00", "20:15:00-08:00" (for 8 hours behind UTC).
Uri	String providing an URI formatted according to IETF RFC 3986 [7].
Volume	Unsigned integer identifying a volume in units of bytes.
VolumeRm	Unsigned integer identifying a volume in units of bytes with "nullable: true" property.

5.2.1.3.3 Enumeration: Event

The enumeration Event represents event reported by the SCEF.

Table 5.2.1.3.3-1: Enumeration Event

Enumeration value	Description
SESSION_TERMINATION	Indicates that Rx session is terminated.
LOSS_OF_BEARER	Indicates a loss of a bearer.
RECOVERY_OF_BEARER	Indicates a recovery of a bearer.
RELEASE_OF_BEARER	Indicates a release of a bearer.
USAGE_REPORT	Indicates the usage report event.
FAILED_RESOURCES_ALLOCATION	Indicates the resource allocation is failed.

5.2.1.3.4   Enumeration: ResultReason

The enumeration ResultReason represents a failure result reason.

Table 5.2.1.3.4-1: Enumeration ResultReason

Enumeration value	Description
ROAMING_NOT_ALLOWED	Identifies the configuration parameters are not allowed by roaming agreement.
OTHER_REASON	Identifies the configuration parameters are not configured due to other reason.

5.2.1.4   Conventions for documenting structured data types

The structured data types shall represent an object (see IETF RFC 8259 [40]). The structured data types shall contain attributes that are simple data types, structured data types, arrays (see below), maps (see below) or enumerations.

An array (see IETF RFC 8259 [40]) shall represent a list of values without keys and with significance in the order of sequence. All values shall be of the same type.

A map shall represent an object (see IETF RFC 8259 [40]) with a list of key-value pairs (with no significance in the order of sequence), where all keys are of type string and shall be unique identifiers assigned by the application rather than by the schema, and where all values shall be of the same type.

NOTE 1: Maps are supported by the OpenAPI specification [27] as described at https://swagger.io/docs/specification/data-models/dictionaries/. Maps can enable a faster lookup of elements identified by some key in huge data structures compared to arrays that contain the key within the elements. Maps can also be used instead of arrays to modify individual elements when modification instructions of the PATCH method are compliant to IETF RFC 7396 [39].

Each structured data type shall be specified in a separate subclause as illustrated in table 5.2.1.4-1.

Table 5.2.1.4-1: Definition of type <Data type>

Attribute name	Data type	Cardinality	Description
<attribute name>	"*<type>*" or "array(*<type>*)" or "map(*<type>*)"	"0..1", "1", or "*M..N*",	<only if applicable>

Attribute name: Name of attributes that belong to the specified data type.

Data type: Data type of the attribute. If the data type is indicated as "*<type>*", the attribute shall be of data type *<type>*. If the data type is indicated as "array(*<type>*)", the attribute shall be an array (see IETF RFC 8259 [40]) that contains elements of data type *<type>*. If the data type is indicated as "map (*<type>*)", the attribute shall be an object (see IETF RFC 8259 [40]) encoding a map (see OpenAPI specification [27]) that contains as values elements of data type *<type>*. *<type>* can either be "integer", "number", "string" or "boolean" (as defined in the OpenAPI specification [27]), or a data type defined in a 3GPP specification.

Cardinality: Defines the allowed number of occurrence of data type <type>. A cardinality of "M..N", is only allowed for data types "array(<type>)" and "map(<type>)" and indicates the number of elements within the array or map; the values M and N can either be the characters "M" and "N", respectively, or integer numbers with M being greater than or equal 0, and N being greater than 1 and M, For data type "<type>", the cardinality shall be set to "0..1" or "1". A lower

boundary of "0" for the cardinality also indicates that the attribute is optional. A lower boundary of "0" for the cardinality indicates that the attribute is optional.

NOTE 2: The "0..N" implies the array or map type of the attribute may be optional. If the attribute is present, the minimum number of elements is described in openAPI file.

Description: Describes the meaning and use of the attribute and may contain normative statements.

5.2.2   Usage of HTTP

5.2.2.1   General

For T8 APIs, support of HTTP/1.1 (IETF RFC 7230 [16], IETF RFC 7231 [17], IETF RFC 7232 [18], IETF RFC 7233 [19], IETF RFC 7234 [20] and IETF RFC 7235 [21]) over TLS (IETF RFC 5246 [4]) is mandatory and support of HTTP/2 (IETF RFC 7540 [22]) over TLS (IETF RFC 5246 [4]) is recommended. An SCS/AS desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 7540 [22].

5.2.2.2   Usage of the HTTP PATCH method

The HTTP PATCH method, as defined in IETF RFC 5789 [38], allows for a partial update of previously sent data, e.g. resources. For a complete replacement of previously sent data, the HTTP PUT method is used. It is defined separately for each resource whether the HTTP PUT and/or the HTTP PATCH are applicable.

If the HTTP PATCH method is used, the JSON bodies within the PATCH request shall be encoded according to "JSON Merge Patch", as defined in IETF RFC 7396 [39].

NOTE: JSON merge patch is not able to modify individual elements of an array. This is not required in the present release.

5.2.3   Content type

The bodies of HTTP request and successful HTTP responses shall be encoded in JSON format (see IETF RFC 8259 [5]).

The MIME media type that shall be used within the related Content-Type header field is "application/json", as defined in IETF RFC 8259 [5].

JSON object used in the HTTP PATCH request shall be encoded according to "JSON Merge Patch" and shall be signalled by the content type "application/merge-patch+json", as defined in IETF RFC 7396 [39].

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [8].

NOTE: This release only supports the content type JSON.

5.2.4   URI structure

All API URIs of T8 APIs shall be:

{apiRoot}/<apiName>/<apiVersion>/

"apiRoot" is configured by means outside the scope of the present document. "apiName" and "apiVersion" shall be set dependent on the API, as defined in the corresponding subclauses below. All resource URIs in the subclauses below are defined relative to the above root API URI.

NOTE 1:   The "apiVersion" will only be increased if the new API version contains not backward compatible changes. Otherwise, the supported feature mechanism defined in subclause 5.2.7 can instead be used to negotiate extensions.

NOTE 2:   A different root structure can be used when the Resource URI is preconfigured in the SCS/AS.

The root structure may be followed by "apiSpecificSuffixes" that are dependent on the API and are defined separately for each API as resource URI where they apply:

> **{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

5.2.5 Notifications

5.2.5.1 General

The SCEF and SCS/AS shall support the delivery of Notifications using a separate HTTP connection towards an address assigned by the SCS/AS, as described in subclause 5.2.5.2.

An SCEF and SCS/AS may support testing a notification connection as described in subclause 5.2.5.3. An SCEF and SCS/AS may support the delivery of Notification using Websocket (IETF RFC 6455 [32]) as described in subclause 5.2.5.4.

5.2.5.2 Notification Delivery using a separate HTTP connection

If a delivery of notifications is required for an API, the SCS/AS shall provide a URI in the "notificationDestination" attribute defined in the data types that are passed in a request to create a resource that represents a subscription to notifications, designating where to send HTTP Notifications to the SCEF unless it is specified for that API that a preconfigured destination address is used.

The SCS/AS may provide the same "notificationDestination" for several subscriptions, and the SCEF should then use the same HTTP connection to deliver related notifications.

The SCEF shall take the role of the HTTP client on the HTTP connection for the delivery of Notifications. Subclause 5.2.2 shall also apply for this HTTP connection with the exception that an SCEF (rather than an SCS/AS) desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version.

5.2.5.3 Notification Test Event

If the optional "Notification_test_event" feature is supported, the SCS/AS may test whether notifications can be received by subscribing to the notification of a test event by providing a "requestTestNotification" attribute set to "true" in the HTTP request to create or update a subscription for notifications. In any other HTTP request or response, this attribute shall retain the value that was provided upon subscription resource creation.

Upon receiving the "requestTestNotification" attribute as part of a subscription creation or update request, the SCEF shall send immediately after establishing the notification delivery mechanism a test notification containing a body formatted according to the "TestNotification" data type as defined in subclause 5.2.1.2.12. If the SCS/AS does not receive the test notification within a configured time, the SCS/AS knows that the notification delivery with the selected method is not possible and may take corrective actions.

5.2.5.4 Notification Delivery using Websocket

The procedures in the present subclause only apply if SCS/AS and SCEF support the "Notification_websocket" feature. If the feature "Notification_websocket" is supported, then the feature "Notification_test_event" shall also be supported.

If a delivery of notifications is required for an API and the SCS/AS does not know from previous interactions with the SCEF whether delivery of notifications over a separate HTTP connection works, the SCS/AS should initially request the SCEF to try to establish a separate HTTP connection for notification delivery according to subclause 5.2.5.2 by providing a URI to the SCEF designating where to send HTTP Notifications, and shall also subscribe to the notification of a test event as in subclause 5.2.5.3.

If the SCS/AS does not receive the requested notification of the test event during a configured period after the subscription, the SCS/AS may configure the subscription to request the SCEF to provide a URI for an HTTP connection to upgrade to Websocket, setting the "requestWebsocketUri" attribute to "true" as specified in subclause 5.2.1.2.13. The SCS/AS may also request the SCEF to provide a URI in a new subscription creation request, and should in this case terminate the original subscription.

NOTE 1: If the SCS/AS has requested the delivery of notifications to a separate entity, it needs to be informed by that separate entity about the receipt of the test notification. That communication between the separate entity and the SCS/AS is out of scope of the present document.

When the SCEF receives a subscription creation or update request to use Websockets to deliver notifications (i.e. with the "requestWebsocketUri" attribute set to "true"), it shall assign a Websocket URI where to receive a Websocket connection establishment and provide this URI in the "websocketUri" attribute in the response, as defined in subclause 5.1.2.1.13. Once such Websocket URI has been assigned for a particular subscription resource, subsequent update requests to this resource that ask for the assignment of a new Websocket URI for that subscription shall be rejected by the SCEF.

Upon the reception of the Websocket URI from the SCEF in the "websocketUri" attribute, as specified in subclause 5.2.1.2.13-1, in the subscription creation or subscription update response, the SCS/AS or a separate entity that is intended to receive the notification shall establish an HTTP connection towards that URI and shall upgrade that connection to the Websocket protocol (IETF RFC 6455 [32]) using the HTTP upgrade mechanism defined in IETF RFC 7230 [16].

NOTE 2: For delivery of Notifications to a separate entity, the SCS/AS needs to provide the Websocket URI to that separate entity. That communication between the SCS/AS and the separate entity is out of scope of the present document.

The following framing of the request and response shall be used when delivering a notification or acknowledging its delivery through Websockets.

NOTE 3: The framing is aligned as much as possible with HTTP delivery in order to simplify implementations.

To deliver a notification towards the SCS/AS, the SCEF shall embed the following structure in a separate Websocket data frame with 0x2 (Binary) opcode in the following order:

1) The string "3GPP-WS-Notif-Seq:", followed by a blank, followed by a four-byte sequence number, encoded as decimal number in ASCII, followed by CRLF

2) The following HTTP headers in any order, with the syntax and semantics as defined in IETF RFC 7230 [16] and IETF RFC 7231 [17]: Content-Type (mandatory), Content-Encoding (optional), Content-Length (mandatory). Every HTTP header line shall be ended by CRLF.

3) CRLF to end the headers section.

4) The payload body of the notification, as defined in the individual APIs.

NOTE 4: The payload body is the same as the one that would be used if delivering the notification as defined in subclause 5.2.5.3.

To acknowledge the reception of a notification message towards the SCEF, the SCS/AS shall embed the following structure in a separate Websocket data frame with 0x2 (Binary) opcode in the following order:

1) The string "3GPP-WS-Notif-Seq:", followed by a blank, followed by the four-byte sequence number of the notification to be confirmed, encoded as decimal number in ASCII, followed by CRLF.

2) The HTTP status code (e.g. 204) and status message (e.g. No Content) as defined for HTTP delivery of the notification in the individual APIs, separated by a single blank character, and ended by CRLF.

3) Conditionally, as defined in IETF RFC 7230 [16] and IETF RFC 7231 [17], the following HTTP headers in any order: Content-Type, Content-Encoding, and Content-Length. Every HTTP header line shall be ended by CRLF.

4) CRLF to end the headers section.

5) The payload body of the response, if applicable based on the status code and the HTTP headers, as defined in IETF RFC 7230 [16] and IETF RFC 7231 [17].

NOTE 5: The status code, the status message and the payload body (if applicable), are the same as if delivering the notification as defined in subclause 5.2.5.3.

Use of CRLF is defined in IETF RFC 7230 [16].

The SCEF need not wait for the confirmation of each notification before delivering the next notification. The SCEF shall determine whether a notification has been delivered successfully by correlating the sent notification with the received acknowledgement by checking the sequence numbers of both for equality. The SCEF may re-send a notification, using the same sequence number, if it has not received an acknowledgement with a matching sequence number after a configurable time-out. The SCS/AS shall consider notifications with the same sequence number that arrive within a configurable time interval as duplicates.

The SCS/AS should send periodic Websocket "PING" frames to keep the connection alive.

NOTE 6: the TCP layer will handle a possible fragmentation and reassembly of large messages.

The security related clause 6 shall also apply for the HTTP connection that is upgraded to Websocket.

5.2.6   Error handling

Table 5.2.6-1 lists response bodies that are applicable to all APIs and as responses for all requests in the present specification unless otherwise specified. The HTTP client shall mandatorily support the processing of the status code for all the applicable methods, when received in a HTTP response message. In such cases the HTTP client shall also support the handling of the "ProblemDetails" JSON object with the Content-Type header field set to the value "application/problem+json", if the corresponding API definition in the current specification does not specify another response body for the corresponding status code.

Table 5.2.6-1: Response bodies supported for responses to all requests.

	Data type	Cardinality	Response Codes (NOTE 1)	Remarks (NOTE 2, NOTE 4)	Applied Methods
Response body	ProblemDetails	1	400 Bad Request	Incorrect parameters were passed in the request.	GET, POST PUT, PATCH, DELETE
	ProblemDetails	1	401 Unauthorized	The client is not authorized as described in IETF RFC 7235 [21].	GET, POST, PUT, PATCH, DELETE
	ProblemDetails	1	403 Forbidden	This represents the case when the server is able to understand the request but unable to fulfil the request due to errors (e.g. the requested parameters are out of range). More information may be provided in the "invalidParams" attribute of the "ProblemDetails" structure. (NOTE 3)	GET, POST, PUT, PATCH, DELETE
	ProblemDetails	1	404 Not Found	The resource URI was incorrect, for instance because of a wrong "scsAsId" field.	GET, POST, PUT, PATCH, DELETE
	ProblemDetails	1	406 Not Acceptable	The content format provided in the "Accept" header is not acceptable by the server.	GET
	ProblemDetails	1	411 Length Required	The code indicates that the server refuses to accept the request without a Content-Length header field.	POST, PUT, PATCH
	ProblemDetails	1	413 Payload Too Large	If the received HTTP request contains payload body larger than the server is able to process, the NF shall reject the HTTP request with the HTTP status code "413 Payload Too Large".	POST, PUT, PATCH
	ProblemDetails	1	415 Unsupported Media Type	The code indicates that the resource is in a format which is not supported by the server for the method.	POST, PUT, PATCH
	ProblemDetails	1	429 Too Many Requests	The code indicates that due to excessive traffic which, if continued over time, may lead to (or may increase) an overload situation. The HTTP header field "Retry-After" may be added in the response to indicate how long the client has to wait before making a new request.	GET, POST, PUT, PATCH, DELETE
	ProblemDetails	1	500 Internal Server Error	The server encountered an unexpected condition that prevented it from fulfilling the request.	GET, POST, PUT, PATCH, DELETE
	ProblemDetails	1	503 Service Unavailable	The server is unable to handle the request.	GET, POST, PUT, PATCH, DELETE

NOTE 1:	In addition to the above response codes, the SCEF can also send other valid HTTP response codes, if applicable. The list of all valid HTTP response codes can be found in HTTP Status Code Registry at IANA [6].
NOTE 2:	The MIME media type that shall be used within the related Content-Type header field is "application/problem+json", as defined in IETF RFC 7807 [8].
NOTE 3:	The information about which provided parameters are out of range shall be provided in the "invalidParams" attribute of the "ProblemDetails" structure for the API of network parameter configuration.
NOTE 4:	More information may be provided in the "detail" attribute of the "ProblemDetails" structure.

The protocol and application errors in subclause 5.2.7.2 of 3GPP TS 29.500 [44] are applicable for above status codes for the APIs defined in the present specification. Specific errors are contained in the related API definition for each API.

5.2.7 Feature negotiation

The procedures in subclause 6.6.2 of 3GPP TS 29.500 [44] shall be applicable for the APIs defined in the present specification with the difference that the SCEF should not register any feature for northbound APIs in the NRF.

The supported features are negotiated separately for each API. For each of the APIs defined in the present specification, the applicable list of features is contained in the related API definition.

5.2.8 HTTP custom headers

5.2.8.1 General

This subclause lists reused HTTP custom headers and defines any new HTTP custom headers introduced by this specification.

5.2.8.2 Reused HTTP custom headers

Table 5.2.8.2-1: Reused HTTP custom headers

Name	Reference	Description

5.2.9 Conventions for Open API specification files

5.2.9.1 General

T8 Open API specification files shall comply with the OpenAPI specification [27] and with the present subclause.

Each API shall be described in one Open API specification file. In addition, 3GPP specifications may contain Open API specification file with common data types.

For the purpose of referencing (see subclause 5.2.9.6), it is assumed that each Open API specification file contained in a 3GPP specification is stored as separate physical, that all Open API specification files are stored in the same directory on the local server, and that the files are named according to the conventions in subclause 5.2.9.6.

5.2.9.2 Formatting of OpenAPI files

The following guidelines shall be used when documenting OpenAPI files:

- OpenAPI specifications shall be documented using YAML format (see YAML 1.2 [41]). For specific restrictions on the usage of YAML in OpenAPI, see OpenAPI 3.0.0 Specification [27].

- The style used for the specification shall be "PL" (Programming Language).

- The different scopes in the YAML data structures representing collections (objects, arrays…) shall use an indentation of two white spaces.

- Comments may be added by following the standard YAML syntax ("#").

5.2.9.3 Structured data types

The OpenAPI file shall contain a definition in the components/schemas section defining a schema with the name of the structured data type as key.

The schema shall contain:

- "type: object";

- If any attributes in the structured data type are marked as mandatory via a minimum cardinality greater than "0", a "required" keyword listing those attributes;

- A "properties" keyword containing for each attribute in the structured data type an entry with the attribute name as key and;

  1. if the data type is "*<type>*"

     a. if the data type of the attribute is "string", "number", "integer", or "boolean", a type definition using that data type as value ("type: *<data type>*"); or

     b. otherwise a reference to the data type schema for the data type *<data type>* of the attribute, i.e. "$ref: '#/components/schemas/*<data type>*'" if that data type schema is contained in the same OpenAPI file and "$ref: '*<filename>*#/components/schemas/*<data type>*'" if that data type schema is contained in file *<filename>* in the same directory on the same server.

  2. if the data type is "array*(<type>)*":

     a. a type definition "type: array";

     b. an "items:" definition containing

        i). if the data type of the attribute is "string", "number", "integer", or "boolean", a type definition using that data type as value ("type: *<data type>*"); or

        ii). Otherwise a reference to the data type schema for the data type *<data type>* of the attribute, i.e. "$ref: '#/components/schemas/*<data type>*'" if that data type schema is contained in the same OpenAPI file and "$ref: '*<filename>*#/components/schemas/*<data type>*'" if that data type schema is contained in file *<filename>* in the same directory on the same server.

     c. if the cardinality contained an integer value *<m>* as lower boundary, "minItems: *<m>*"; and

     d. if the cardinality contained an integer value *<n>* as upper boundary, "maxItems: *<n>*";

  3. if the data type is "map*(<type>)*";

     a. a type definition "type: object"; and

     b. an "additionalProperties:" definition containing

        i). if the data type of the attribute is "string", "number", "integer", or "boolean", a type definition using that data type as value ("type: *<data type>*"); or

        ii). Otherwise a reference to the data type schema for the data type *<data type>* of the attribute, i.e. "$ref: '#/components/schemas/*<data type>*'" if that data type schema is contained in the same OpenAPI file and "$ref: '*<filename>*#/components/schemas/*<data type>*'" if that data type schema is contained in file *<filename>* in the same directory on the same server.

     c. if the cardinality contained an integer value *<m>* as lower boundary, "min Properties: *<m>*"; and

     d. if the cardinality contained an integer value *<n>* as upper boundary, "max Properties: *<n>*";

4. "description: *<description>*", where *<description>* is the description of the attribute in the table defining the structured data type.

NOTE 1: An omission of the "minProperties", and "maxProperties" keywords indicates that no lower or upper boundaries respectively, for the number of properties in an object are defined. An omission of the "minItems", and "maxItems" keywords indicates that no lower or upper boundaries, respectively, for the number of items in an array are defined.

NOTE 2: The "0..N" implies the array or map type of the attribute may be optional. If the attribute is present, the minimum number of elements is described in openAPI file.

Example:

Table 5.2.9.3-1: Definition of type ExampleStructuredType

Attribute name	Data type	Cardinality	Description
exSimple	ExSimple	1	exSimple attribute description
exArrayElements	array(string)	1..10	exArrayElements attribute description
exMapElements	map(ExStructure)	1..N	exMapElements attribute description

The data structure in table 5.2.9.3-1 is described in an OpenAPI file as follows:

```
components:
  schemas:
    ExampleStructuredType:
      type: object
      required:
        - exSimple
        - exMapElements
      properties:
        exSimple:
          $ref: '#/components/schemas/ExSimple'
          description: exSimple attribute description
        exArrayElements:
          type: array
          items:
            type: string
          minItems: 1
          maxItems: 10
          description: exArrayElements attribute description
        exMapElements:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/ExStructure'
          minProperties: 1
          description: exMapElements attribute description
```

5.2.9.4   Info

```
The Open API specification file of an API shall contain an "info" field with the title and version
as defined in subclause 4.3 of 3GPP TS 29.501 [49].
```

5.2.9.5   Servers

As defined in subclause 5.2.4, the base URI of an API consists of **{apiRoot}/<apiName>/<apiVersion>**. It shall be encoded in the corresponding Open API specification file as "servers" field with **{apiRoot}** as variable.

Example:

```
servers:
  - url: '{apiRoot}/3gpp-yyyy/v1'
    variables:
      apiRoot:
        default: https://demohost.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
```

5.2.9.6   References to other 3GPP-defined Open API specification files

For the purpose of referencing, it shall be assumed that each Open API specification file contained in a 3GPP specification is stored as separate physical file, that all Open API specification files are stored in the same directory on the local server, and that the files are named according to the following convention: The file name shall consist of (in the order below):

- the 3GPP specification number in the format "Tsxxyyy";

- an "_" character;

- if the OpenAPI specification file contains an API definition, the API name as defined for corresponding base URL parts (see subclause 4.4) of that API.

- if the OpenAPI specification file contains a definition of CommonData, the string "CommonData"; and

- the string ".yaml".

Examples:

Reference to Data Type "Xxx" defined in the same file

```
$ref: '#/components/schemas/Xxx'
```

Reference to Data Type "Xxx" defined as Common Data in 3GPP TS 29.122:

```
$ref: 'TS29122_CommonData.yaml#/components/schemas/Xxx'
```

Reference to Data Type "Xxx" defined within API "Nxxx_Yyy" in 3GPP TS ab.cde:

```
$ref: 'Tsabcde_Nxxx_Yyy.yaml#/components/schemas/Xxx'
```

5.2.9.7 Server-initiated communication

If an API contains notifications as described in subclause 5.2.5, it should be described as "callback" in Open API specification files.

Example:

```
paths:
  /subscriptions:
    post:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              type: object
              properties:
                callbackUrl: # Callback URL
                  type: string
                  format: uri
      responses:
        '201':
          description: Success
      callbacks:
        myNotification: # arbitrary name
          '{$request.body#/callbackUrl}': # refers The callback URL in the POST
            post:
              requestBody: # Contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NotificationBody'
              responses: # Expected responses to the callback message
                '200':
                  description: xxx
```

5.2.9.8 Describing the body of HTTP PATCH requests

In the OpenAPI file, the content field key of the Request Body Object shall contain "application/merge-patch+json". The content field value is a Media Type Object identifying the applicable patch body Schema Object. The patch body Schema Object may contain structured data types derived from the data types used in the schema to describe a complete representation of the resource in such a manner that attributes that are allowed to be modified are listed in the "properties" validation keyword.

NOTE 1: A derived structured data type is beneficial if the data types used to describe a complete representation of the resource contains mandatory attributes, if attributes are allowed to be removed by the PATCH operation, or if a checking by the OpenAPI tooling that only allowed modifications are done via the "additionalProperties: false" keyword is desired. It also provides a clear description in the OpenAPI file to developers which modifications need to be supported.

As an alternative, the data types used in the schema to describe a complete representation of the resource may be used if any attributes that are allowed to be removed are marked as "nullable: true" in that schema.

Any attributes that are allowed to be removed shall be marked as "nullable: true" in the patch body Schema Object.

The "additionalProperties: false" keyword may be set.

NOTE 2: The "additionalProperties: false" keyword enables the OpenAPI tooling to check that only allowed modifications are done. Extensions of the object in future releases are still possible under the assumption that the supported features mechanism is used to negotiate the usage of any new attribute prior to the PATCH invocation. If new optional attributes are expected to be introduced without corresponding supported feature or if PATCH can be used as first operation in an API, the usage of the "additionalProperties: false" keyword is not appropriate.

5.2.9.9   Error Responses

As described in subclause 5.2.6, T8 APIs use valid HTTP response codes as error codes in HTTP responses and may include a "ProblemDetails" data structure specified in subclause 5.2.1.2.12 or an application-specific data structure.

Subclause 5.2.6 specifies HTTP status code per HTTP method. OpenAPI files should include at least the status codes in that table.

For the purpose of referencing, HTTP error responses with "ProblemDetails" data structure are specified as part of the CommonData OpenAPI file in Annex A.2.

Example:

In the example below, the 400, and 500 and default error response descriptions are referenced.

```
Paths:
  /users:
    get:
      responses:
        '200':
          content:
            application/json
              schema:
                $ref: '#/components/schemas/ExampleGetBody'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

The following definitions provided in Annex A.2 are used in that example:

```
components:
  responses:
    '400':
      description: Bad request
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '500':
      description: Internal Server Error
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    default:
      description: Generic Error
```

5.2.9.10   Enumerations

For enumerations, the OpenAPI file shall contain a definition in the components/schemas section defining a schema with the name of the enumeration as key.

The schema

- shall contain the "anyOf" keyword listing as alternatives:

    1. the "type: string" keyword and the "enum" keyword with a list of all defined values for the enumeration; and

    2. the "type: string" keyword and the "description" keyword with a description stating that the string is only provided for extensibility and is not used to encode contents defined in the present version of the specification. And

- may contain a description listing the defined values of the enumeration together with explanations of those values.

    NOTE: The "enum" keyword restricts the permissible values of the string to the enumerated ones. This can lead to extensibility problems when new values need to be introduced.

Example:

Table 5.2.9.10-1: Enumeration ExampleEnumeration

Enumeration value	Description	Applicability
One	Value One description	
Two	Value Two description	

The data structure in table 5.2.9.10-1 is described in an OpenAPI file as follows:

```
components:
  schemas:
    ExampleEnumeration:
      anyOf:
      - type: string
        enum:
           - One
           - Two
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      Description: >
        Possible values are
        - One: Value One description
        - Two: Value Two description
```

5.2.9.11   Read only attribute

Each OpenAPI specification should include "readOnly: true" for those attributes that are only provided by the SCEF in the HTTP response message to prevent the SCS/AS from provisioning those attributes which is not expected, if the write and read operations (e.g. POST request and response) share the same data type which contains those attributes.

Example:

```
    NiddStatus:
      anyOf:
      - type: string
        enum:
           - ACTIVE
           - TERMINATED_UE_NOT_AUTHORIZED
           - TERMINATED
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      Description: >
```

```
        Possible values are
        - ACTIVE: The NIDD configuration is active.
        - TERMINATED_UE_NOT_AUTHORIZED: The NIDD configuration was terminated because the UE´s
authorisation was revoked.
        - TERMINATED: The NIDD configuration was terminated.
      readOnly: true
```

5.2.9.12   externalDocs

Each OpenAPI specification shall provide in an "externalDoc" field the reference to the 3GPP TS describing the API, as illustrated below.

Example:

```
externalDocs
  description: 3GPP TS 29.122 V15.1.0 T8 reference point for Northbound APIs
  url: http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/
```

5.2.10   Redirection handling

An HTTP request may be redirected to a different target entity.

Upon receipt of an HTTP request from the SCS/AS, when the SCEF redirects the HTTP request to a different target SCEF, the URI of the target SCEF towards which the request is redirected shall be given by the Location header field of the "307 Temporary Redirect" or "308 Permanent Redirect" response. The SCS/AS should then send the HTTP request towards the new target SCEF.

Upon receipt of a notification/callback request from the SCEF, when the SCS/AS redirects the notification/callback request to a different target SCS/AS, the URI of the target SCS/AS towards which the notification/callback request is redirected shall be given by the Location header field of the "307 Temporary Redirect" or "308 Permanent Redirect" response. The SCEF should then send the HTTP request towards the new target SCS/AS.

5.3   MonitoringEvent API

5.3.1   Overview

The MonitoringEvent API is a RESTful API that allows the SCS/AS to subscribe to notifications about specific events in 3GPP networks. It also allows the SCEF to report the event by sending notifications to the authorised users when the corresponding event is detected. The API also allows the SCEF to indicate the removal of a previously configured monitoring request. The MonitoringEvent API defines a set of data models, resources and the related procedures for the creation and management of monitoring event subscriptions. The corresponding JSON schema for the representation of the resources and operations defined by the MonitoringEvent API is provided in its complete form in Annex A.3.

5.3.2   Data model

5.3.2.1   Resource data types

5.3.2.1.1   Introduction

This clause defines data structures to be used in resource representations, including subscription resources.

Table 5.3.2.1.1-1 specifies data types re-used by the MonitoringEvent API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the MonitoringEvent API.

Table 5.3.2.1.1-1: MonitoringEvent API re-used Data Types

Data type	Reference	Comments
CivicAddress	3GPP TS 29.572 [42]	Civic address.
CodeWord	3GPP TS 29.515 [65]	Code word
DlDataDeliveryStatus	3GPP TS 29.571 [45]	Traffic Descriptor of source of downlink data notifications.
DddTrafficDescriptor	3GPP TS 29.571 [45]	Traffic Descriptor of source of downlink data.
GeographicArea	3GPP TS 29.572 [42]	Identifies the geographical information of the user(s).
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).
LocationQoS	3GPP TS 29.572 [42]	Requested location QoS
LdrType	3GPP TS 29.572 [42]	Location deferred requested event type
VelocityRequested	3GPP TS 29.572 [42]	Velocity of the target UE requested
AgeOfLocationEstimate	3GPP TS 29.572 [42]	Age of the location estimate for change of location type or motion type of Location deferred report.
AccuracyFulfilmentIndicator	3GPP TS 29.572 [42]	The indication whether the obtained location estimate satisfies the requested QoS or not
VelocityEstimate	3GPP TS 29.572 [42]	UE velocity, if requested and available
LinearDistance	3GPP TS 29.572 [42]	This IE shall be present and set to true if a location estimate is required for motion event report.
NetworkAreaInfo	3GPP TS 29.554 [50]	Identifies a network area information.
PositioningMethod	3GPP TS 29.572 [42]	Identifies the positioning method used to obtain the location estimate of the UE.
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.3.4-1.
ServiceIdentiy	3GPP TS 29.515 [65]	Service identity
SupportedGADShapes	3GPP TS 29.572 [42]	Supported Geographical Area Description shapes.
TimeWindow	5.2.1.2.3	Identifies the time interval.

5.3.2.1.2 Type: MonitoringEventSubscription

This type represents a subscription to monitoring an event. The same structure is used in the subscription request and subscription response.

Table 5.3.2.1.2-1: Definition of type MonitoringEventSubscription

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 3)
self	Link	0..1	Link to the resource "Individual Monitoring Event Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
mtcProviderId	string	0..1	Identifies the MTC Service Provider and/or MTC Application. (NOTE 7)	
externalId	ExternalId	0..1	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	(NOTE 5)
msisdn	Msisdn	0..1	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	(NOTE 5)
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1) (NOTE 6)	
addExtGroupIds	array(ExternalGroupId)	0..N	Identifies user groups as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1) (NOTE 6)	Number_of_UEs_in_an_area_notification, Number_of_UEs_in_an_area_notification_5G
ipv4Addr	Ipv4Addr	0..1	Identifies the Ipv4 address. (NOTE 1)	Location_notification, Communication_failure_notification
ipv6Addr	Ipv6Addr	0..1	Identifies the Ipv6 address. (NOTE 1)	Location_notification, Communication_failure_notification
notificationDestination	Link	1	An URI of a notification destination that T8 message shall be delivered to.	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
monitoringType	MonitoringType	1	Enumeration of monitoring type. Refer to clause 5.3.2.4.3.	
maximumNumberOfReports	integer	0..1	Identifies the maximum number of event reports to be generated by the HSS, MME/SGSN as specified in subclause 5.6.0 of 3GPP TS 23.682 [2]. (NOTE 2, NOTE 9)	
monitorExpireTime	DateTime	0..1	Identifies the absolute time at which the related monitoring event request is considered to expire, as specified in subclause 5.6.0 of 3GPP TS 23.682 [2]. (NOTE 2)	
repPeriod	DurationSec	0..1	Identifies the periodic time for the event reports. (NOTE 8, NOTE 9)	

groupReportGuardTim e	DurationSec	0..1	Identifies the time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCS/AS, as specified in subclause 5.6.0 of 3GPP TS 23.682 [2].	
maximumDetectionTim e	DurationSec	0..1	If "monitoringType" is "LOSS_OF_CONNECTIVITY", this parameter may be included to identify the maximum period of time after which the UE is considered to be unreachable.	Loss_of_conne ctivity_notificati on
reachabilityType	ReachabilityTyp e	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter shall be included to identify whether the request is for "Reachability for SMS" or "Reachability for Data".	Ue-reachability_no tification
maximumLatency	DurationSec	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter may be included to identify the maximum delay acceptable for downlink data transfers.	Ue-reachability_no tification
maximumResponseTi me	DurationSec	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter may be included to identify the length of time for which the UE stays reachable to allow the SCS/AS to reliably deliver the required downlink data.	Ue-reachability_no tification
suggestedNumberOfDl Packets	integer	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter may be included to identify the number of packets that the serving gateway shall buffer in case that the UE is not reachable.	Ue-reachability-notification
idleStatusIndication	boolean	0..1	If "monitoringType" is set to "UE_REACHABILITY" or "AVAILABILITY_AFTER_DDN_FAILURE", this parameter may be included to indicate the notification of when a UE, for which PSM is enabled, transitions into idle mode. - "true": indicate enabling of notification - "false": indicate no need to notify Default: "false".	Ue-reachability_no tification, Availability_afte r_DDN_failure_ notification, Availability_afte r_DDN_failure_ notification_en hancement
locationType	LocationType	0..1	If "monitoringType" is "LOCATION_REPORTING" or "NUMBER_OF_UES_IN_AN_AREA", this parameter shall be included to identify whether the request is for Current Location, Initial Location or Last known Location. (NOTE 4)	Location_notific ation, Number_of_UE s_in_an_area_ notification, Number_of_UE s_in_an_area_ notification_5G, eLCS
accuracy	Accuracy	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify the desired level of accuracy of the requested location information, as described in subclause 4.9.2 of 3GPP TS 23.682 [2]. (NOTE 10, NOTE 11) For 5G, if the eLCS feature is not supported, the default value is "TA_RA".	Location_notific ation, eLCS

minimumReportInterval	DurationSec	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify a minimum time interval between Location Reporting notifications. If the "ldrType" attribute is present and set to "ENTERING_INTO_AREA". "LEAVING_FROM_AREA", "BEING_INSIDE_AREA" or "MOTION", this attribute shall not be included if the maximumNumberOfReports attribute is present and set to one time event.	Location_notification, eLCS
maxRptExpireIntvl	DurationSec	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify a maximum time interval between Location Reporting notifications. If the "ldrType" attribute is present and set to "ENTERING_INTO_AREA". "LEAVING_FROM_AREA", "BEING_INSIDE_AREA" or "MOTION", this attribute shall not be included if the maximumNumberOfReports attribute is present and set to one time event.	eLCS
samplingInterval	DurationSec	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify the maximum time interval between consecutive evaluations by a UE of a trigger event.	eLCS
reportingLocEstInd	boolean	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate whether event reporting requires the location information. If set to true, the location estimation information shall be included in event reporting. Default: "false" if omitted.	eLCS
linearDistance	LinearDistance	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the linear(straight line) distance threshold for motion event reporting.	eLCS
locQoS	LocationQoS	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the expected location QoS requirement for an immediate MT-LR or deferred MT-LR. (NOTE 10)	eLCS
svcId	ServiceIdentity	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the service identity of AF.	eLCS
ldrType	LdrType	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the event type for a deferred MT-LR.	eLCS
velocityRequested	VelocityRequested	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate if the velocity of the target UE is requested or not.	eLCS
maxAgeOfLocEst	AgeOfLocationEstimate	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate acceptable maximum age of location estimate.	eLCS

locTimeWindow	TimeWindow	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the starting time and ending time for a deferred MT-LR.	eLCS
supportedGADShapes	array(Supported GADShapes)	0..N	Supported Geographical Area Description shapes.	eLCS
codeWord	CodeWord	0..1	Code word.	eLCS
associationType	AssociationType	0..1	If "monitoringType" is "CHANGE_OF_IMSI_IMEI_ASSOCIATION", this parameter shall be included to identify whether the change of IMSI-IMEI or IMSI-IMEISV association shall be detected.	Change_of_IMSI_IMEI_association_notification
plmnIndication	boolean	0..1	If "monitoringType" is "ROAMING_STATUS", this parameter may be included to indicate the notification of UE's Serving PLMN ID. - "true": The value shall be used to indicate enabling of notification; - "false": The value shall be used to indicate disabling of notification. Default: "false".	Roaming_status_notification
locationArea	LocationArea	0..1	If "monitoringType" is "NUMBER_OF_UES_IN_AN_AREA", this parameter may be included to indicate the area within which the SCS/AS requests the number of UEs.	Number_of_UEs_in_an_area_notification
locationArea5G	LocationArea5G	0..1	If "monitoringType" is "NUMBER_OF_UES_IN_AN_AREA", this parameter may be included to indicate the area within which the AF requests the number of UEs. If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to indicate the area within which the AF requests the area event of the target UE. (NOTE 12)	Number_of_UEs_in_an_area_notification_5G, eLCS
dddTraDescriptors	array(DddTraffic Descriptor)	0..N	The traffic descriptor(s) of the downlink data source. May be included for event "DOWNLINK_DATA_DELIVERY_STATUS" or "AVAILABILITY_AFTER_DDN_FAILURE".	Downlink_data_delivery_status_5G, Availability_after_DDN_failure_notification_enhancement
dddStati	array(DlDataDeliveryStatus)	0..N	May be included for event "DOWNLINK_DATA_DELIVERY_STATUS". The subscribed stati (delivered, transmitted, buffered) for the event. If omitted all stati are subscribed.	Downlink_data_delivery_status_5G
monitoringEventReport	MonitoringEventReport	0..1	Identifies a monitoring event report which is sent from the SCEF to the SCS/AS.	

| apiNames | array(string) | 0..N | If "monitoringType" is "API_SUPPORT_CAPABILITY", this parameter may be included. Each element identifies the name of an API.

It shall set as {apiName} part of the URI structure for each T8 or N33 API as defined in the present specification or 3GPP TS 29.522 [62], respectively.

This allows the SCS/AS to request the capability change for its interested APIs. If it is omitted, the SCS/AS requests to be notified for capability change for all APIs the SCEF+NEF supports. | API_support_capability_notification |

NOTE 1: One of the properties "externalId", "msisdn", "ipv4Addr", "ipv6Addr" or "externalGroupId" shall be included for features "Location_notification" and "Communication_failure_notification";. One of the properties "externalId", "msisdn" or "externalGroupId" shall be included for feature "eLCS". "ipv4Addr" or "ipv6Addr" is required for monitoring via the PCRF for an individual UE. One of the properties "externalId", "msisdn" or "externalGroupId" shall be included for features "Pdn_connectivity_status", "Loss_of_connectivity_notification", "Ue-reachability_notification", "Change_of_IMSI_IMEI_association_notification", "Roaming_status_notification", "Availability_after_DDN_failure_notification" and "Availability_after_DDN_failure_notification_enhancement";;

NOTE 2: Inclusion of either "maximumNumberOfReports" (with a value higher than 1) or "monitorExpireTime" makes the Monitoring Request a Continuous Monitoring Request, where the SCEF sends Notifications until either the maximum number of reports or the monitoring duration indicated by the property "monitorExpireTime" is exceeded. The "maximumNumberOfReports" with a value 1 makes the Monitoring Request a One-time Monitoring Request. At least one of "maximumNumberOfReports" or "monitorExpireTime" shall be provided.

NOTE 3: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.

NOTE 4: In this release, for features "Number_of_UEs_in_an_area_notification" and "Number_of_UEs_in_an_area_notification_5G", locationType shall be set to "LAST_KNOWN_LOCATION". For 5G, if the "locationType" attribute sets to "LAST_KNOWN_LOCATION", the "maximumNumberOfReports" attribute shall set to 1 as a One-time Monitoring Request.

NOTE 5: The property does not apply for the features "Number_of_UEs_in_an_area_notification" and "Number_of_UEs_in_an_area_notification_5G".

NOTE 6: For the features "Number_of_UEs_in_an_area_notification" and "Number_of_UEs_in_an_area_notification_5G", the property "externalGroupId" may be included for single group and "addExtGroupIds" may be included for multiple groups but not both.

NOTE 7: The SCEF should check received MTC provider identifier and then the SCEF may:
- override it with local configured value and send it to HSS;
- send it directly to the HSS; or
- reject the monitoring configuration request.

NOTE 8: This property is only applicable for the NEF.

NOTE 9: The value of "maximumNumberOfReports" attribute sets to 1 and the "repPeriod" attribute are mutually exclusive.

NOTE 10: If the eLCS feature is supported, the "accuracy" attribute and "locQoS" attribute are mutually exclusive, and only the "GEO_AREA" value is applicable for the "accuracy" attribute.

NOTE 11: The value of "TWAN_ID" is only applicable when the monitoring subscription is via the PCRF as described in subclause 4.4.2.2.4.

NOTE 12: If the eLCS feature is supported, only the "geographicAreas" attribute within the "locationArea5G" attribute is applicable.

5.3.2.2   Notification data types

5.3.2.2.1   Introduction

This clause defines data structures to be used in notifications.

5.3.2.2.2   Type: MonitoringNotification

This data type represents a monitoring notification which is sent from the SCEF to the SCS/AS.

Table 5.3.2.2.2-1: Definition of type MonitoringNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
subscription	Link	1	Link to the subscription resource to which this notification is related.	
configResults	array(ConfigResult)	0..N	Each element identifies a notification of grouping configuration result.	
monitoringEventReports	array(MonitoringEventReport)	0..N	Each element identifies a monitoring event report.	
cancelInd	Boolean	0..1	Indicates whether to request to cancel the corresponding monitoring subscription. Set to false or omitted otherwise.	
appliedParam	AppliedParameterConfiguration	0..1	Indicates the applied parameter configuration in the network. For the attributes included in AppliedParameterConfiguration data type, the "maximumLatency" and "maximumResponseTime" attributes require the "Ue-reachability_notification" feature support, and the "maximumDetectionTime" attribute requires the "Loss_of_connectivity_notification" feature support.	Enhanced_param_config
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.3.2.3 Referenced structured data types

5.3.2.3.1 Introduction

This clause defines structured data types that are referenced from data structures defined in the previous clauses.

5.3.2.3.2 Type: MonitoringEventReport

This data type represents a monitoring event notification which is sent from the SCEF to the SCS/AS.

Table 5.3.2.3.2-1: Definition of type MonitoringEventReport

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
imeiChange	AssociationType	0..1	If "monitoringType" is "CHANGE_OF_IMSI_IMEI_ASSOCIATION", this parameter shall be included to identify the event of change of IMSI-IMEI or IMSI-IMEISV association is detected. Refer to 3GPP TS 29.336 [11] Subclause 8.4.22.	Change_of_IMSI_IMEI_association_notification
externalId	ExternalId	0..1	External identifier (NOTE 2)	
idleStatusInfo	IdleStatusInfo	0..1	If "idleStatusIndication" in the "MonitoringEventSubscription"sets to "true", this parameter shall be included to indicate the information when the UE transitions into idle mode.	Ue-reachability_notification, Availability_after_DDN_failure_notification
locationInfo	LocationInfo	0..1	If "monitoringType" is "LOCATION_REPORTING", this parameter shall be included to indicate the user location related information.	Location_notification, eLCS
locFailureCause	LocationFailureCause	0..1	Indicates the location positioning failure cause.	Location_notification, eLCS
lossOfConnectReason	integer	0..1	If "monitoringType" is "LOSS_OF_CONNECTIVITY", this parameter shall be included if available to identify the reason why loss of connectivity is reported. Refer to 3GPP TS 29.336 [11] Subclause 8.4.58.	Loss_of_connectivity_notification
maxUEAvailabilityTime	DateTime	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter may be included to identify the timestamp until which a UE using a power saving mechanism is expected to be reachable for SM delivery. Refer to Subclause 5.3.3.22 of 3GPP TS 29.338 [34].	Ue-reachability_notification
msisdn	Msisdn	0..1	Identifies the MS internal PSTN/ISDN number (NOTE 2)	
monitoringType	MonitoringType	1	Identifies the type of monitoring type as defined in clause 5.3.2.4.3.	
uePerLocationReport	UePerLocationReport	0..1	If "monitoringType" is "NUMBER_OF_UES_IN_AN_AREA", this parameter shall be included to indicate the number of UEs found at the location.	Number_of_UEs_in_an_area_notification, Number_of_UEs_in_an_area_notification_5G
plmnId	PlmnId	0..1	If "monitoringType" is "ROAMING_STATUS" and "plmnIIndication" in the "MonitoringEventSubscription" sets to "true", this parameter shall be included to indicate the UE's serving PLMN.	Roaming_status_notification

reachabilityType	ReachabilityType	0..1	If "monitoringType" is "UE_REACHABILITY", this parameter shall be included to identify the reachability of the UE. Refer to 3GPP TS 29.336 [11] Subclause 8.4.20.	Ue-reachability_notification
roamingStatus	boolean	0..1	If "monitoringType" is "ROAMING_STATUS", this parameter shall be set to "true" if the UE is on roaming status. Set to false or omitted otherwise.	Roaming_status_notification
failureCause	FailureCause	0..1	If "monitoringType" is "COMMUNICATION_FAILURE", this parameter shall be included to indicate the reason of communication failure.	Communication_failure_notification
eventTime	DateTime	0..1	Identifies when the event is detected or received. Shall be included for each group of UEs.	
pdnConnInfoList	array(PdnConnectionInformation)	0..N	If "monitoringType" is "PDN_CONNECTIVITY_STATUS", this parameter shall be included to indicate the PDN connection details.	Pdn_connectivity_status
dddStatus	DlDataDeliveryStatus	0..1	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_STATUS", this parameter shall be included to identify the downlink data delivery status detected by the network.	Downlink_data_delivery_status_5G
dddTrafDescriptor	DddTrafficDescriptor	0..1	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_STATUS", this parameter shall be included to identify the downlink data descriptor impacted by the downlink data delivery status change.	Downlink_data_delivery_status_5G
maxWaitTime	DateTime	0..1	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_STATUS", this parameter may be included to identify the time before which the data will be buffered.	Downlink_data_delivery_status_5G
apiCaps	array(ApiCapabilityInfo)	0..N	If "monitoringType" is "API_SUPPORT_CAPABILITY", this parameter shall be included to indicate the availability of all APIs supported by the serving network or the availability of interested APIs, indicated by the "apiNames" attribute in "MonitoringEventSubscription", supported by the serving network. If no API is supported by the serving network, an empty apiCaps shall be provided.	API_support_capability_notification
NOTE 1: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features. NOTE 2: Identifies the user for which the event occurred. At least one of the properties shall be included.				

5.3.2.3.3   Type: IdleStatusInfo

This data type represents the information when the UE transitions into idle mode. It is sent from the SCEF to the SCS/AS.

Table 5.3.2.3.3-1: Definition of type IdleStatusInfo

Attribute name	Data type	Cardinality	Description
activeTime	DurationSec	0..1	Identifies the active time granted to the UE. It shall be present if the idle status indication is requested by the SCS/AS with "idleStatusIndication" in the "monitoringEventSubscription" sets to "true".
edrxCycleLength	number	0..1	Identifies the power saving interval in unit of seconds. It shall be present if the idle status indication is requested by the SCS/AS with "idleStatusIndication" in the "monitoringEventSubscription" sets to "true".
suggestedNumberOfDlPackets	integer	0..1	Identifies the number of packets shall be buffered in the serving gateway. It shall be present if the idle status indication is requested by the SCS/AS with "idleStatusIndication" in the "monitoringEventSubscription" sets to "true".
idleStatusTimestamp	DateTime	0..1	Identifies the timestamp at which the UE transitions into idle mode. It shall be present if the idle status indication is requested by the SCS/AS with "idleStatusIndication" in the "monitoringEventSubscription" sets to "true".
periodicAUTimer	DurationSec	0..1	Identifies the subscribed periodic RAU/TAU timer value. It shall be present if the idle status indication is requested by the SCS/AS with "idleStatusIndication" in the "monitoringEventSubscription" sets to "true".

5.3.2.3.4   Type: UePerLocationReport

This data type represents the number of UEs found at the indicated location information. It is sent from the SCEF to the SCS/AS.

Table 5.3.2.3.4-1: Definition of type UePerLocationReport

Attribute name	Data type	Cardinality	Description
ueCount	integer	1	Identifies the number of UEs.
externalIds	array(ExternalId)	0..N	Each element uniquely identifies a user. (NOTE)
msisdns	array(Msisdn)	0..N	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE)
NOTE: The property shall be included if received from the MME(s)/SGSN(s).			

5.3.2.3.5   Type: LocationInfo

This data type represents the user location information which is sent from the SCEF to the SCS/AS.

Table 5.3.2.3.5-1: Definition of LocationInfo data Type

Attribute name	Data type	Cardinality	Description	Applicability
ageOfLocationInfo	DurationMin	0..1	Indicates the elapsed time since the last network contact of the UE. Refer to the Age-Of-Location-Information AVP as defined in subclause 7.3.126 of 3GPP TS 29.272 [33].	
cellId	string	0..1	Indicates the Cell Global Identification of the user which identifies the cell the UE is registered. Refer to the Cell-Global-Identity AVP or E-UTRAN-Cell-Global-Identity AVP as defined in subclause 7.3.119 or subclause 7.3.117 of 3GPP TS 29.272 [33]. (NOTE 2)	
enodeBId	string	0..1	Indicates the eNodeB in which the UE is currently located. Refer to the eNodeB-ID AVP or Extended-eNodeB-ID AVP as defined in subclause 7.3.198 or subclause 7.3.218 of 3GPP TS 29.272 [33].	
routingAreaId	string	0..1	Identifies the Routing Area Identity of the user where the UE is located. Refer to the Routing-Area-Identity AVP as defined in subclause 7.3.120 of 3GPP TS 29.272 [33].	
trackingAreaId	string	0..1	Identifies the Tracking Area Identity of the user where the UE is located. Refer to the Tracking-Area-Identity AVP as defined in subclause 7.3.118 of 3GPP TS 29.272 [33]. (NOTE 3)	
plmnId	string	0..1	Identifies the PLMN Identity of the user where the UE is located. Refer to the Visited-PLMN-Id AVP as defined in subclause 7.3.9 of 3GPP TS 29.272 [33].	
twanId	string	0..1	Identifies the TWAN Identity of the user where the UE is located.	
geographicArea	GeographicArea	0..1	Identifies a geographic area of the user where the UE is located.	
civicAddress	CivicAddress	0..1	The civic address of the target UE.	eLCS
positionMethod	PositioningMethod	0..1	Identifies the positioning method used to obtain the location estimate of the UE, if it is available at the LCS server and if needed.	eLCS
qosFulfilInd	AccuracyFulfilmentIndicator	0..1	Represents whether the requested accuracy is fulfilled or not. (NOTE 1)	eLCS
ueVelocity	VelocityEstimate	0..1	UE velocity, if requested and available	eLCS
ldrType	LdrType	0..1	The IE may be included to indicate the type of event that triggers event notification.	eLCS
NOTE 1: For the eLCS feature, if "reportingLocEstInd" attribute is set to false or omitted during the monitoring event request, the location estimation information shall not be included. Otherwise, if the "reportingLocEstInd" attribute is set to true, and - if the "qosFulfilInd" attribute is set to "REQUESTED_ACCURACY_FULFILLED", the location estimate information may be included if the "lcsQosClass" attribute within the "locQoS" attribute is set to "BEST_EFFORT"; or - if the "qosFulfilInd" attribute is set to "REQUESTED_ACCURACY_NOT_FULFILLED", the location estimate shall not be included if the "lcsQosClass" attribute within "locQoS" attribute is set to "ASSURED". NOTE 2: For NEF, the context of the property shall refer to the Ecgi or Ncgi data type as defined in subclause 5.4.4.5 or subclause 5.4.4.6 of 3GPP TS 29.571 [45]. NOTE 3: For NEF, the context of the property shall refer to the Tai data type as defined in subclause 5.4.4 of 3GPP TS 29.571 [45]].				

5.3.2.3.6 Type: FailureCause

This data type represents the reason of communication failure. It shall comply with the provisions defined in table 5.3.2.3.6-1.

Table 5.3.2.3.6-1: Definition of type FailureCause

Attribute name	Data type	Cardinality	Description
bssgpCause	integer	0..1	Identifies a non-transparent copy of the BSSGP cause code. Refer to 3GPP TS 29.128 [12].
causeType	integer	0..1	Identify the type of the S1AP-Cause. Refer to 3GPP TS 29.128 [12].
gmmCause	integer	0..1	Identifies a non-transparent copy of the GMM cause code. Refer to 3GPP TS 29.128 [12].
ranapCause	integer	0..1	Identifies a non-transparent copy of the RANAP cause code. Refer to 3GPP TS 29.128 [12].
ranNasCause	string	0..1	Indicates RAN and/or NAS release cause code information, TWAN release cause code information or untrusted WLAN release cause code information. Refer to 3GPP TS 29.214 [10]. (NOTE)
s1ApCause	integer	0..1	Identifies a non-transparent copy of the S1AP cause code. Refer to 3GPP TS 29.128 [12].
smCause	integer	0..1	Identifies a non-transparent copy of the SM cause code. Refer to 3GPP TS 29.128 [12].
NOTE: If this property is provided in the "FailureCause" type, then other properties shall not be provided.			

5.3.2.3.7 Type: PdnConnectionInformation

This data type represents the PDN connection information of the UE.

Table 5.3.2.3.7-1: Definition of type PdnConnectionInformation

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
status	PdnConnectionStatus	1	Identifies the PDN connection status.	
apn	string	0..1	Identifies the APN, it is depending on the SCEF local configuration whether or not this attribute is sent to the SCS/AS.	
pdnType	PdnType	1	PDN type	
interfaceInd	InterfaceIndication	0..1	Identifies the 3GPP network function used to communicate with the SCS/AS for non-IP PDN type.	
ipv4Addr	Ipv4Addr	0..1	Identifies the UE Ipv4 address.	
ipv6Addrs	array(Ipv6Addr)	0..N	Identifies the UE Ipv6 address. (NOTE 2)	
NOTE 1: Properties marked with a feature as defined in subclause 5.5.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: ipv6 prefix is included in this attribute if ipv6 full address is not available.				

5.3.2.3.8 Type: AppliedParameterConfiguration

This data type represents the applied parameter configuration in the network.

Table 5.3.2.3.8-1: Definition of type AppliedParameterConfiguration

Attribute name	Data type	Cardinality	Description	Applicability
externalIds	array(ExternalId)	0..N	Each element uniquely identifies a user. (NOTE)	
msisdns	array(Msisdn)	0..N	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE)	
maximumLatency	DurationSec	0..1	This parameter may be included to identify the maximum delay acceptable for downlink data transfers, which is applied in the network.	
maximumResponseTime	DurationSec	0..1	This parameter may be included to identify the length of time for which the UE stays reachable to allow the SCS/AS to reliably deliver the required downlink data, which is applied in the network.	
maximumDetectionTime	DurationSec	0..1	This parameter may be included to identify the maximum period of time after which the UE is considered to be unreachable, which is applied in the network.	
NOTE: If both are omitted, it means the change applies for the whole configuration (i.e. a single UE or a group of UEs).				

5.3.2.3.9 Type: ApiCapabilityInfo

This data type represents the availability information of a supported API.

Table 5.3.2.3.9-1: Definition of type ApiCapabilityInfo

Attribute name	Data type	Cardinality	Description	Applicability
apiName	string	1	Identifies the name of an available API provided by the SCEF+NEF. It shall set as {apiName} part of the URI structure for each T8 or N33 API as defined in the present specification or 3GPP TS 29.522 [62], respectively.	
suppFeat	SupportedFeatures	1	Indicates all the features supported by the API in the serving network, which provided by the SCEF+NEF.	

5.3.2.4 Referenced simple data types and enumerations

5.3.2.4.1 Introduction

This clause defines simple data types and enumerations that are referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.3.2.4.2 Simple data types

The simple data types defined in table 5.3.2.4.2-1 shall be supported.

Table 5.3.2.4.2-1: Simple data types

Type name	Description

5.3.2.4.3 Enumeration: MonitoringType

The enumeration MonitoringType represents a monitoring event type. It shall comply with the provisions defined in table 5.3.2.4.3-1.

Table 5.3.2.4.3-1: Enumeration MonitoringType

Enumeration value	Description	Applicability (NOTE 1)
LOSS_OF_CONNECTIVITY	The SCS/AS requests to be notified when the 3GPP network detects that the UE is no longer reachable for signalling or user plane communication	Loss_of_connectivity_notification
UE_REACHABILITY	The SCS/AS requests to be notified when the UE becomes reachable for sending either SMS or downlink data to the UE	Ue-reachability_notification
LOCATION_REPORTING	The SCS/AS requests to be notified of the current location or the last known location of the UE	Location_notification, eLCS
CHANGE_OF_IMSI_IMEI _ASSOCIATION	The SCS/AS requests to be notified when the association of an ME (IMEI(SV)) that uses a specific subscription (IMSI) is changed	Change_of_IMSI_IMEI_associati on_notification
ROAMING_STATUS	The SCS/AS queries the UE's current roaming status and requests to get notified when the status changes	Roaming_status_notification
COMMUNICATION_FAIL URE	The SCS/AS requests to be notified of communication failure events	Communication_failure_notificati on
AVAILABILITY_AFTER_ DDN_FAILURE	The SCS/AS requests to be notified when the UE has become available after a DDN failure	Availability_after_DDN_failure_n otification, Availability_after_DDN_failure_n otification_enhancement
NUMBER_OF_UES_IN_ AN_AREA	The SCS/AS requests to be notified the number of UEs in a given geographic area	Number_of_UEs_in_an_area_no tification, Number_of_UEs_in_an_area_no tification_5G
PDN_CONNECTIVITY_S TATUS	The SCS/AS requests to be notified when the 3GPP network detects that the UE's PDN connection is set up or torn down.	Pdn_connectivity_status
DOWNLINK_DATA_DELI VERY_STATUS	The AF requests to be notified when the 3GPP network detects that the downlink data delivery status is changed.	Downlink_data_delivery_status_ 5G
API_SUPPORT_CAPABI LITY	The SCS/AS requests to be notified of the availability of support of service APIs.	API_support_capability_notificati on
NOTE 1: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features. NOTE 2: More monitoring types can be added in the future based on stage 2.		

5.3.2.4.4 Enumeration: ReachabilityType

The enumeration ReachabilityType represents a reachability type. It shall comply with the provisions defined in table 5.3.2.4.4-1. If reachabilityType set to "SMS", the monitoring event request from SCS/AS shall be only for one-time monitoring request.

Table 5.3.2.4.4-1: Enumeration ReachabilityType

Enumeration value	Description	Applicability (NOTE)
SMS	The SCS/AS requests to be notified when the UE becomes reachable for sending SMS to the UE	Ue-reachability_notification
DATA	The SCS/AS requests to be notified when the UE becomes reachable for sending downlink data to the UE	Ue-reachability_notification
NOTE:	Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.	

5.3.2.4.5   Enumeration: LocationType

The enumeration LocationType represents a location type. It shall comply with the provisions defined in table 5.3.2.4.5-1. If locationType set to "LAST_KNOWN_LOCATION", the monitoring event request from SCS/AS shall be only for one-time monitoring request.

Table 5.3.2.4.5-1: Enumeration LocationType

Enumeration value	Description	Applicability (NOTE)
CURRENT_LOCATION	The SCS/AS requests to be notified for current location	Location_notification, eLCS
LAST_KNOWN_LOCATION	The SCS/AS requests to be notified for last known location	Location_notification, Number_of_UEs_in_an_area_notification, Number_of_UEs_in_an_area_notification_5G
CURRENT_OR_LAST_KNOWN_LOCATION	The AF requests the current or last known location.	eLCS
INITIAL_LOCATION	The AF requests the initial location.	eLCS
NOTE:	Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.	

5.3.2.4.6   Enumeration: AssociationType

The enumeration AssociationType represents an IMEI or IMEISV to IMSI association. It shall comply with the provisions defined in table 5.3.2.4.6-1.

Table 5.3.2.4.6-1: Enumeration AssociationType

Enumeration value	Description	Applicability (NOTE)
IMEI	The value shall be used when the change of IMSI-IMEI association shall be detected	Change_of_IMSI_IMEI_association_notification
IMEISV	The value shall be used when the change of IMSI-IMEISV association shall be detected	Change_of_IMSI_IMEI_association_notification
NOTE:	Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.	

5.3.2.4.7   Enumeration: Accuracy

The enumeration Accuracy represents a desired granularity of accuracy of the requested location information. It shall comply with the provisions defined in table 5.3.2.4.7-1.

Table 5.3.2.4.7-1: Enumeration Accuracy

Enumeration value	Description
CGI_ECGI	The SCS/AS requests to be notified at cell level location accuracy.
ENODEB	The SCS/AS requests to be notified at eNodeB level location accuracy.
TA_RA	The SCS/AS requests to be notified at TA/RA level location accuracy.
PLMN	The SCS/AS requests to be notified at PLMN level location accuracy.
TWAN_ID	The SCS/AS requests to be notified at TWAN identifier level location accuracy.
GEO_AREA	The SCS/AS requests to be notified of the geographical area accuracy.

5.3.2.4.8 Enumeration: PdnConnectionStatus

The enumeration PdnConnectionStatus represents the PDN connection status. It shall comply with the provisions defined in table 5.3.2.4.8-1.

Table 5.3.2.4.8-1: Enumeration PdnConnectionStatus

Enumeration value	Description	Applicability (NOTE)
CREATED	The PDN connection is created.	Pdn_connectivity_status
RELEASED	The PDN connection is released.	Pdn_connectivity_status
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.3.2.4.9 Enumeration: PdnType

The enumeration PdnType represents the PDN connection type. It shall comply with the provisions defined in table 5.3.2.4.9-1.

Table 5.3.2.4.9-1: Enumeration PdnType

Enumeration value	Description	Applicability (NOTE)
IPV4	PDN connection of IPv4 type	
IPV6	PDN connection of IPv6 type	
IPV4V6	PDN connection of IPv4v6 type	
NON_IP	PDN connection of non-IP type	
ETHERNET	PDN connection of Ethernet type	
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.3.2.4.10 Enumeration: InterfaceIndication

The enumeration InterfaceIndication represents the network entity used for data delivery towards the SCS/AS. It shall comply with the provisions defined in table 5.3.2.4.10-1.

Table 5.3.2.4.10-1: Enumeration InterfaceIndication

Enumeration value	Description	Applicability (NOTE)
EXPOSURE_FUNCTION	SCEF is used for the PDN connection towards the SCS/AS.	Pdn_connectivity_status
PDN_GATEWAY	PDN gateway is used for the PDN connection towards the SCS/AS.	Pdn_connectivity_status
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.3.2.4.11   Enumeration: LocationFailureCause

The enumeration LocationFailureCause represents the cause of location positioning failure. It shall comply with the provisions defined in table 5.3.2.4.11-1.

Table 5.3.2.4.11-1: Enumeration LocationFailureCause

Enumeration value	Description	Applicability
"POSITIONING_DENIED"	Positioning is denied.	
"UNSUPPORTED_BY_UE"	Positioning is not supported by UE.	
"NOT_REGISTED_UE"	UE is not registered.	
"UNSPECIFIED"	Unspecified.	

5.3.3   Resource structure

5.3.3.1   General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-monitoring-event/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-monitoring-event" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.3.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
Monitoring Event Subscriptions	/{scsAsId}/subscriptions/	GET	Read all subscriptions for a given SCS/AS
		POST	Create a new subscription of monitoring event
Individual Monitoring Event Subscription	/{scsAsId}/subscriptions/{subscriptionId}	PUT	Modify an existing subscription of monitoring event
		GET	Read a subscription of monitoring event
		DELETE	Delete a subscription of monitoring event

5.3.3.2   Resource: Monitoring Event Subscriptions

5.3.3.2.1   Introduction

This resource allows an SCS/AS to read all of the active monitoring event subscriptions or create a new monitoring event subscription for the SCS/AS at the SCEF.

5.3.3.2.2   Resource definition

Resource URI: **{apiRoot}/3gpp-monitoring-event/v1/{scsAsId}/subscriptions/**

This resource shall support the resource URI variables defined in table 5.3.3.2.2-1.

Table 5.3.3.2.2-1: Resource URI variables for resource "Monitoring Event Subscriptions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.3.3.2.3   Resource methods

5.3.3.2.3.1   GET

The GET method allows to read all active subscriptions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.2.3.1-1 and table 5.3.3.2.3.1-2.

Table 5.3.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(MonitoringEventSubscription)	0..N	200 OK	The subscription information for the SCS/AS in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.3.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.3.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.3.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.3.3.2.3.3 PATCH

This HTTP method is not supported for the resource.

5.3.3.2.3.4 POST

The POST method creates a new subscription resource to monitor an event for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message. The SCEF shall construct the URI of the created resource.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.2.3.4-1 and table 5.3.3.2.3.4-2.

Table 5.3.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.2.3.4-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	MonitoringEventSubscription	1		Parameters to register a subscription to notifications about monitoring event with the SCEF.
Response body	Data type	Cardinality	Response codes	Remarks
	MonitoringEventSubscription	1	201 Created	The subscription resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
	MonitoringEventReport	1	200 OK	The operation is successful, and corresponding monitoring event report is included. This is only applicable for the one-time monitoring request if report is available in the response.
	ProblemDetails	0..1	400 Bad Request	The subscription resource is not allowed to be created since the supported feature corresponding to the monitoring event is not supported by the client. (NOTE 4)
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created since one or more of the received parameters are out of the range defined by operator policies. (NOTE 2)
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created since the Idle Status Indication is received in the request but not supported by the network. (NOTE 3)
	ProblemDetails	0..1	500 Internal Server Error	The subscription resource is not allowed to be created since the event is not supported by the server. (NOTE 5)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				
NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "PARAMETER_OUT_OF_RANGE" as defined in subclause 5.3.5.3. In such case, the "invalidParams" attribute may be included within the "ProblemDetails" data structure to indicate which parameters are out of range.				
NOTE 3: The "cause" attribute within the "ProblemDetails" data structure may be set to "IDLE_STATUS_UNSUPPORTED" as defined in subclause 5.3.5.3.				
NOTE 4: The "cause" attribute within the "ProblemDetails" data structure may be set to "EVENT_FEATURE_MISMATCH" as defined in subclause 5.3.5.3.				
NOTE 5: The "cause" attribute within the "ProblemDetails" data structure may be set to "EVENT_UNSUPPORTED" as defined in subclause 5.3.5.3.				

Table 5.3.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-monitoring-event/v1/{scsAsId}/subscriptions/{subscriptionId}

5.3.3.2.3.5 DELETE

This HTTP method is not supported for the resource.

5.3.3.3 Resource: Individual Monitoring Event Subscription

5.3.3.3.1 Introduction

This resource allows an SCS/AS to read, update or delete an active monitoring event subscription at the SCEF.

5.3.3.3.2 Resource definition

Resource URI: **{apiRoot}/3gpp-monitoring-event/v1/{scsAsId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.2.3.2.2-1.

Table 5.3.3.3.2-1: Resource URI variables for resource "Individual Monitoring Event Subscription"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
subscriptionId	string	Identifier of the subscription resource. The subscriptionId corresponds to the stage 2 TLTRI.

5.3.3.3.3 Resource methods

5.3.3.3.3.1 GET

The GET method allows to read an active subscription resource to obtain details of the subscription. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.3.3.1-1 and table 5.3.3.3.3.1-2.

Table 5.3.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	MonitoringEventSubscription	1	200 OK	The subscription information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

Table 5.3.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.3.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.3.3.3.3.2   PUT

The PUT method modifies an existing subscription resource to update the subscription. The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.3.3.2-1 and table 5.3.3.3.3.2-2.

Table 5.3.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.3.3.2-2: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks	
	MonitoringEventSubscription	1	Parameters to update a subscription to notifications about monitoring event with the SCEF.	
Response body	Data type	Cardinality	Response codes	Remarks
	MonitoringEventSubscription	1	200 OK	The subscription was updated successfully.
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be updated since the HTTP method is not supported. (NOTE 2, NOTE 3)
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				
NOTE 2: The error case is only applicable for monitoring event configuration via PCRF.				
NOTE 3: The "cause" attribute within the "ProblemDetails" data structure may be set to "OPERATION_PROHIBITED" as defined in subclause 5.3.5.3.				

Table 5.3.3.3.3.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.3.3.3.3.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.3.3.3.3.3   PATCH

This HTTP method is not supported for the resource.

5.3.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.3.3.3.3.5   DELETE

The DELETE method deletes the related resource and terminates the related monitoring subscription. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.3.3.5-1 and table 5.3.3.3.3.5-2.

Table 5.3.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	none		204 No Content	The subscription was terminated successfully.
	array(MonitoringEventReport)	1..N	200 OK	The subscription was terminated successfully, the monitoring event report(s) shall be included if received.
	none		307 Temporary Redirect	Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.3.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.3.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.3.3.4   Void

5.3.3a   Notifications

5.3.3a.1   General

The notifications provided by the MonitoringEvent API are specified in this clause.

Table 5.3.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Monitoring Notification	{notificationDestination}	POST	Sent from the SCEF to the SCS/AS about the notification of grouping configuration result, detected monitoring event report(s) or notify the SCS/AS to cancel a monitoring subscription

5.3.3a.2 Monitoring Notification

5.3.3a.2.1 Description

The Monitoring Notification allows the SCEF to send notification about grouping configuration result, monitoring event report(s) or a monitoring subscription cancellation to the SCS/AS.

5.3.3a.2.2 Target URI

The Callback URI **"{notificationDestination}"** shall be used with the callback URI variables defined in table 5.3.3a.2.2-1.

Table 5.3.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the SCS/AS during creation or modification of the monitoring event subscription.

5.3.3a.2.3 Standard Methods

5.3.3a.2.3.1 Notification via POST

The HTTP POST method reports the notification for a monitoring subscription. The SCEF shall initiate the HTTP POST request message and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.3.3a.2.3.1-1 and the response data structures and response codes specified in table 5.3.3a.2.3.1-2.

Table 5.3.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
MonitoringNotification	1	The monitoring notification provided by the SCEF.

Table 5.3.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	The monitoring notification is received successfully.
none		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.3.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.3.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.3.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the MonitoringNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.3.4   Used Features

The table below defines the features applicable to the MonitoringEvent API. Those features are negotiated as described in subclause 5.2.7.

Table 5.3.4-1: Features used by MonitoringEvent API

Feature Number	Feature	Description
1	Loss_of_connectivity_notification	The SCS/AS is notified when the 3GPP network detects that the UE is no longer reachable for signalling or user plane communication
2	Ue-reachability_notification	The SCS/AS is notified when the UE becomes reachable for sending either SMS or downlink data to the UE
3	Location_notification	The SCS/AS is notified of the current location or the last known location of the UE
4	Change_of_IMSI_IMEI_association_notification	The SCS/AS is notified when the association of an ME (IMEI(SV)) that uses a specific subscription (IMSI) is changed
5	Roaming_status_notification	The SCS/AS is notified when the UE's roaming status changes
6	Communication_failure_notification	The SCS/AS is notified of communication failure events
7	Availability_after_DDN_failure_notification	The SCS/AS is notified when the UE has become available after a DDN failure
8	Number_of_UEs_in_an_area_notification	The SCS/AS is notified the number of UEs present in a given geographic area The feature supports the pre-5G (e.g. 4G) requirement.
9	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event feature is also supported.
10	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
11	Subscription_modification	Modifications of an individual subscription resource.
12	Number_of_UEs_in_an_area_notification_5G	The AF is notified the number of UEs present in a given geographic area. The feature supports the 5G requirement. This feature may only be supported in 5G.
13	Pdn_connectivity_status	The SCS/AS requests to be notified when the 3GPP network detects that the UE's PDN connection is set up or torn down.
14	Downlink_data_delivery_status_5G	The AF requests to be notified when the 3GPP network detects that the downlink data delivery status is changed. The feature is not applicable to the pre-5G.
15	Availability_after_DDN_failure_notification_enhancement	The AF is notified when the UE has become available after a DDN failure and the traffic matches the packet filter provided by the AF. The feature is not applicable to the pre-5G.
16	Enhanced_param_config	This feature supports the co-existence of multiple event configurations for target UE(s) if there are parameters affecting periodic RAU/TAU timer and/or Active Time. Supporting this feature also requires the support of feature number 1 or 2.
17	API_support_capability_notification	The SCS/AS is notified of the availability of support of service APIs. This feature is only applicable in interworking SCEF+NEF scenario.
18	eLCS	This feature supports the enhanced location exposure service (e.g. location information preciser than cell level).
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.3.5 Error handling

5.3.5.1 General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.3.5.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the MonitoringEvent API.

5.3.5.3 Application Errors

The application errors defined for MonitoringEvent API are listed in table 5.3.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.3.5.3-1.

Table 5.3.5.3-1: Application errors

Application Error	HTTP status code	Description
PARAMETER_OUT_OF_RANGE	403 Forbidden	Indicates that the resource is not allowed to be created since one or more of the received parameter are out of range defined by operator policies.
IDLE_STATUS_UNSUPPORTED	403 Forbidden	Indicates that the resource is not allowed to be created since the Idle Status Indication is received in the request but not supported by the network.
OPERATION_PROHIBITED	403 Forbidden	Indicates the HTTP method is not supported.
EVENT_FEATURE_MISMATCH	400 Bad Request	Indicates the resource creation is not allowed since the supported feature corresponding to the monitoring event is not supported by the client.
EVENT_UNSUPPORTED	500 Internal Server Error	Indicates the required monitoring event is not supported by the server.

5.4 ResourceManagementOfBdt API

5.4.1 Overview

The ResourceManagementOfBdt API is a RESTful API that allows the SCS/AS to request background data transfer related conditions for a set of UEs. The ResourceManagementOfBdt API defines a set of data models, resources and the related procedures for the creation and management of the background data transfer request. The corresponding JSON schema for the representation of the resources and operations defined by the ResourceManagementOfBdt API is provided in its complete form in Annex A.4.

5.4.2 Data model

5.4.2.1 Resource data types

5.4.2.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.4.2.1.1-1 specifies data types re-used by the ResourceManagementOfBdt API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the ResourceManagementOfBdt API.

Table 5.4.2.1.1-1: ResourceManagementOfBdt API re-used Data Types

Data type	Reference	Comments
GeographicArea	3GPP TS 29.572 [42]	Identifies the geographical information of the user(s).
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).
NetworkAreaInfo	3GPP TS 29.554 [50]	Identifies a network area information.
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.4.4-1.

5.4.2.1.2 Type: Bdt

This type represents a BDT subscription. The same structure is used in the subscription request and subscription response.

Table 5.4.2.1.2-1: Definition of type Bdt

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	0..1	Link to the resource "Individual BDT Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
volumePerUE	UsageThreshold	1	Identifies the data volume expected to be transferred per UE.	
numberOfUEs	integer	1	Identifies the number of UEs.	
desiredTimeWindow	TimeWindow	1	Identifies the time interval.	
locationArea	LocationArea	0..1	Identifies the area within which the SCS/AS requests the number of UE.	Bdt
locationArea5G	LocationArea5G	0..1	Identifies the area within which the AF requests the number of UE.	LocBdt_5G
referenceId	BdtReferenceId	0..1	Identifies a selected policy of background data transfer.	
transferPolicies	array(TransferPolicy)	0..N	Identifies an offered transfer policy.	
selectedPolicy	integer	0..1	Identity of the selected background data transfer policy. Shall not be present in initial message exchange, can be provided by NF service consumer in a subsequent message exchange.	
externalGroupId	ExternalGroupId	0..1	Identifies a group of users. (NOTE 2)	Group_Id
notificationDestination	Link	0..1	Contains the URI to receive the BDT notification from the NEF.	BdtNotification_5G
warnNotifEnabled	boolean	0..1	Indicates whether the BDT warning notification is enabled or not. If it is set to true, the BDT warning notification is enabled; if it is set to false or absent, the BDT warning notification is disabled.	BdtNotification_5G
trafficDes	TrafficDescriptor	0..1	Contains the traffic descriptor of the background data. (NOTE 2)	
NOTE 1: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: The attribute is only applicable to the NEF.				

5.4.2.1.3 Type: BdtPatch

This type represents a BDT request for the service provided by the SCS/AS to the SCEF via T8 interface. The structure is used for PATCH request.

Table 5.4.2.1.3-1: Definition of type BdtPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
selectedPolicy	integer	1	Identity of the selected background data transfer policy.	
warnNotifEnabled	boolean	0..1	Indicates whether the BDT warning notification is enabled. - true: the BDT warning notification is enabled; - false: the BDT warning notification is not enabled.	BdtNotificatio n_5G
NOTE: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.4.2.1.4 Type: ExNotification

This type represents a BDT notification provided by the NEF to the AF. The structure is used for POST request.

Table 5.4.2.1.4-1: Definition of type ExNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
bdtRefId	BdtReferenceId	1	This IE indicates transfer policies of background data transfer which the notification corresponds to.	
locationArea5G	LocationArea5G	0..1	This IE represents a network area where a network performance will go below the criteria set by the operator.	
timeWindow	TimeWindow	0..1	This IE indicates a time window when a network performance will go below the criteria set by the operator.	
candPolicies	array(TransferPolicy)	0..N	This IE indicates a list of the candidate transfer policies from which the AF may select a new transfer policy due to network performance degradation.	
NOTE: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.4.2.2 Referenced structured data types

5.4.2.2.1 Introduction

This clause defines structured data types that are referenced from data structures defined in the previous clauses.

5.4.2.2.2 Type: TransferPolicy

This data type represents an offered transfer policy sent from the SCEF to the SCS/AS, or a selected transfer policy sent from the SCS/AS to the SCEF.

Table 5.4.2.2.2-1: Definition of type TransferPolicy

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
bdtPolicyId	integer	1	Identifier for the transfer policy	
maxUplinkBandwidth	Bandwidth	0..1	Indicates the maximum aggregated bitrate in the uplink authorized by the PCRF.	
maxDownlinkBandwidth	Bandwidth	0..1	Indicates the maximum aggregated bitrate in the downlink authorized by the PCRF.	
ratingGroup	integer	1	Indicates the rating group during the time window.	
timeWindow	TimeWindow	1	Indicates the recommended time window of the transfer policy	
NOTE: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.4.2.3 Referenced simple data types and enumerations

5.4.2.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.4.2.3.2 Simple data types

The simple data types defined in table 5.4.2.3.2-1 shall be supported.

Table 5.4.2.3.2-1: Simple data types

Type name	Description
TrafficDescriptor	String identifying a traffic descriptor as defined in table 5.2.1 of 3GPP TS 24.526 [64].

5.4.3 Resource structure

5.4.3.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-bdt/v1/

"apiRoot" is set as described in subclause 5.2.4. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.4.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
BDT Subscription	/{scsAsId}/subscriptions	GET	Read all active background data transfer subscription resources for a given SCS/AS
		POST	Create a new background data transfer subscription resource
Individual BDT Subscription	/{scsAsId}/subscriptions/{subscriptionId}	PATCH	Modify a background data transfer subscription resource to select one of the transfer policies offered by the SCEF
		PUT	Update a background data transfer subscription resource for negotiation of background data transfer policy
		GET	Read a background data transfer subscription resource
		DELETE	Delete a background data transfer resources

5.4.3.2 Resource: BDT Subscriptions

5.4.3.2.1 Introduction

This resource allows the SCS/AS to read all active long-term transactions related to BDT resource management.

5.4.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-bdt/v1/{scsAsId}/subscriptions/**

This resource shall support the resource URI variables defined in table 5.4.3.2.2-1.

Table 5.4.3.2.2-1: Resource URI variables for resource "BDT Subscriptions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.4.3.2.3 Resource methods

5.4.3.2.3.1 GET

The GET method allows to read all active resources for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.4.3.2.3.1-1 and table 5.4.3.2.3.1-2.

Table 5.4.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.4.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body		Data type	Cardinality	**Response codes**	**Remarks**

Response body	Data type	Cardinality	Response codes	Remarks
	array(Bdt)	0..N	200 OK	The resource information for the SCS/AS in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.4.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.4.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.4.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.4.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.4.3.2.3.4   POST

The POST method creates a new background data transfer subscription resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.4.3.2.3.4-1 and table 5.4.3.2.3.4-2.

Table 5.4.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.4.3.2.3.4-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks	
	Bdt	1	Parameters to register a subscription to request background data transfer related information with the SCEF.	
Response body	Data type	Cardinality	Response codes	Remarks
	Bdt	1	201 Created	The resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.4.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-bdt/v1/{scsAsId}/subscriptions/{subscriptionId}

5.4.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.4.3.3   Resource: Individual BDT Subscription

5.4.3.3.1   Introduction

This resource allows the SCS/AS to manage resources for BDT using a long-term transaction.

5.4.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-bdt/v1/{scsAsId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.4.3.3.2-1.

Table 5.4.3.3.2-1: Resource URI variables for resource "Individual BDT Subscription"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
subscriptionId	string	Identifier of the subscription resource. The subscriptionId corresponds to the stage 2 TLTRI.

5.4.3.3.3   Resource methods

5.4.3.3.3.1   GET

The GET method allows to read an individual BDT subscription resource to obtain details of an active resource BDT subscription. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.4.3.3.3.1-1 and table 5.4.3.3.3.1-2.

Table 5.4.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.4.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	Bdt	1	200 OK	The resource information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

Table 5.4.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.4.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.4.3.3.3.2 PUT

The PUT method allows the SCS/AS to modify an existing subscription resource completely. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.4.3.3.3.2-1.

Table 5.4.3.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	Bdt	1		The SCS/AS requests to update the BDT policy subscription.
Response body	Data type	Cardinality	Response codes	Remarks
	Bdt	1	200 OK	The subscription was modified successfully. The SCEF shall return an updated subscription in the response payload body.
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.4.3.3.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.4.3.3.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.4.3.3.3.3 PATCH

The PATCH method allows the SCS/AS to modify an existing subscription resource, in order to notify the SCEF about the selected transfer policy. The SCS/AS shall initiate the HTTP PATCH message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.4.3.3.3.3-1.

Table 5.4.3.3.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	BdtPatch	1		Background data transfer policy selected by the SCS/AS.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	Bdt	1	200 OK	The resource was modified successfully. The SCEF shall return an updated subscription in the response payload body.
	None		204 No Content	The resource was modified successfully.
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.4.3.3.3.3-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.4.3.3.3.3-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.4.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.4.3.3.3.5   DELETE

The DELETE method deletes the resource and terminates the BDT subscription. The SCS/AS shall initiate the HTTP DELETE message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.4.3.3.3.5-1 and table 5.4.3.3.3.5-2.

Table 5.4.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.4.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

<table>
<tr><th>Request body</th><th>Data type</th><th>Cardinality</th><th colspan="2">Remarks</th></tr>
<tr><td></td><td>none</td><td></td><td colspan="2"></td></tr>
<tr><th rowspan="4">Response body</th><th>Data type</th><th>Cardinality</th><th>Response codes</th><th>Remarks</th></tr>
<tr><td>none</td><td></td><td>204 No Content</td><td>The resource was terminated successfully.</td></tr>
<tr><td>none</td><td></td><td>307 Temporary Redirect</td><td>Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF.
Redirection handling is described in subclause 5.2.10.</td></tr>
<tr><td>none</td><td></td><td>308 Permanent Redirect</td><td>Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF.
Redirection handling is described in subclause 5.2.10.</td></tr>
<tr><td colspan="5">NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.</td></tr>
</table>

Table 5.4.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.4.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.4.3.4 Void

5.4.3a Notifications

5.4.3a.1 General

The notifications provided by the ResourceManagementOfBdt API are specified in this clause.

Table 5.4.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
BDT Warning Notification	{notificationDestination}	POST	Notify the BDT warning from the NEF to the AF identified by the notification destination URI (NOTE)
NOTE: This notification may only be supported in 5G.			

5.4.3a.2 BDT Warning Notification

5.4.3a.2.1 Description

The BDT warning notification allows the NEF to notify the AF of the BDT warning notification. The notification may only be supported in 5G.

5.4.3a.2.2 Target URI

The Callback URI **"{notificationDestination}"** shall be used with the callback URI variables defined in table 5.4.3a.2.2-1.

Table 5.4.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Reference provided by the AF when the AF requests to send a BDT warning notification when the network performance in the area of interest goes below the criteria set by the operator. This URI shall be provided within the "notificationDestination" attribute in the Bdt data type.

5.4.3a.2.3 Standard Methods

5.4.3a.2.3.1 Notification via POST

The POST method allows to notify AS identified by the notification destination URI of the BDT warning by the NEF and the AF shall respond to the message.

This method shall support the request data structures specified in table 5.4.3a.2.3.1-1 and the response data structures and response codes specified in table 5.4.3a.2.3.1-2.

Table 5.4.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
ExNotification	1	Representation of the BDT warning notification.

Table 5.4.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	This case represents a successful notification of BDT warning notification.
none		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.4.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.4.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.4.3a.2.3.2　　　　　Notification via Websocket

If supported by both AF and NEF and successfully negotiated, the ExNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.4.4　Used Features

The table below defines the features applicable to the ResourceManagementOfBdt API. Those features are negotiated as described in subclause 5.2.7.

Table 5.4.4-1: Features used by ResourceManagementOfBdt API

Feature Number	Feature	Description
1	Bdt	The feature supports the pre-5G (e.g. 4G) requirement.
2	LocBdt_5G	The feature supports the 5G requirement. This feature may only be supported in 5G.
3	Group_Id	The feature supports forwarding an external group identifier of the user. This feature shall not be supported in pre-5G.
4	BdtNotification_5G	The feature supports the sending of BDT notification. This feature includes sending of the BDT warning notification to the AF. This feature may only be supported in 5G.
Feature:　　A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description:　　A clear textual description of the feature.		

5.5　ChargeableParty API

5.5.1　Overview

The ChargeableParty API is a RESTful API that allows the SCS/AS to either request to sponsor the traffic from the beginning or to request becoming the chargeable party at a later point in time via the T8 interface. The ChargeableParty API defines a set of data models, resources and the related procedures for the creation and management of the AS sessions with chargeable party change. The corresponding JSON schema for the representation of the resources and operations defined by the Chargeable API is provided in its complete form in Annex A.5.

5.5.2　Data model

5.5.2.1　Resource data types

5.5.2.1.1　Introduction

This clause defines data structures to be used in resource representations.

Table 5.5.2.1.1-1 specifies data types re-used by the ChargeableParty API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the ChargeableParty API.

Table 5.5.2.1.1-1: ChargeableParty API re-used Data Types

Data type	Reference	Comments
EthFlowDescription	3GPP TS 29.514 [52]	Defines a packet filter for an Ethernet flow.(NOTE)
MacAddr48	3GPP TS 29.571 [45]	MAC Address.
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.5.4-1.
NOTE: In order to support a set of MAC addresses with a specific range in the traffic filter, feature MacAddressRange_5G as specified in clause 5.5.4 shall be supported.		

5.5.2.1.2 Type: ChargeableParty

This type represents the configuration of a chargeable party. The same structure is used in the configuration request and configuration response.

Table 5.5.2.1.2-1: Definition of type ChargeableParty

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	0..1	Link to the resource "Individual Chargeable Party Transaction". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
notificationDestination	Link	1	Contains the URI to receive the notification of bearer level event(s) from the SCEF.	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
ipv4Addr	Ipv4Addr	0..1	Identifies the Ipv4 address. (NOTE 2)	
ipDomain	string	0..1	The IPv4 address domain identifier. The attribute may only be provided if the ipv4Addr attribute is present.	
ipv6Addr	Ipv6Addr	0..1	Identifies the Ipv6 address. (NOTE 2)	
macAddr	MacAddr48	0..1	Identifies the MAC address. (NOTE 2)	EthChgParty_5G
flowInfo	array(FlowInfo)	0..N	Describes the IP flows. (NOTE 2)	
ethFlowInfo	array(EthFlowDescription)	0..N	Identifies Ethernet packet flows. (NOTE 2)	EthChgParty_5G
sponsorInformation	SponsorInformation	1	Describes the sponsor information such as who is sponsoring the traffic.	
sponsoringEnabled	boolean	1	Indicates whether the sponsoring data connectivity is enabled. - true: the sponsoring data connectivity is enabled; - false: the sponsoring data connectivity is not enabled.	
referenceId	BdtReferenceId	0..1	The reference ID for a previously selected policy of background data transfer.	
usageThreshold	UsageThreshold	0..1	Time period and/or traffic volume.	
NOTE 1: Properties marked with a feature as defined in subclause 5.5.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: One of ipv4, ipv6 or MAC address shall be provided. If ipv4 or ipv6 address is provided, IP flow information shall be provided. If MAC address is provided, Ethernet flow information shall be provided.				

5.5.2.1.3   Type: ChargeablePartyPatch

This type represents the configuration of a chargeable party. The structure is used for PATCH request.

Table 5.5.2.1.3-1: Definition of type ChargeablePartyPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
flowInfo	array(FlowInfo)	0..N	Describes the application flows.	
ethFlowInfo	array(EthFlowDescription)	0..N	Describes Ethernet packet flows.	EthChgParty_5G
sponsoringEnabled	boolean	0..1	Indicates whether the sponsoring data connectivity is enabled. - true: the sponsoring data connectivity is enabled; - false: the sponsoring data connectivity is not enabled.	
referenceId	BdtReferenceId	0..1	The reference ID for a previously selected policy of background data transfer.	
usageThreshold	UsageThresholdRm	0..1	Time period and/or traffic volume.	
NOTE: Properties marked with a feature as defined in subclause 5.5.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.5.3 Resource structure

5.5.3.1 General

All resource URIs of this API should have the following root:

> **{apiRoot}/3gpp-chargeable-party/v1/**

"apiRoot" is set as described in subclause 5.2.4. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
Chargeable Party Transactions	/{scsAsId}/transactions	GET	Read all chargeable party transaction resources for a given SCS/AS
		POST	Create a new chargeable party transaction resource
Individual Chargeable Party Transaction	/{scsAsId}/transactions/{transactionId}	GET	Read a chargeable party transaction resource
		PATCH	Partial update a chargeable party transaction resource.
		DELETE	Delete an existing chargeable party transaction resource

5.5.3.2 Resource: Chargeable Party Transactions

5.5.3.2.1 Introduction

This resource allows the SCS/AS to read all active long-term transactions related to setting a chargeable party and create individual long-term transactions.

5.5.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-chargeable-party/v1/{scsAsId}/transactions/**

This resource shall support the resource URI variables defined in table 5.5.3.2.2-1.

Table 5.5.3.2.2-1: Resource URI variables for resource "Chargeable Party Transactions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.5.3.2.3 Resource methods

5.5.3.2.3.1 GET

The GET method allows to read all active chargeable party transactions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.5.3.2.3.1-1 and table 5.5.3.2.3.1-2.

Table 5.5.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.5.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			

Response body	Data type	Cardinality	Response codes	Remarks
	array(ChargeableParty)	0..N	200 OK	The chargeable party transactions information for the SCS/AS in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.5.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.5.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.5.3.2.3.2 PUT

This HTTP method is not supported for the resource.

5.5.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.5.3.2.3.4   POST

The POST method creates a new chargeable party transaction resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message. The SCEF shall construct the URI of the created resource.

This method shall support request and response data structures, and response codes, as specified in the table 5.5.3.2.3.4-1.

Table 5.5.3.2.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks	
	ChargeableParty	1	Parameters to create a chargeable party transaction with the SCEF.	
Response body	Data type	Cardinality	Response codes	Remarks
	ChargeableParty	1	201 Created	The transaction was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.5.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-chargeable-party/v1/{scsAsId}/transactions/{transactionId}

5.5.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.5.3.3   Resource: Individual Chargeable Party Transaction

5.5.3.3.1   Introduction

This resource allows the SCS/AS to configure a chargeable party for some application flows using a long-term transaction.

5.5.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-chargeable-party/v1/{scsAsId}/transactions/{transactionId}**

This resource shall support the resource URI variables defined in table 5.5.3.3.2-1.

Table 5.5.3.3.2-1: Resource URI variables for resource "Individual Chargeable Party Transaction"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
transactionId	string	Identifier of the transaction. The transactionId corresponds to the stage 2 TLTRI.

5.5.3.3.3   Resource methods

5.5.3.3.3.1   GET

The GET method allows to read a transaction resource to obtain details of an active. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.5.3.3.3.1-1 and table 5.5.3.3.3.1-2.

Table 5.5.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.5.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	ChargeableParty	1	200 OK	The chargeable party transactions information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.5.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.5.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.5.3.3.3.2   PUT

This HTTP method is not supported for the resource.

5.5.3.3.3.3   PATCH

The PATCH method allows to change the sponsoring status of an active chargeable party transaction. It also allows to activate a background data tranfer policy. The SCS/AS shall initiate the HTTP PATCH request message and the SCEF shall respond to the message.This method shall support request and response data structures, and response codes, as specified in the table 5.5.3.3.3.3-1.

Table 5.5.3.3.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	ChargeablePartyPatch	1		Sponsor status change, usage threshold change and/or background data transfer policy activation.
Response body	Data type	Cardinality	Response codes	Remarks
	ChargeableParty	1	200 OK	The chargeable party transaction resource was modified successfully. The SCEF shall return a representation of the updated chargeable party transaction resource in the response payload body.
	none		307 Temporary Redirect	Temporary redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.			

Table 5.5.3.3.3.3-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.5.3.3.3.3-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.5.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.5.3.3.3.5   DELETE

The DELETE method allows to delete an active chargeable party transaction resource and to terminate the related chargeable party transaction. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.5.3.3.3.5-1.

Table 5.5.3.3.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	none		204 No Content	The subscription was deleted successfully.
	NotificationData	1	200 OK	The subscription was deleted successfully. The notification data shall be included in the response.
	none		307 Temporary Redirect	Temporary redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.5.3.3.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.5.3.3.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.5.3.4 Void

5.5.3a Notifications

5.5.3a.1 General

The notifications provided by the ChargeableParty API are specified in this clause.

Table 5.5.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notificationDestination}	POST	Notify the bearer level event(s) from the SCEF to the SCS/AS identified by the notification destination URI

5.5.3a.2 Event Notification

5.5.3a.2.1 Description

The Event Notification allows the SCEF to notify the SCS/AS of the bearer level event(s).

5.5.3a.2.2 Target URI

The Callback URI **"{**notificationDestination**}"** shall be used with the callback URI variables defined in table 5.5.3a.2.2-1.

Table 5.5.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Reference provided by the SCS/AS when the SCS/AS requests to sponsor the traffic from the beginning or to become the chargeable party at a later point. This URI shall be provided within the "notificationDestination" attribute in the ChargeableParty type.

5.5.3a.2.3 Standard Methods

5.5.3a.2.3.1 Notification via POST

The POST method allows to notify SCS/AS identified by the notification destination URI of the bearer level event(s) by the SCEF and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.5.3a.2.3.1-1 and the response data structures and response codes specified in table 5.5.3a.2.3.1-2.

Table 5.5.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
NotificationData	1	Representation of the bearer level notification.

Table 5.5.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	This case represents a successful notification of bearer level event(s).
none		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.5.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.5.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.5.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the NotificationData may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.5.4   Used Features

The table below defines the features applicable to the ChargeableParty API. Those features are negotiated as described in subclause 5.2.7.

Table 5.5.4-1: Features used by ChargeableParty API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event feature is also supported.
2	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
3	EthChgParty_5G	Chargeable Party for Ethernet UE. This feature may only be supported in 5G.
4	MacAddressRange_5G	Indicates the support of a set of MAC addresses with a specific range in the traffic filter. This feature may only be supported in 5G.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".		
Description: A clear textual description of the feature.		

5.6   NIDD API

5.6.1   Overview

The NIDD API is a RESTful API that allows the SCS/AS to send non-IP data to the UE or receive non-IP data from the UE. The NIDD API defines a set of data models, resources and the related procedures for the non-IP data transfer. The corresponding JSON schema for the representation of the resources and operations defined by the NIDD API is provided in its complete form in Annex A.6.

5.6.2   Data model

5.6.2.1   Resource data types

5.6.2.1.1   Introduction

This clause defines data structures to be used in resource representations, including subscription resources.

Table 5.6.2.1.1-1 specifies data types re-used by the NIDD API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the NIDD API.

Table 5.5.2.1.1-1: NIDD API re-used Data Types

Data type	Reference	Comments
NullValue	3GPP TS 29.571 [45]	JSON's null value, used as an explicit value of an enumeration.
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.6.4-1.

5.6.2.1.2   Type: NiddConfiguration

This type represents the configuration for NIDD. The same structure is used in the configuration request and configuration response.

Table 5.6.2.1.2-1: Definition of type NiddConfiguration

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	0..1	Link to the resource "Individual NIDD configuration". This parameter shall be supplied by the SCEF in HTTP responses	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
mtcProviderId	string	0..1	Identifies the MTC Service Provider and/or MTC Application. (NOTE 3)	
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in subclause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.3 of 3GPP TS 23.682 [2]. (NOTE 2)	GroupMessageDelivery
duration	DateTime	0..1	Identifies the absolute time at which the related NIDD Configuration request is considered to expire, as specified in subclause 5.13.2 of 3GPP TS 23.682 [2]. When omitted in the request, it indicates the configuration is requested to be valid forever by the SCS/AS. When omitted in the response, it indicates the configuration is set to valid forever by the SCEF.	
reliableDataService	boolean	0..1	Indicates whether the reliable data service (as defined in subclause 4.5.14.3 of 3GPP TS 23.682 [2]) acknowledgement is requested. - true: reliable data service acknowledgement is requested; - false (default): reliable data service acknowledgement is not requested.	
rdsPorts	array(RdsPort)	0..N	Indicates the static port configuration that is used for reliable data transfer between specific applications using RDS (as defined in subclause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).	
pdnEstablishmentOption	PdnEstablishmentOptions	0..1	Indicate what the SCEF should do if the UE has not established the PDN connection and MT non-IP data needs to be sent. (wait for the UE to establish the PDN connection, respond with an error cause, or send a device trigger; see step 2 of the MT NIDD Procedure in clause 5.13.3 of 3GPP TS 23.682 [2]) The SCEF will use the value as the default preference from the SCS/AS when handling all MT non-IP packets associated with the NIDD connection.	
notificationDestination	Link	1	An URI of a notification destination that T8 message shall be delivered to.	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event

websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
maximumPacketSize	integer	0..1	The Maximum Packet Size is the maximum NIDD packet size that was transferred to the UE by the SCEF in the PCO, see subclause 4.5.14.1 of 3GPP TS 23.682 [2]. If no maximum packet size was provided to the UE by the SCEF, the SCEF sends a default configured max packet size to SCS/AS. Unit: bit.	
niddDownlinkDataTransfers	array(NiddDownlinkDataTransfer)	0..N	The downlink data deliveries that needed to be executed by the SCEF. The cardinality of the property shall be 0..1 in the request and 0..N in the response (i.e. response may contain multiple buffered MT NIDD). For GroupMessageDelivery feature, this property is only applicable for the configuration response to GET request.	
status	NiddStatus	0..1	May be supplied by the SCEF	

NOTE 1: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features unless stated otherwise.
NOTE 2: One of the properties "externalId", "msisdn" or "externalGroupId" shall be included.
NOTE 3: The SCEF should check received MTC provider identifier and then the SCEF may:
    - override it with local configured value and send it to HSS;
    - send it directly to the HSS; or
    - reject the NIDD configuration request.				

5.6.2.1.3 Type: NiddDownlinkDataTransfer

This type represents received NIDD downlink data from the SCS/AS.

Table 5.6.2.1.3-1: Definition of type NiddDownlinkDataTransfer

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in subclause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.3 of 3GPP TS 23.682 [2]. (NOTE 2)	GroupMessageDelivery
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
self	Link	0..1	Link to the resource "Individual NIDD downlink data delivery". This parameter shall be supplied by the SCEF in HTTP responses.	
data	Bytes	1	The non-IP data that needed to be delivered to UE from the SCS/AS.	
reliableDataService	boolean	0..1	Indicates whether the reliable data service (as defined in subclause 4.5.14.3 of 3GPP TS 23.682 [2]) acknowledgement is requested. - true: reliable data service acknowledgement is requested; - false (default): reliable data service acknowledgement is not requested.	
rdsPort	RdsPort	0..1	Indicates the port configuration that is used for reliable data transfer between specific applications using RDS (as defined in subclause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).	
maximumLatency	DurationSec	0..1	It is used to indicate maximum delay acceptable for downlink data and may be used to configure the buffer duration; a Maximum Latency of 0 indicates that buffering is not allowed. If not provided, the SCEF determines the acceptable delay based on local polices.	
priority	integer	0..1	It is used to indicate the priority of the non-IP data packet relative to other non-IP data packets. For GroupMessageDelivery feature, this property is not applicable.	
pdnEstablishmentOption	PdnEstablishmentOptions	0..1	Indicate what the SCEF should do if the UE has not established the PDN connection and MT non-IP data needs to be sent (wait for the UE to establish the PDN connection, respond with an error cause, or send a device trigger; see step 2 of the MT NIDD Procedure in subclause 5.13.3 of 3GPP TS 23.682 [2]) If PDN Connection Establishment Option is not provided with the non-IP packet, the SCEF uses the PDN Connection Establishment Option that was provided during NIDD Configuration to decide how to handle the absence of a PDN connection.	
deliveryStatus	DeliveryStatus	0..1	Indicates the MT NIDD delivery status.	

requestedRetransmissionTime	DateTime	0..1	Identifies the absolute time at which the SCEF is expected to retransmit the non-IP data when the deliveryStatus indicates that the non-IP data is buffered in the SCEF. This parameter may be supplied by the SCEF for delivery status "BUFFERING_TEMPORARILY_NOT_REACHABLE"	
NOTE 1: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features unless stated otherwise.				
NOTE 2: One of the properties "externalId", "msisdn" or "externalGroupId" shall be included.				

5.6.2.1.4   Type: NiddUplinkDataNotification

This type represents NIDD uplink data to be notified to the SCS/AS.

Table 5.6.2.1.4-1: Definition of type NiddUplinkDataNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
niddConfiguration	Link	1	Link to the NIDD configuration resource to which this notification is related.	
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
data	Bytes	1	The non IP data that needed to be delivered from the UE to the SCS/AS.	
reliableDataService	boolean	0..1	Indicates whether the reliable data service acknowledgement is requested. - true: reliable data service acknowledgement is requested; - false: reliable data service acknowledgement is not requested.	
rdsPort	RdsPort	0..1	Indicates the port configuration that is used for reliable data transfer between specific applications using RDS (as defined in clause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).	
NOTE 1: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: One of the properties "externalId" or "msisdn" shall be included.				

5.6.2.1.5   Type: NiddDownlinkDataDeliveryStatusNotification

This type represents the delivery status for a specific NIDD downlink data delivery.

Table 5.6.2.1.5-1: Definition of type NiddDownlinkDataDeliveryStatusNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
niddDownlinkDataTransfer	Link	1	Link to the NIDD downlink data transfer resource to which this notification is related.	
deliveryStatus	DeliveryStatus	1	Indicates the MT NIDD delivery status.	
requestedRetransmissionTime	DateTime	0..1	Identifies the absolute time at which the UE will be reachable. This parameter may be supplied by the SCEF for delivery status "FAILURE_TEMPORARILY_NOT_REACHABLE"	
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.6.2.1.6   Type: NiddConfigurationStatusNotifiation

This type represents an NIDD configuration status notification.

Table 5.6.2.1.6-1: Definition of type NiddConfigurationStatusNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
niddConfiguration	Link	1	Link to the NIDD configuration resource to which this notification is related.	
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
status	NiddStatus	1	Indicates the NIDD configuration status.	
rdsCapIndication	boolean	0..1	It indicates whether the network capability for the reliable data service is enabled or not.	
rdsPort	RdsPort	0..1	Indicates the port configuration that is used for reliable data transfer between specific applications using RDS (as defined in clause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).	Rds_port_verification
NOTE 1: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: One of the properties "externalId" or "msisdn" shall be included.				

5.6.2.1.7   Type: NiddConfigurationPatch

This type represents an NIDD configuration used in PATCH.

Table 5.6.2.1.7-1: Definition of type NiddConfigurationPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
duration	DateTimeRm	0..1	Identifies the absolute time at which the related NIDD Configuration request is considered to expire, as specified in subclause 5.13.2 of 3GPP TS 23.682 [2]. When set to null in the PATCH request, it indicates the configuration is requested to be valid forever by the SCS/AS. When omitted in the response, it indicates the configuration is set to valid forever by the SCEF.	
reliableDataService	boolean	0..1	Indicates whether the reliable data service (as defined in clause 4.5.14.3 of 3GPP TS 23.682 [2]) acknowledgement is requested. - true: reliable data service acknowledgement is requested; - false: reliable data service acknowledgement is not requested.	
rdsPorts	array(RdsPort)	0..N	Indicates the static port configuration that is used for reliable data transfer between specific applications using RDS (as defined in clause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).	
pdnEstablishmentOption	PdnEstablishmentOptionsRm	0..1	Indicate what the SCEF should do if the UE has not established the PDN connection and MT non-IP data needs to be sent. (wait for the UE to establish the PDN connection, respond with an error cause, or send a device trigger; see step 2 of the MT NIDD Procedure in clause 5.13.3 of 3GPP TS 23.682 [2]) The SCEF will use the value as the default preference from the SCS/AS when handling all MT non-IP packets associated with the NIDD connection.	
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.6.2.1.8 Type: GmdNiddDownlinkDataDeliveryNotification

This type represents the delivery status for a specific group NIDD downlink data delivery.

Table 5.6.2.1.8-1: Definition of type GmdNiddDownlinkDataDeliveryNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
niddDownlinkDataTransfer	Link	1	Link to the NIDD downlink data transfer resource to which this notification is related.	
gmdResults	array(GmdResult)	1..N	Indicates the group message delivery result.	GroupMessageDelivery
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.6.2.1.9 Type: ManagePort

This type represents the configuration for RDS dynamic port management which is applicable for Rds_dynamic_port feature.

Table 5.6.2.1.9-1: Definition of type ManagePort

Attribute name	Data type	Cardinality	Description	Applicability
self	Link	0..1	Link to the resource "Individual ManagePort Configuration". This parameter shall be supplied by the SCEF in HTTP PUT/GET responses and in the notification POST request.	
applicationId	string	1	Indicates the application that is associated with port configuration specified above (as defined in subclause 5.4.2.6 of 3GPP TS 24.250 [31]).	
manageEntity	ManageEntity	0..1	Indicates the "Individual ManagePort Configuration" resource is created by which function entity (UE or the AS). This attribute is supplied by the SCEF.	
skipUeInquiry	boolean	0..1	Indicate whether to skip UE inquiry. Set to "true" if the SCS/AS decides to reserve port on the SCEF without confirming with the UE; otherwise set to "false". Default value is "false" if omitted.	

5.6.2.1.10 Type: ManagePortNotification

This type represents a ManagePort notification of port numbers that are reserved.

Table 5.6.2.1.10-1: Definition of type ManagePortNotification

Attribute name	Data type	Cardinality	Description	Applicability
niddConfiguration	Link	1	Link to the NIDD configuration resource to which this notification is related.	
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE)	
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE)	
managedPorts	array(ManagePort)	0..N	Indicates the reserved RDS port configuration information.	
NOTE: One of the properties "externalId" or "msisdn" shall be included.				

5.6.2.2 Referenced structured data types

5.6.2.2.1 Introduction

This clause defines structured data types that are referenced from data structures defined in the previous clauses.

5.6.2.2.2 Type: RdsPort

This type represents the port configuration for Reliable Data Transfer. It shall comply with the provisions defined in table 5.6.2.2.2-1.

Table 5.6.2.2.2-1: Definition of RdsPort data Type

Attribute name	Data type	Cardinality	Description
portUE	Port	1	Indicates the port number on UE that is used for reliable data transfer with a specific application on UE using RDS (as defined in clause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).
portSCEF	Port	1	Indicates the port number on SCEF that is used for reliable data transfer with a specific application on SCEF using RDS (as defined in clause 5.2.4 and 5.2.5 of 3GPP TS 24.250 [31]).

5.6.2.2.3 Type: GmdResult

This type represents the group message delivery result. It shall comply with the provisions defined in table 5.6.2.2.3-1.

Table 5.6.2.2.3-1: Definition of GmdResult data Type

Attribute name	Data type	Cardinality	Description
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in sublause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE)
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE)
deliveryStatus	DeliverySta tus	1	Indicates the MT NIDD delivery status.
requestedRetransm issionTime	DateTime	0..1	Identifies the absolute time at which the UE will be reachable. This parameter may be supplied by the SCEF for delivery status "FAILURE_TEMPORARILY_NOT_REACHABLE"
NOTE: One of the properties "externalId" or "msisdn" shall be included.			

5.6.2.2.4 Type: NiddDownlinkDataDeliveryFailure

This type represents the failure delivery result. It shall comply with the provisions defined in table 5.6.2.2.4-1.

Table 5.6.2.2.4-1: Definition of NiddDownlinkDataDeliveryFailure data Type

Attribute name	Data type	Cardinality	Description
problemDetail	ProblemDet ails	1	Detailed problem as defined in subclause 5.2.1.2.12.
requestedRetransm issionTime	DateTime	0..1	Identifies the absolute time at which the UE will be reachable. This parameter may be supplied by the SCEF for error indicating "TEMPORARILY_NOT_REACHABLE"

5.6.2.2.5 Type: RdsDownlinkDataDeliveryFailure

This type represents the failure delivery result for RDS. It shall comply with the provisions defined in table 5.6.2.2.5-1.

Table 5.6.2.2.5-1: Definition of RdsDownlinkDataDeliveryFailure data Type

Attribute name	Data type	Cardinality	Description
requestedRetransm issionTime	DateTime	0..1	Identifies the absolute time at which the UE will be reachable. This parameter may be supplied by the SCEF for error indicating "TEMPORARILY_NOT_REACHABLE"
NOTE: This data type also contains all the properties defined for ProblemDetails data type in subclause 5.2.1.2.12.			

5.6.2.3 Referenced simple data types and enumerations

5.6.2.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.6.2.3.2 Simple data types

The simple data types defined in table 5.6.2.3.2-1 shall be supported.

Table 5.6.2.3.2-1: Simple data types

Type name	Description

5.6.2.3.3 Enumeration: PdnEstablishmentOptions

The enumeration PdnEstablishmentOptions represents PDN establishment options that describe the network behaviour when there is no PDN connection towards the addressed UE.

Table 5.6.2.3.3-1: Enumeration PdnEstablishmentOptions

Enumeration value	Description	Applicability (NOTE)
WAIT_FOR_UE	wait for the UE to establish the PDN connection	
INDICATE_ERROR	respond with an error cause	
SEND_TRIGGER	send a device trigger	
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.		

5.6.2.3.4 Enumeration: DeliveryStatus

The enumeration DeliveryStatus represents the status of a downlink NIDD data delivery resource.

Table 5.6.2.3.4-1: Enumeration DeliveryStatus

Enumeration value	Description	Applicability (NOTE)
SUCCESS	Success but details not provided	
SUCCESS_NEXT_HOP_ACKNOWLE DGED	Successful delivery to the next hop with acknowledgment.	
SUCCESS_NEXT_HOP_UNACKNOW LEDGED	Successful delivery to the next hop without acknowledgment	
SUCCESS_ACKNOWLEDGED	Reliable delivery was acknowledged by the UE	
SUCCESS_UNACKNOWLEDGED	Reliable delivery was not acknowledged by the UE	
TRIGGERED	The SCEF triggered the device and is buffering the data.	
BUFFERING	The SCEF is buffering the data due to no PDN connection established.	
BUFFERING_TEMPORARILY_NOT_ REACHABLE	The SCEF has been informed that the UE is temporarily not reachable but is buffering the data	
SENDING	The SCEF has forwarded the data, but they may be stored elsewhere.	
FAILURE	Delivery failure but details not provided	
FAILURE_RDS_DISABLED	RDS was disabled.	
FAILURE_NEXT_HOP	Unsuccessful delivery to the next hop.	
FAILURE_TIMEOUT	Unsuccessful delivery due to timeout.	
FAILURE_TEMPORARILY_NOT_REA CHABLE	The SCEF has been informed that the UE is temporarily not reachable without buffering the data.	
NOTE:	Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.	

5.6.2.3.5 Enumeration: NiddStatus

The enumeration NiddStatus represents the status of a NIDD configuration.

Table 5.6.2.3.5-1: Enumeration NiddStatus

Enumeration value	Description	Applicability (NOTE)
ACTIVE	The NIDD configuration is active.	
TERMINATED_UE_NOT_ AUTHORIZED	The NIDD configuration was terminated because the UE´s authorisation was revoked.	
TERMINATED	The NIDD configuration was terminated.	
RDS_PORT_UNKNOWN	The RDS port is unknown.	Rds_port_verificatio n
NOTE:	Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.	

5.6.2.3.6 Enumeration: PdnEstablishmentOptionsRm

The enumeration PdnEstablishmentOptionsRm represents PDN establishment options that describe the network behaviour when there is no PDN connection towards the addressed UE. It is defined in subclause 5.6.2.3.3 but also allows null value (specified as "NullValue" data type) so it can be removed in "JSON Merge Patch", as defined in IETF RFC 7396 [39].

Table 5.6.2.3.6-1: Enumeration PdnEstablishmentOptionsRm

Enumeration value	Description	Applicability (NOTE)
WAIT_FOR_UE	wait for the UE to establish the PDN connection	
INDICATE_ERROR	respond with an error cause	
SEND_TRIGGER	send a device trigger	
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.6.2.3.7   Enumeration: ManageEntity

The enumeration ManageEntity represents the origin that manages the RDS port.

Table 5.6.2.3.7-1: Enumeration ManageEntity

Enumeration value	Description	Applicability
UE	Representing the UE.	
AS	Representing the Application Server	

5.6.3   Resource structure

5.6.3.1   General

All resource URIs of this API should have the following root:

    {apiRoot}/3gpp-nidd/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-nidd" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.6.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
NIDD configurations	/{scsAsId}/configurations	GET	SCS/AS	Read all NIDD configuration resources for a given SCS/AS
		POST	SCS/AS	Create a new NIDD configuration resource.
Individual NIDD configuration	/{scsAsId}/configurations/{configurationId}	PATCH	SCS/AS	Modify an existing NIDD configuration resource
		GET	SCS/AS	Read an NIDD configuration resource
		DELETE	SCS/AS	Delete an existing NIDD configuration resource
NIDD downlink data deliveries	/{scsAsId}/configurations/{configurationId}/downlink-data-deliveries	GET	SCS/AS	Read all pending NIDD downlink data delivery resources related to a particular NIDD configuration resource.
		POST	SCS/AS	Create an NIDD downlink data delivery resource related to a particular NIDD configuration resource.
Individual NIDD downlink data delivery	/{scsAsId}/configurations/{configurationId}/downlink-data-deliveries/{downlinkDataDeliveryId}	PUT	SCS/AS	Replace an NIDD downlink data delivery resource.
		DELETE	SCS/AS	Delete an NIDD downlink data delivery resource.
		GET	SCS/AS	Read pending NIDD downlink data delivery resource
ManagePort Configurations	/{scsAsId}/configurations/{configurationId}/rds-ports	GET	SCS/AS	Read all RDS ManagePort Configurations.
Individual ManagePort Configuration	/{scsAsId}/configurations/{configurationId}/rds-ports/{portId}	PUT	SCS/AS	Create a new Individual ManagePort Configuration resource to reserve port numbers
		DELETE	SCS/AS	Delete an Individual ManagePort Configuration resource to release port numbers
		GET	SCS/AS	Read an Individual ManagePort Configuration resource resource to query port numbers

5.6.3.2 Resource: NIDD Configurations

5.6.3.2.1 Introduction

This resource allows the SCS/AS to create an NIDD configuration at the SCEF, and read all NIDD configurations in the SCEF.

5.6.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/**

This resource shall support the resource URI variables defined in table 5.6.3.2.2-1.

Table 5.6.3.2.2-1: Resource URI variables for resource "NIDD Configurations"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.6.3.2.3 Resource methods

5.6.3.2.3.1 GET

The GET method allows to read all active NIDD configurations for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.2.3.1-1 and table 5.6.3.2.3.1-2.

Table 5.6.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			

	Data type	Cardinality	Response codes	Remarks
Response body	array(NiddConfiguration)	0..N	200 OK	The configuration information for the SCS/AS in the request URI are returned.
	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.6.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.6.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.6.3.2.3.4   POST

To create a NIDD configuration, the SCS/AS shall use the HTTP POST method on the "configurations" collection resource as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.2-1.

The possible response messages from the SCEF, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.2.3.4-1.

Table 5.6.3.2.3.4-1: Data structures supported by the POST request/response by the resource

	Data type	Cardinality		Remarks
Request body	NiddConfiguration	1		Parameters to create and authorize a NIDD configuration with the SCEF.
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	NiddConfiguration	1	201 Created	The NIDD configuration was created successfully. The SCEF shall return a data structure of type "NiddConfiguration" in the response payload body. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.6.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}

5.6.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.6.3.3   Resource: Individual NIDD Configuration

5.6.3.3.1   Introduction

This resource allows the SCS/AS to query/update/cancel the specific NIDD configuration at the SCEF.

5.6.3.3.2 Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}**

This resource shall support the resource URI variables defined in table 5.6.3.3.2-1.

Table 5.6.3.3.2-1: Resource URI variables for resource "Individual NIDD Configuration"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration. The configurationId corresponds to the stage 2 TLTRI.

5.6.3.3.3 Resource methods

5.6.3.3.3.1 GET

The GET method allows to read a NIDD configuration resource to obtain details of an active configuration. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.3.3.1-1 and table 5.6.3.3.3.1-2.

Table 5.6.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	None			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	NiddConfiguration	1	200 OK	The configuration information related to the request URI is returned.
	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.6.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.3.3.2   PUT

This HTTP method is not supported for the resource.

5.6.3.3.3.3   PATCH

Assuming that a NIDD configuration has been created using the HTTP POST method described in subclause 5.6.3.2.3.4, partial updating of its properties can be performed by the SCS/AS by using the HTTP PATCH method on the "configuration" instance resource as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.2-1

The possible response messages from the SCEF, depending on whether the PATCH request is successful or unsuccessful, are shown in Table 5.6.3.3.3.3-1.

Table 5.6.3.3.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	NiddConfigurationPatch	1		Parameters to update a NIDD configuration with the SCEF.
Response body	Data type	Cardinality	Response codes	Remarks
	NiddConfiguration	1	200 OK	The NIDD configuration was modified successfully. The SCEF shall return an updated data structure of type "NiddConfiguration" in the response payload body.
	None		204 No Content	The NIDD configuration has been modified successfully and no content is to be sent in the response message body.
	None		307 Temporary Redirect	Temporary redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

Table 5.6.3.3.3.3-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.3.3.3-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.3.3.4 POST

This HTTP method is not supported for the resource.

5.6.3.3.3.5 DELETE

To cancel a NIDD configuration, the SCS/AS shall use the HTTP DELETE method on the individual "NIDD configuration" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.6.3.3.3.5-1.

Table 5.6.3.3.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none		.	
Response body		Data type	Cardinality	Response codes	Remarks
	NiddConfiguration	1	200 OK	The NIDD configuration was cancelled successfully. The SCEF shall return a full representation of the deleted resource including a data structure of type "NiddConfiguration" with a "TERMINATE" status in the response body.
	None		204 No Content	The NIDD configuration was cancelled successfully. The response body shall be empty.
	None		307 Temporary Redirect	Temporary redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.6.3.3.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.3.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.4 Resource: NIDD downlink data deliveries

5.6.3.4.1 Introduction

This resource allows the SCS/AS to read all pending NIDD downlink data delivery resources for a particular NIDD configuration resource.

This resource also allows the SCS/AS to create an NIDD downlink data delivery.

This resource is applicable for a single UE and a group of UEs NIDD MT delivery.

5.6.3.4.2 Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}/downlink-data-deliveries**

This resource shall support the resource URI variables defined in table 5.6.3.4.2-1.

Table 5.6.3.4.2-1: Resource URI variables for resource "NIDD Downlink Data Deliveries"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration.

5.6.3.4.3 Resource methods

5.6.3.4.3.1 GET

The GET method allows to read all pending NIDD downlink data deliveries for a given SCS/AS and NIDD configuration. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.4.3.1-1 and table 5.6.3.4.3.1-2.

Table 5.6.3.4.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.4.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks	
	None				
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**	
	array(NiddDownlinkData Transfer)	0..N	200 OK	All pending NIDD downlink data deliveries for the SCS/AS and NIDD configuration in the request URI are returned.	
	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
	None		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

Table 5.6.3.4.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.4.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.4.3.2   PUT

This HTTP method is not supported for the resource.

5.6.3.4.3.3   PATCH

This HTTP method is not supported for the resource.

5.6.3.4.3.4   POST

To deliver the downlink non-IP data, the SCS/AS shall use the HTTP POST method on the "NIDD downlink data deliveries" resource with the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.3-1.

The possible response messages from the SCEF, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.4.3.4-1.

Table 5.6.3.4.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	NiddDownlinkDataTransfer	1		The parameters and non-IP data for the MT delivery.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	NiddDownlinkDataTransfer	1	200 OK	The NIDD downlink data delivery was successful. The SCEF shall return a data structure of type "NiddDownlinkDataTransfer" in the response payload body.
	NiddDownlinkDataTransfer	1	201 Created	The NIDD downlink data delivery request was accepted by the SCEF, the NIDD will be performed later. The SCEF shall return a data structure of type "NiddDownlinkDataTransfer" in the response payload body, and shall return the URI of the resource representing the downlink data transfer in the "Location" header.
	None		307 Temporary Redirect	Temporary redirection, during NIDD downlink data delivery. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during NIDD downlink data delivery. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	NiddDownlinkDataDeliveryFailure	0..1	500 Internal Server Error	The NIDD downlink data delivery request was not successful, the "cause" attribute in "ProblemDetails" data type may include value defined in subclause 5.6.5.3.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.6.3.4.3.4-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.4.3.4-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.4.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}/downlink-data-deliveries/{downlinkDataDeliveryId}

5.6.3.4.3.5   DELETE

This HTTP method is not supported for the resource.

5.6.3.5   Resource: Individual NIDD downlink data delivery

5.6.3.5.1   Introduction

For NIDD MT delivery for a single UE, this resource allows the SCS/AS to read a pending NIDD downlink delivery resource, or to replace or cancel an NIDD downlink data delivery resource related to an NIDD configuration resource.

For NIDD MT delivery for a group of UEs, this resource allows the SCS/AS to read a pending NIDD downlink delivery resource related to a NIDD configuration resource.

5.6.3.5.2   Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}/downlink-data-deliveries/{downlinkDataDeliveryId}**

This resource shall support the resource URI variables defined in table 5.6.3.5.2-1.

Table 5.6.3.4.2-1: Resource URI variables for resource "Individual NIDD Downlink Data Delivery"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration.
downlinkDataDeliveryId	string	Identifier of the downlink data delivery.

5.6.3.5.3   Resource methods

5.6.3.5.3.1   GET

The GET method allows to read a NIDD downlink data delivery resource to obtain details. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.5.3.1-1 and table 5.6.3.5.3.1-2.

Table 5.6.3.5.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.5.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	NiddDownlinkDataTransfer	1	200 OK	Individual NIDD downlink data delivery resource is returned.
	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.6.3.5.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.5.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.5.3.2   PUT

To replace the buffered downlink non-IP data, the SCS/AS shall use the HTTP PUT method on the"Individual NIDD downlink data delivery" resource with the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.3-1.

The possible response messages from the SCEF, depending on whether the PUT request is successful or unsuccessful, are shown in Table 5.6.3.5.3.2-1.

Table 5.6.3.5.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	NiddDownlinkDataTransfer	1		The parameters and non-IP data for the MT delivery.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	NiddDownlinkDataTransfer	1	200 OK	The NIDD downlink data delivery was accepted by the SCEF, the NIDD will be performed later. The SCEF shall return a data structure of type "NiddDownlinkDataTransfer" in the response payload body.
	ProblemDetails	0..1	403 Forbidden	The resource is not allowed to be updated since the HTTP PUT method is not supported. (NOTE 2)
	ProblemDetails	0..1	404 Not Found	The buffered data is not allowed to be replaced since data delivery has already been delivered. (NOTE 3)
	ProblemDetails	0..1	409 Conflict	The buffered data is not allowed to be replaced since data delivery is ongoing sent. (NOTE 4)
	NiddDownlinkDataDeliveryFailure	0..1	500 Internal Server Error	The NIDD downlink data replacement request was not successful, the "cause" attribute in "ProblemDetails" data type may include value defined in subclause 5.6.5.3.
	None		307 Temporary Redirect	Temporary redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply. NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "OPERATION_PROHIBITED" as defined in subclause 5.6.5.3. NOTE 3: The "cause" attribute within the "ProblemDetails" data structure may be set to "ALREADY_DELIVERED" as defined in subclause 5.6.5.3. NOTE 4: The "cause" attribute within the "ProblemDetails" data structure may be set to "SENDING" as defined in subclause 5.6.5.3.				

Table 5.6.3.5.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.5.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.5.3.3 PATCH

This HTTP method is not supported for the resource.

5.6.3.5.3.4 POST

This HTTP method is not supported for the resource.

5.6.3.5.3.5 DELETE

To cancel a NIDD downlink data delivery, the SCS/AS shall use the HTTP DELETE method on the "Individual NIDD downlink data delivery" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in table 5.6.3.3.3.5-1.

Table 5.6.3.5.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			.
	Data type	**Cardinality**	**Response codes**	**Remarks**
	none		204 No Content	The NIDD downlink data delivery was cancelled successfully. The response body shall be empty.
	ProblemDetails	0..1	403 Forbidden	The resource is not allowed to be deleted since the HTTP DELETE method is not supported. (NOTE 2)
	ProblemDetails	0..1	404 Not Found	The buffered data is not allowed to be deleted since data delivery has already been delivered. (NOTE 3)
	ProblemDetails	0..1	409 Conflict	The buffered data is not allowed to be deleted since data delivery is ongoing sent. (NOTE 4)
Response body	NiddDownlinkDataDeliveryFailure	0..1	500 Internal Server Error	The NIDD downlink data cancellation request was not successful, the "cause" attribute in "ProblemDetails" data type may include value defined in subclause 5.6.5.3.
	None		307 Temporary Redirect	Temporary redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply. NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "OPERATION_PROHIBITED" as defined in subclause 5.6.5.3. NOTE 3: The "cause" attribute within the "ProblemDetails" data structure may be set to "ALREADY_DELIVERED" as defined in subclause 5.6.5.3. NOTE 4: The "cause" attribute within the "ProblemDetails" data structure may be set to "SENDING" as defined in subclause 5.6.5.3.				

Table 5.6.3.5.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.5.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.6   Void

5.6.3.7   Void

5.6.3.8   Void

5.6.3.9   Resource: Individual ManagePort Configuration

5.6.3.9.1   Introduction

This resource allows the SCS/AS to create, delete or read the specific ManagePort configuration at the SCEF.

5.6.3.9.2   Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}/rds-ports/{portId}**

This resource shall support the resource URI variables defined in table 5.6.3.9.2-1.

Table 5.6.3.9.2-1: Resource URI variables for resource "Individual ManagePort Configuration"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration. The configurationId corresponds to the stage 2 TLTRI.
portId	string	UE port identifier including both UE port number and exposure function port number. Pattern: "^(ue([0-9]|(1[0-5]))-ef([0-9]|(1[0-5])))$".

5.6.3.9.3   Resource methods

5.6.3.9.3.1   GET

The GET method allows to read a ManagePort configuration resource to query the ports reserved. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.9.3.1-1 and table 5.6.3.9.3.1-2.

Table 5.6.3.9.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.9.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	None			
Response body		Data type	Cardinality	Response codes	Remarks
	ManagePort	1	200 OK	The configuration information related to the request URI is returned.
	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanen t Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

Table 5.6.3.9.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.9.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.9.3.2   PUT

To create a ManagePort configuration and reserve a port number, the SCS/AS shall use the HTTP PUT method on the"ManagePort" resource with the body of the message is encoded in JSON format with the data structure defined in table 5.6.3.9.3.2-1.

The possible response messages from the SCEF, depending on whether the PUT request is successful or unsuccessful, are shown in Table 5.6.3.9.3.2-1.

Table 5.6.3.9.3.2-1: Data structures supported by the PUT request/response by the resource

<table>
<tr><td rowspan="2">**Request body**</td><td>**Data type**</td><td>**Cardinality**</td><td colspan="2">**Remarks**</td></tr>
<tr><td>ManagePort</td><td>1</td><td colspan="2">The ManagePort configuration to be created which represents the information used for reserving the port configuration for an application.</td></tr>
<tr><td rowspan="5">**Response body**</td><td>**Data type**</td><td>**Cardinality**</td><td>**Response codes**</td><td>**Remarks**</td></tr>
<tr><td>ManagePort</td><td>1</td><td>201 Created</td><td>This indicates the reservation of port configuration for specified application is successful.</td></tr>
<tr><td>None</td><td></td><td>202 Accepted</td><td>This indicates the request for reservation of port configuration for specified application is accepted and under processing.</td></tr>
<tr><td>ProblemDetails</td><td>0..1</td><td>403 Forbidden</td><td>The cause value shall be set to "PORT_NOT_FREE" in the "cause" attribute of the "ProblemDetails" structure.</td></tr>
<tr><td>RdsDownlinkDataDeliveryFailure</td><td>0..1</td><td>500 Internal Server Error</td><td>The request was not successful, the "cause" attribute in "ProblemDetails" data type may include value defined in subclause 5.6.5.3.</td></tr>
<tr><td colspan="5">NOTE 1:   The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.</td></tr>
</table>

5.6.3.9.3.3   PATCH

This HTTP method is not supported for the resource.

5.6.3.9.3.4   POST

This HTTP method is not supported for the resource.

5.6.3.9.3.5   DELETE

To cancel a ManagePort configuration and release port numbers, the SCS/AS shall use the HTTP DELETE method on the ManagePort resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.6.3.9.3.5-1.

Table 5.6.3.9.3.5-1.: Data structures supported by the DELETE request/response by the resource

	Data type	Cardinality		Remarks
Request body	ManagePort	1		The ManagePort configuration to be cancelled which represents the information used for releasing the port configuration for an application
Response body	Data type	Cardinality	Response codes	Remarks
	None		204 No Content	The ManagePort configuration was cancelled successfully and the port configuration was released.
	None		202 Accepted	This indicates the request for cancellation of port configuration for specified application is accepted and under processing.
	ProblemDetails	0..1	404 Not Found	The cause value shall be set to "PORT_NOT_ASSO_WITH_APP" in the "cause" attribute of the "ProblemDetails" structure.
	RdsDownlinkDataDeliveryFailure	0..1	500 Internal Server Error	The request was not successful, the "cause" attribute in "ProblemDetails" data type may include value defined in subclause 5.6.5.3.
	None		307 Temporary Redirect	Temporary redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.6.3.9.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.9.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.10 Void

5.6.3.11 Resource: ManagePort Configurations

5.6.3.11.1 Introduction

This resource allows the SCS/AS to read all ManagePort configurations for a given NIDD configuration at the SCEF.

5.6.3.11.2 Resource definition

Resource URI: **{apiRoot}/3gpp-nidd/v1/{scsAsId}/configurations/{configurationId}/rds-ports**

This resource shall support the resource URI variables defined in table 5.6.3.11.2-1.

Table 5.6.3.11.2-1: Resource URI variables for resource "ManagePort Configurations"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration of type string. The configurationId corresponds to the stage 2 TLTRI.

5.6.3.11.3　　　　　Resource methods

5.6.3.11.3.1　　　　　GET

The GET method allows to read all ManagePort configurations on the SCEF. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.6.3.11.3.1-1 and table 5.6.3.11.3.1-2.

Table 5.6.3.11.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.6.3.11.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	None			

	Data type	Cardinality	Response codes	Remarks
	array(ManagePort)	0..N	200 OK	All RDS dynamic port configuration information related to the request URI are returned.
Response body	None		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	None		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:　　The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.6.3.11.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.6.3.11.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.6.3.11.3.2   PUT

This HTTP method is not supported for the resource.

5.6.3.11.3.3   PATCH

This HTTP method is not supported for the resource.

5.6.3.11.3.4   POST

This HTTP method is not supported for the resource.

5.6.3.11.3.5   DELETE

This HTTP method is not supported for the resource.

5.6.3a   Notifications

5.6.3a.1   General

The notifications provided by the NIDD API are specified in this clause.

Table 5.6.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
NIDD Configuration Update Notification	{notification_uri}	POST	Send notifications about the status of an NIDD configuration to the SCS/AS.
NIDD Downlink Data Delivery Status Notification	{notification_uri}	POST	Report a specific NIDD downlink data delivery result to the SCS/AS.
NIDD Uplink Data Notification	{notification_uri}	POST	Send an uplink non-IP data notification from the SCEF to the SCS/AS.
ManagePort Notification	{notification_uri}	POST	Send notifications about the port numbers that are reserved.

5.6.3a.2   NIDD Configuration Update Notification

5.6.3a.2.1   Description

The NIDD Configuration Update Notification allows the SCEF to send notifications about the status of an NIDD configuration to the SCS/AS.

5.6.3a.2.2   Target URI

The Callback URI **"{notification_uri}"** shall be used with the callback URI variables defined in table 5.6.3a.2.2-1.

Table 5.6.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination where T8 notification requests shall be delivered. This URI shall be provided within the "notificationDestination" attribute in the NiddConfiguration type.

5.6.3a.2.3 Standard Methods

5.6.3a.2.3.1 Notification via POST

To report the status of the NIDD configuration to the SCS/AS, the SCEF shall use the HTTP POST method on the notification point as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.6-1.

This method shall support the request data structures specified in table 5.6.3a.2.3.1-1 and the response data structures and response codes specified in table 5.6.3a.2.3.1-2.

Table 5.6.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
NiddConfigurationStatusNotification	1	The NIDD configuration status notification.

Table 5.6.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification with a body.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
None		307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
None		308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.6.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.6.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.6.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the NiddConfigurationStatusNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.6.3a.3   NIDD Downlink Data Delivery Status Notification

5.6.3a.3.1   Description

The NIDD Downlink Data Delivery Status Notification allows the SCEF to send notifications about the status of downlink NIDD data delivery to the SCS/AS. This resource is applicable for a single UE and a group of UEs NIDD MT delivery.

5.6.3a.3.2   Target URI

The Callback URI **"{notification_uri}"** shall be used with the callback URI variables defined in table 5.6.3a.3.2-1.

Table 5.6.3a.3.2-1: Callback URI variables

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination URI where T8 notification requests shall be delivered. This URI shall be provided within the "notificationDestination" attribute in the NiddConfiguration type.

5.6.3a.3.3   Standard Methods

5.6.3a.3.3.1   Notification via POST

To report the delivery status of the downlink non-IP data delivery, the SCEF shall use the HTTP POST method on the notification endpoint with the body of the message encoded in JSON format with the data structure defined in table 5.6.2.1.5-1 for a single UE or table 5.6.2.1.8-1 for a group of UEs.

This method shall support the request and response data structures specified in table 5.6.3a.3.3.1-1 and table 5.6.3a.3.3.1-2 for a single UE, and support the request and response data structures specified in table 5.6.3a.3.3.1-3 and table 5.6.3a.3.3.1-4 for a group of UEs.

Table 5.6.3a.3.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
NiddDownlinkDataDeliveryStatusNotification	1	The Down link data delivery status notification for a single UE.

Table 5.6.3a.3.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
None		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
None		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.6.3a.3.3.1-3: Data structures supported by the POST Request Body

Data type	Cardinality	Description
GmdNiddDownlinkDataDeliveryStatusNotification	1	The Down link data delivery status notification for a group of UEs.

Table 5.6.3a.3.3.1-4: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
None		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
None		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.6.3a.3.3.1-5: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.6.3a.3.3.1-6: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.6.3a.3.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the NiddDownlinkDataDeliveryStatusNotification or GmdNiddDownlinkDataDeliveryStatusNotification may alternatively be delivered for a single UE or a group of UEs through the Websocket mechanism as defined in subclause 5.2.5.4.

5.6.3a.4   NIDD Uplink Data Notification

5.6.3a.4.1   Description

The NIDD Uplink Data Notification allows the SCEF to send notifications about received NIDD uplink data..

5.6.3a.4.2   Target URI

The Callback URI **"{notification_uri}"** shall be used with the callback URI variables defined in table 5.6.3a.4.2-1.

Table 5.6.3a.4.2-1: Callback URI variables

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination URI where T8 notification requests shall be delivered. This URI shall be provided within the "notificationDestination" attribute in the NiddConfiguration type.

5.6.3a.4.3   Standard Methods

5.6.3a.4.3.1   Notification via POST

To send the uplink non-IP data to the SCS/AS, the SCEF shall use the HTTP POST method on the notification endpoint in SCS/AS as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.4-1.

This method shall support the request data structures specified in table 5.6.3a.4.3.1-1 and the response data structures and response codes specified in table 5.6.3a.4.3.1-2.

Table 5.6.3a.4.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
NiddUplinkDataNotification	1	The parameters and non-IP data for the NIDD uplink non-IP data notification.

Table 5.6.3a.4.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the uplink data notification
(None)		204 No Content	The successful acknowledgement of the notification without a body.
None		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
None		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.6.3a.4.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.6.3a.4.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.6.3a.4.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the NiddUplinkDataNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.6.3a.5 ManagePort Notification

5.6.3a.5.1 Description

The ManagePort Notification allows the SCEF to send notifications about the port numbers that are reserved.

5.6.3a.5.2 Target URI

The Callback URI "**{notification_uri}**" shall be used with the callback URI variables defined in table 5.6.3a.5.2-1.

Table 5.6.3a.5.2-1: Callback URI variables

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination URI where T8 notification requests shall be delivered. This URI shall be provided within the "notificationDestination" attribute in the NiddConfiguration type.

5.6.3a.5.3 Standard Methods

5.6.3a.5.3.1 Notification via POST

To send the information about reserved ports and their configuration to the SCS/AS, the SCEF shall use the HTTP POST method on the notification endpoint in SCS/AS as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.6.2.1.10-1.

This method shall support the request data structures specified in table 5.6.3a.5.3.1-1 and the response data structures and response codes specified in table 5.6.3a.5.3.1-2.

Table 5.6.3a.5.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
ManagePortNotification	1	The parameters that represents the information about port numbers that are reserved for use with an application.

Table 5.6.3a.5.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful notification of reserved port configuration.
(None)		204 No Content	The successful acknowledgement of the reserved port configuration without a body.
None		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
None		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.6.3a.5.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.6.3a.5.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.6.3a.5.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the ManagePortNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.6.4   Used Features

The table below defines the features applicable to the NIDD API. Those features are negotiated as described in subclause 5.2.7.

Table 5.6.4-1: Features used by NIDD API

Feature Number	Feature	Description
1	GroupMessageDelivery	This feature indicates the support of group message delivery via MT NIDD as defined in subclause 5.5.3 of 3GPP TS 23.682 [2].
2	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
3	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
4	MT_NIDD_modification_cancellation	Modification and cancellation of an individual MT NIDD resource.
5	Rds_port_verification	This feature indicates the support of RDS port verification in the MO/MT NIDD delivery.
6	Rds_dynamic_port	This feature indicates the support of RDS dynamic port management.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.6.5   Error handling

5.6.5.1   General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.6.5.2   Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the NIDD API.

5.6.5.3   Application Errors

The application errors defined for the NIDD API are listed in table 5.6.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.6.5.3-1.

Table 5.6.5.3-1: Application errors

Application Error	HTTP status code	Description	Applicability
QUOTA_EXCEEDED	403 Forbidden	Not enough quota for the MT NIDD	
DATA_TOO_LARGE	403 Forbidden	The non-IP data size is larger than "maximumPacketSize" of the NIDD configuration.	
RDS_PORT_UNKNOWN	403 Forbidden	The SCEF does not know the RDS port numbers in the MT NIDD, such port numbers does not match with the configured port numbers.	Rds_port_verif ication
OPERATION_PROHIBITED	403 Forbidden	Indicates the operation is prohibitted.	
PORT_NOT_FREE	403 Forbidden	Port is not free as it is already associated with an application	Rds_dynamic _port
ALREADY_DELIVERED	404 Not Found	The SCEF has already delivered the buffered data.	
PORT_NOT_ASSOC_WITH_AP P	404 Not Found	Port is free and is not associated with any application.	Rds_dynamic _port
SENDING	409 Conflict	The SCEF is already in sending the buffered non-IP data.	
TRIGGERED	500 Internal Server Error	The SCEF triggered the device but did not buffer the data. The SCS AS may resubmit the data	
TEMPORARILY_NOT_REACHA BLE	500 Internal Server Error	The SCEF has aborted the delivery because the UE is temporarily not reachable. The SCEF may in addition indicate a requested re-submission time for the data.	
NEXT_HOP	500 Internal Server Error	Unsuccessful delivery to the next hop.	
TIMEOUT	500 Internal Server Error	Unsuccessful delivery due to timeout.	
NO_PDN_CONNECTION	500 Internal Server Error	The SCEF cannot proceed since there is no PDN connection.	

5.7 DeviceTriggering API

5.7.1 Overview

The DeviceTriggering API is a RESTful API that allows the SCS/AS to deliver specific device trigger to the SCEF; it allows the SCS/AS to replace or recall the pending device trigger via the SCEF. If the corresponding device trigger delivery report is received by the SCEF, it also allows the SCEF to indicate the trigger delivery result to the SCS/AS.

The DeviceTriggering API defines a set of data models, resources and the related procedure for the creation and management of the device triggering. The corresponding JSON schema for the representation of the resources and operations defined by the DeviceTriggering API is provided in its complete form in Annex A.7.

5.7.2 Data model

5.7.2.1 Resource data types

5.7.2.1.1 Introduction

This clause defines data structures to be used in resource representations, including subscription resources.

Table 5.7.2.1.1-1 specifies data types re-used by the DeviceTriggering API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the DeviceTriggering API.

Table 5.7.2.1.1-1: DeviceTriggering API re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.7.4-1.

5.7.2.1.2 Type: DeviceTriggering

This type represents device triggering request. The same structure is used in the request and response.

Table 5.7.2.1.2-1: Definition of type DeviceTriggering

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual Device Triggering Transaction". This parameter shall be supplied by the SCEF in HTTP responses.	
externalId	ExternalId	0..1	Uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	0..1	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
validityPeriod	DurationSec	1	The validity time in seconds for the specific action requested.	
priority	Priority	1	Identifies the priority of the device trigger.	
applicationPortId	Port	1	This is used to uniquely identify the triggering application addressed in the device for destination port. See subclause 9.2.3.24.4 in 3GPP TS 23.040 [43] for further details.	
appSrcPortId	Port	0..1	This is used to uniquely identify the triggering application addressed in the device for originator port. See subclause 9.2.3.24.4 in 3GPP TS 23.040 [43] for further details.	
triggerPayload	Bytes	1	The device triggering payload.	
notificationDestination	Link	1	A URI indicating the notification destination for T8 notifications.	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
deliveryResult	DeliveryResult	0..1	The delivery result shall be included in the HTTP responses that indicate the delivery status of the device triggering.	
NOTE 1: Properties marked with a feature as defined in subclause 5.7.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: One of the properties "externalId" or "msisdn" shall be included.				

5.7.2.1.3 Type: DeviceTriggeringDeliveryReportNotification

This type represents device triggering delivery report notification.

Table 5.7.2.1.4-1: Definition of type DeviceTriggeringDeliveryReportNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
transaction	Link	1	Link to the related device triggering transaction resource to which this notification is related.	
Result	DeliveryResult	1	OK, unknown or diverse failures	
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.7.2.2 Referenced simple data types and enumerations

5.7.2.2.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.7.2.2.2 Simple data types

The simple data types defined in table 5.7.2.2.2-1 shall be supported.

Table 5.7.2.2.2-1: Simple data types

Type name	Description

5.7.2.2.3 Enumeration: DeliveryResult

The enumeration DeliveryResult represents the result of the delivery of a device triggering request

Table 5.7.2.2.3-1: Enumeration DeliveryResult

Enumeration value	Description	Applicability (NOTE)
SUCCESS	The SCEF includes this value in a device triggering notification. The value indicates that the device action request was successfully completed.	
UNKNOWN	The SCEF includes this value in a device triggering notification. The value indicates any unspecified errors.	
FAILURE	The SCEF includes this value in a device triggering notification. The value indicates that this trigger encountered a delivery error and is deemed permanently undeliverable.	
TRIGGERED	The SCEF includes this value in the response for a successful device triggering request. The value indicates that device triggering request is accepted by the SCEF.	
EXPIRED	The SCEF includes this value in a device triggering notification. The value indicates that the validity period expired before the trigger could be delivered.	
UNCONFIRMED	The SCEF includes this value in a device triggering notification. The value indicates that the delivery of the device action request is not confirmed.	
REPLACED	The SCEF includes this value in the response for a successful device triggering replacement request. The value indicates that the device triggering replacement request is accepted by the SCEF.	
TERMINATE	The SCEF includes this value in the response for a successful device triggering cancellation request. The value indicates that the delivery of the device action request is terminated by the SCS/AS.	
NOTE:	Properties marked with a feature as defined in subclause 5.7.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.	

5.7.2.2.4   Enumeration: Priority

The enumeration Priority represents the priority indication for a trigger payload.

Table 5.7.2.2.4-1: Enumeration Priority

Enumeration value	Description	Applicability (NOTE)
NO_PRIORITY	This value indicates that the device trigger has no priority.	
PRIORITY	This value indicates that the device trigger has priority.	
NOTE:	Properties marked with a feature as defined in subclause 5.7.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.	

5.7.3   Resource structure

5.7.3.1   General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-device-triggering/v1/

"apiRoot" is set as described in subclause 5.2.4. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.7.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
Device Triggering Transactions	/{scsAsId}/transactions	GET	SCS/AS	Read all active device triggering transaction resources for a given SCS/AS
		POST	SCS/AS	Create a new device triggering transaction resource
Individual Device Triggering Transaction	/{scsAsId}/transactions/{transactionId}	PUT	SCS/AS	Replace an existing device triggering transaction resource and the corresponding device trigger request
		GET	SCS/AS	Read a device triggering transaction resource
		DELETE	SCS/AS	Delete an existing device triggering transaction resource and cancel the device triggering

5.7.3.2 Resource: Device Triggering Transactions

5.7.3.2.1 Introduction

This resource allows the SCS/AS to read all active resources related to device triggering, and create a resource for a device triggering transaction with the SCEF.

5.7.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-device-triggering/v1/{scsAsId}/transactions/**

This resource shall support the resource URI variables defined in table 5.7.3.2.2-1.

Table 5.7.3.2.2-1: Resource URI variables for resource "Device Triggering Transactions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.7.3.2.3 Resource methods

5.7.3.2.3.1 GET

The GET method allows to read all active device triggering transactions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in table 5.7.3.2.3.1-1 and table 5.7.3.2.3.1-2.

Table 5.7.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.7.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(DeviceTriggering)	0..N	200 OK	The device triggering transactions information for the SCS/AS in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

Table 5.7.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.7.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.7.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.7.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.7.3.2.3.4   POST

To create a long-term transaction for a device triggering, the SCS/AS shall use the HTTP POST method on the "transactions" collection resource as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.7.2.1.2-1.

The possible response messages from the SCEF, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.7.3.2.3.4-1.

Table 5.7.3.2.3.4-1: Data structures supported by the POST request/response by the resource

<table>
<tr><td rowspan="2">Request body</td><td>Data type</td><td>Cardinality</td><td colspan="2">Remarks</td></tr>
<tr><td>DeviceTriggering</td><td>1</td><td colspan="2">Parameters to request a device triggering delivery.</td></tr>
<tr><td rowspan="5">Response body</td><td>Data type</td><td>Cardinality</td><td>Response codes</td><td>Remarks</td></tr>
<tr><td>DeviceTriggering</td><td>1</td><td>201 Created</td><td>The long term transaction for the device triggering was created successfully.</td></tr>
<tr><td></td><td></td><td></td><td>The SCEF shall return a data structure of type "DeviceTriggering" in the response payload body.</td></tr>
<tr><td></td><td></td><td></td><td>The URI of the created resource shall be returned in the "Location" HTTP header</td></tr>
<tr><td colspan="4">NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.</td></tr>
</table>

Table 5.7.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-device-triggering/v1/{scsAsId}/transactions/{transactionId}

5.7.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.7.3.3   Resource: Individual Device Triggering Transaction

5.7.3.3.1   Introduction

This resource allows the SCS/AS to operate a specific pending device triggering by using a long-term transaction.

5.7.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-device-triggering/v1/{scsAsId}/transactions/{transactionId}**

This resource shall support the resource URI variables defined in table 5.7.3.3.2-1.

Table 5.7.3.3.2-1: Resource URI variables for resource "Individual Device Triggering Transaction"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
transactionId	string	Identifier of the transaction resource. The transactionId corresponds to the stage 2 TLTRI.

5.7.3.3.3   Resource methods

5.7.3.3.3.1   GET

The GET method allows to read an individual device triggering transaction resource to obtain details of an active transaction. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.7.3.3.3.1-1 and table 5.7.3.3.3.1-2.

Table 5.7.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.7.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	DeviceTriggering	1	200 OK	The device triggering transaction information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.7.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.7.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.7.3.3.3.2   PUT

A pending device triggering delivery can be replaced by the SCS/AS. To replace the pending device triggering, the SCS/AS shall use the HTTP PUT method on the "transaction" instance resource as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.7.2.1.2-1

The properties "msisdn" or "externalId" shall remain unchanged from previously provided value.

The possible response messages from the SCEF, depending on whether the PUT request is successful or unsuccessful, are shown in Table 5.7.3.3.3.2-1.

Table 5.7.3.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	DeviceTriggering	1		Parameters to replace a device triggering with the SCEF.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	DeviceTriggering	1	200 OK	The device triggering was modified successfully. The SCEF shall return an updated data structure of type "DeviceTriggering" with the "DeliveryResult" field in the response payload body.
	none		307 Temporary Redirect	Temporary redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

Table 5.7.3.3.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.7.3.3.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.7.3.3.3.3 PATCH

This HTTP method is not supported for the resource.

5.7.3.3.3.4 POST

This HTTP method is not supported for the resource.

5.7.3.3.3.5 DELETE

To cancel an ongoing device triggering delivery, the SCS/AS shall use the HTTP DELETE method on the individual "transaction" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.7.3.3.3.5-1.

Table 5.7.3.3.3.5-1: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	DeviceTriggering	1	200 OK	The Device Triggering delivery was cancelled successfully. The SCEF shall return a data structure of type "DeviceTriggering" with a "TERMINATE" status in the response body.
	None		204 No Content	The Device Triggering was cancelled successfully. The SCEF shall not return a response payload.
	none		307 Temporary Redirect	Temporary redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.7.3.3.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.7.3.3.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.7.3.4 Void

5.7.3a Notifications

5.7.3a.1 General

The notifications provided by the DeviceTriggering API are specified in this clause.

Table 5.7.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Device Triggering Delivery Report Notification	{notification_uri}	POST	Report a device triggering delivery report to SCS/AS.

5.7.3a.2 Device Triggering Delivery Report Notification

5.7.3a.2.1 Description

The Device Triggering Delivery Report Notification allows the SCEF to send notifications about device triggering delivery report events to the SCS/AS.

5.7.3a.2.2 Target URI

The Callback URI **"{notification_uri}"** shall be used with the callback URI variables defined in table 5.7.3a.2.2-1.

Table 5.7.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination URI where T8 notification requests shall be delivered. This URI shall be provided within the "notificationDestination" attribute in the DeviceTriggering type.

5.7.3a.2.3 Standard Methods

5.7.3a.2.3.1 Notification via POST

To report the delivery status of the device trigging delivery, the SCEF shall use the HTTP POST method on the notification endpoint as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.7.2.1.4-1.

This method shall support the request data structures specified in table 5.7.3a.2.3.1-1 and the response data structures and response codes specified in table 5.7.3a.2.3.1-2.

Table 5.7.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
DeviceTriggeringDeliveryReportNotification	1	The Device Triggering delivery report.

Table 5.7.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
none		307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.7.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.7.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.7.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the DeviceTriggeringDeliveryReportNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.7.4   Used Features

The table below defines the features applicable to the DeviceTriggering API. Those features are negotiated as described in subclause 5.2.7.

Table 5.7.4-1: Features used by DeviceTriggering API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
2	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.8   GMD via MBMS related APIs

5.8.1   Overview

There are two Group Message Delivery via MBMS related APIs defined:

-    GMDviaMBMSbyMB2 API;

-    GMDviaMBMSbyxMB API.

Both APIs are RESTful APIs that allow the SCS/AS to deliver the group message to the SCEF. They define a set of data models, resources and the related procedures for the creation and management of the group message delivery. The corresponding JSON schema for the representation of the resources and operations defined by the GMDviaMBMSbyMB2 API and GMDviaMBMSbyxMB API are provided in its complete form in Annex A.8.1 and Annex A.8.2, respectively.

5.8.2 GMDviaMBMSbyMB2 API

5.8.2.1 Data model

5.8.2.1.1 Resource data types

5.8.2.1.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.8.2.1.1.1-1 specifies data types re-used by the GMDviaMBMSbyMB2 API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the GMDviaMBMSbyMB2 API.

Table 5.8.2.1.1.1-1: GMDviaMBMSbyMB2 API re-used Data Types

Data type	Reference	Comments
GeographicArea	3GPP TS 29.572 [42]	Identifies the geographical information of the user(s).
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.8.2.3-1.

5.8.2.1.1.2 Type: TMGIAllocation

This type represents TMGI Allocation request. The same structure is used in the request and response.

Table 5.8.2.1.1.2-1: Definition of type TMGIAllocation

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual TMGI Allocation". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
tmgiExpiration	DateTimeRo	0..1	Identifies the absolute time at which the TMGI is considered to expire.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.2.1.1.3 Type: GMDViaMBMSByMb2

This type represents the group message delivery via MBMS by MB2.

Table 5.8.2.1.1.3-1: Definition of type GMDViaMBMSByMb2

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual GMD via MBMS by MB". This parameter shall be supplied by the SCEF in HTTP responses.	
notificationDestination	Link	1	A URI indicating the notification destination where T8 notification requests shall be delivered	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
messageDeliveryStartTime	DateTime	0..1	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
groupMessagePayload	Bytes	0..1	Indicates the payload the SCS/AS intends to deliver to the UEs.	
scefMessageDeliveryIPv4	Ipv4AddrRo	0..1	Indicates the Ipv4 address where the SCEF wants to receive the data.	
scefMessageDeliveryIPv6	Ipv6AddrRo	0..1	Indicates the Ipv6 address where the SCEF wants to receive the data.	
scefMessageDeliveryPort	PortRo	0..1	Indicates the port number where the SCEF wants to receive the data.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.8.2.1.1.4   Type: GMDByMb2Notification

This type represents the group message delivery notification.

Table 5.8.2.1.1.4-1: Definition of type GMDByMb2Notification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
transaction	Link	1	Link to the transaction resource to which this notification is related.	
deliveryTriggerStatus	boolean	1	Indicates whether delivery of group message payload corresponding to the TMGI was successful (TRUE) or not (FALSE).	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.2.1.1.5   Type: TMGIAllocationPatch

This type represents TMGI Allocation request. The structure is used for PATCH request.

Table 5.8.2.1.1.5-1: Definition of type TMGIAllocationPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.2.1.1.6 Type: GMDViaMBMSByMb2Patch

This type represents group message delivery via MBMS request by MB2. The structure is used for PATCH request.

Table 5.8.2.1.1.6-1: Definition of the GMDViaMBMSByMb2Patch data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
messageDeliveryStartTime	DateTime	0..1	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
groupMessagePayload	Bytes	0..1	Indicates the payload the SCS/AS intends to deliver to the UEs.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.2.1.1.7 Type: MbmsLocArea

This data type represents the user location area which is sent from the SCS/AS to the SCEF by group message delivery via MBMS request.

Table 5.8.2.1.1.7-1: Definition of the MbmsLocArea data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
cellId	array(string)	0..N	Indicates a Cell Global Identification of the user which identifies the cell the UE is registered.	
enodeBId	array(string)	0..N	Indicates an eNodeB in which the UE is currently located.	
geographicArea	array(GeographicArea)	0..N	Identifies a geographic area of the user where the UE is located.	
mbmsServiceAreaId	array(string)	0..N	Identifies an MBMS Service Area Identity of the user where the UE is located.	
civicAddress	array(CivicAddress)	0..N	Identifies a civic address of the user where the UE is located.	
NOTE: Properties marked with a feature as defined in subclause 5.8.2.3 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.8.2.2 Resource structure

5.8.2.2.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-group-message-delivery-mb2/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-group-message-delivery-mb2" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.8.2.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
TMGI Allocation	/{scsAsId} /tmgi-allocation	GET	SCS/AS	Read all active TMGI resources for a given SCS/AS
		POST	SCS/AS	Create a new TMGI resource for a given SCS/AS
Individual TMGI Allocation	/{scsAsId} /tmgi-allocation/{tmgi}	PUT	SCS/AS	Replace an existing TMGI resource for a given SCS/AS and TMGI
		PATCH	SCS/AS	Modify an existing TMGI resource for a given SCS/AS and TMGI
		GET	SCS/AS	Read a TMGI allocation resource for a given SCS/AS and a TMGI
		DELETE	SCS/AS	Deallocate an existing TMGI resource for agiven SCS/AS and TMGI
GMD via MBMS by MB2	/{scsAsId} /tmgi-allocation/{tmgi}/delivery-via-mbms	GET	SCS/AS	Read all group message delivery resources for a given SCS/AS and TMGI.
		POST	SCS/AS	Create a group message delivery resource for given SCS/AS and TMGI selected by the SCS/AS when MB2 is used as a southbound interface.
Individual GMD via MBMS by MB2	/{scsAsId} /tmgi-allocation/{tmgi}/delivery-via-mbms/ {transactionId}	PUT	SCS/AS	Replace a group message delivery resource
		PATCH	SCS/AS	Modify a group message delivery resource.
		GET	SCS/AS	Read a group message delivery resource.
		DELETE	SCS/AS	Delete a group message delivery resource.

5.8.2.2.2 Resource: TMGI Allocation

5.8.2.2.2.1 Introduction

This resource allows the SCS/AS to read all active TMGI or request a TMGI allocation.

5.8.2.2.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/**

This resource shall support the resource URI variables defined in table 5.8.2.2.2.2-1.

Table 5.8.2.2.2.2-1: Resource URI variables for resource "TMGI Allocation"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.8.2.2.2.3   Resource methods

5.8.2.2.2.3.1   GET

The GET method read all TMGI Allocation resource for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.2.3.1-1.

Table 5.8.2.2.2.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	array(TMGIAllocation)	0..N	200 OK	The TMGI allocation for the SCS/AS in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.8.2.2.2.3.2   PUT

This HTTP method is not supported for the resource.

5.8.2.2.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.8.2.2.2.3.4   POST

The POST method creates a new TMGI Allocation resource for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.2.3.4-1.

Table 5.8.2.2.2.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks	
	TMGIAllocation	1	Parameters to create a TMGI allocation resource	
Response body	Data type	Cardinality	Response codes	Remarks
	TMGIAllocation	1	201 Created	The creation of a TMGI allocation was created successfully. The SCEF shall return a data structure of type "TMGI Allocation" in the response payload body. On success, the HTTP response shall include a "Location" HTTP header that points to the created resource URI identified by the ScsAsId and the TMGI
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.8.2.2.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}

5.8.2.2.2.3.5 DELETE

This HTTP method is not supported for the resource.

5.8.2.2.3 Resource: Individual TMGI Allocation

5.8.2.2.3.1 Introduction

This resource allows the SCS/AS to read an active TMGI or renew an TMGI.

5.8.2.2.3.2 Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}**

This resource shall support the resource URI variables defined in table 5.8.2.2.3.2-1.

Table 5.8.2.2.3.2-1: Resource URI variables for resource "Individual TMGI Allocation"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
Tmgi	string	TMGI.

5.8.2.2.3.3 Resource methods

5.8.2.2.3.3.1 GET

The GET method reads a TMGI Allocation resource for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.3.3.1-1.

Table 5.8.2..2.3.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	TMGIAllocation	1	200 OK	A TMGI allocation for the SCS/AS in the request URI is returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.8.2.2.3.3.2 PUT

The PUT method replaces a TMGI Allocation resource for a given SCS/AS to renew a TMGI expiration time. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.3.3.2-1.

Table 5.8.2.2.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks	
	TMGIAllocation	1	Parameters to replace a TMGI resource	
Response body	Data type	Cardinality	Response codes	Remarks
	TMGIAllocation	1	200 OK	The replace of a TMGI allocation was created successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

5.8.2.2.3.3.3 PATCH

The PATCH method modifies a TMGI Allocation resource for a given SCS/AS to renew a TMGI expiration time. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.3.3.3-1.

Table 5.8.2.2.3.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality	Remarks	
	TMGIAllocationPatch	1	Parameters to modify a TMGI resource	
Response body	Data type	Cardinality	Response codes	Remarks
	TMGIAllocation	1	200 OK	The modification of a TMGI allocation was created successfully.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

5.8.2.2.3.3.4 POST

This HTTP method is not supported for the resource.

5.8.2.2.3.3.5 DELETE

The DELETE method deletes a TMGI Allocation resource for a given SCS/AS to deallocate a TMGI. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.3.3.5-1.

Table 5.8.2.2.3.3.5-1: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	none		204 No Content	The TMGI allocation resource was removed successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

5.8.2.2.4   Resource: GMD via MBMS by MB2

5.8.2.2.4.1   Introduction

This resource allows the SCS/AS to read all active group message delivery resources or create a group message delivery when the MB2 is used as a southbound interface.

5.8.2.2.4.2   Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}/delivery-via-mbms/**

This resource shall support the resource URI variables defined in table 5.8.2.2.4.2-1.

Table 5.8.2.2.4.2-1: Resource URI variables for resource "GMD via MBMS by MB2"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
Tmgi	string	TMGI

5.8.2.2.4.3   Resource methods

5.8.2.2.4.3.1   GET

The GET method reads all group message delivery via MBMS resources for a given SCS/AS and a TMGI. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.4.3.1-1.

Table 5.8.2.2.4.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(GMDViaMBMSBy Mb2)	0..N	200 OK	The TMGI allocation for the SCS/AS in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.8.2.2.4.3.2   PUT

This HTTP method is not supported for the resource.

5.8.2.2.4.3.3   PATCH

This HTTP method is not supported for the resource.

5.8.2.2.4.3.4   POST

The POST method creates a new group message delivery via MBMS resource for a given SCS/AS and TMGI selected by the SCS/AS. It is initiated by the SCS/AS and answered by the SCEF. The SCEF shall construct the URI of the created resource using that URI.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.4.3.4-1.

Table 5.8.2.2.4.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks	
	GMDViaMBMSByMb2	1	Parameters to create and authorize a group message delivery via MBMS with the SCEF.	

Response body	Data type	Cardinality	Response codes	Remarks
	GMDViaMBMSByMb2	1	201 Created	The creation of a group message delivery was created successfully. The SCEF shall return a data structure of type "GMDViaMBMSByMb2" in the response payload body. On success, the HTTP response shall include a "Location" HTTP header that points to the created resource URI identified by the ScsAsId and the Transaction Id.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.8.2.2.4.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}/delivery-via-mbms/{transactionId}

5.8.2.2.4.3.5   DELETE

This HTTP method is not supported for the resource.

5.8.2.2.5   Resource: Individual GMD via MBMS by MB2

5.8.2.2.5.1   Introduction

This resource allows the SCS/AS to modify or delete a group message delivery via MBMS by MB2 resource.

5.8.2.2.5.2   Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}/delivery-via-mbms/{transactionId}**

This resource shall support the resource URI variables defined in table 5.8.2.2.5.2-1.

Table 5.8.2.2.5.2-1: Resource URI variables for resource "Individual GMD via MBMS by MB2"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
transactionId	string	TransactionId selected by the SCEF. The transactionId corresponds to the stage 2 TLTRI.

5.8.2.2.5.3   Resource methods

5.8.2.2.5.3.1   GET

The GET method reads a group message delivery via MBMS by MB2 resource for a given SCS/AS, a TMGI and a transactionId. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.5.3.1-1.

Table 5.8.2.2.5.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	GMDViaMBMSbyMb2	0..1	200 OK	The group message delivery resource for the SCS/AS in the request URI is returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.8.2.2.5.3.2 PUT

Assuming that a group message delivery has been created using the HTTP POST method described in subclause 5.8.2.2.4.3.4, replace of its properties can be performed by the SCS/AS by using the HTTP PUT method on the "delivery_via_mbms" instance resource as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.8.2.2.5.3.2-1.

The content body of the group message delivery via MBMS update request shall contain updated full representation of the group message delivery resource. Only the properties "locationinfo", "accuracy", "messageDeliverystarttime" and "groupMessagepayload" can be modified.

The possible response messages from the SCEF, depending on whether the PUT request is successful or unsuccessful, are shown in Table 5.8.2.2.5.3.2-1.

Table 5.8.2.2.5.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	GMDViaMBMSByMb2	1		Parameters to replace group message delivery resource with the SCEF.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	GMDViaMBMSByMb2	1	200 OK	The group message delivery was modified successfully. The SCEF shall return an updated data structure of type "GMDViaMBMSByMb2" in the response payload body.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

5.8.2.2.5.3.3 PATCH

Assuming that a group message delivery has been created using the HTTP POST method described in subclause 5.8.2.2.4.3.4, partial updating of its properties can be performed by the SCS/AS by using the HTTP PATCH method on the "delivery-via-mbms" instance resource.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.2.2.5.3.3-1.

Table 5.8.2.2.5.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	GMDViaMBMSByMb2Patch	1		Parameters to partially update a group message delivery with the SCEF.
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	GMDViaMBMSByMb2	1	200 OK	The group message delivery was modified successfully. The SCEF shall return an updated data structure of type "GMDViaMBMSByMb2" in the response payload body.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

5.8.2.2.5.3.4 POST

This HTTP method is not supported for the resource.

5.8.2.2.5.3.5 DELETE

To cancel a group message delivery, the SCS/AS shall use the HTTP DELETE method on the individual "delivery_via_mbms" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.8.2.2.5.3.5-1.

Table 5.8.2.2.5.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	none		204 No Content	The group message delivery subscription was cancelled successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

5.8.2.2.6 Void

5.8.2.2a Notifications

5.8.2.2a.1 General

The notifications provided by the GMDviaMBMSbyMB2 API are specified in this clause.

Table 5.8.2.2a.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
GMD via MBMS by MB2 Notification	{notificationDestination}	POST	Report a specific group message delivery result to the SCS/AS for a given transaction Id selected by the SCEF.

5.8.2.2a.2 GMD via MBMS by MB2 Notification

5.8.2.2a.2.1 Description

The GMD via MBMS by MB2 Notification allows the SCEF report the delivery trigger status to the SCS/AS to indicate whether group message delivery was triggered successful.

5.8.2.2a.2.2 Target URI

The Callback URI "**{**notificationDestination**}**" shall be used with the callback URI variables defined in table 5.8.2.2a.2.2-1.

Table 5.8.2.2a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	A URI indicating the notification destination where T8 notification requests shall be delivered. This URI shall be provided within the field "notificationDestination" in the GMDViaMBMSByMb2 type.

5.8.2.2a.2.3 Standard Methods

5.8.2.2a.2.3.1 Notification via POST

To report the status of the delivery trigger status to the SCS/AS, the SCEF shall use the HTTP POST method on the notification point as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.8.2.1.1.4-1.

This method shall support the request data structures specified in table 5.8.2.2a.2.3.1-1 and the response data structures and response codes specified in table 5.8.2.2a.2.3.1-2.

Table 5.8.2.2a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
GMDByMb2Notification	1	The delivery status notification.

Table 5.8.2.2a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification with a body.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

5.8.2.2a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the GMDByMb2Notification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.8.2.3   Used Features

The table below defines the features applicable to the GMDviaMBMSbyMB2 API. Those features are negotiated as described in subclause 5.2.7.

Table 5.8.2.3-1: Features used by GMDviaMBMSbyMB2 API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
2	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.8.3   GMDviaMBMSbyxMB API

5.8.3.1   Data model

5.8.3.1.1   Resource data types

5.8.3.1.1.1   Introduction

This clause defines data structures to be used in resource representations.

Table 5.8.3.1.1.1-1 specifies data types re-used by the GMDviaMBMSbyxMB API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the GMDviaMBMSbyxMB API.

Table 5.8.3.1.1.1-1: GMDviaMBMSbyxMB API re-used Data Types

Data type	Reference	Comments
GeographicArea	3GPP TS 29.572 [42]	Identifies the geographical information of the user(s).
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.8.3.3-1.

5.8.3.1.1.2   Type: ServiceCreation

This type represents the service resource.

Table 5.8.3.1.1.2-1: Definition of the ServiceCreation data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual xMB Service". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2] supplied by the SCS/AS.	
userServiceId	string	0..1	Identifies the MBMS User Service supplied by the SCEF.	
serviceClass	string	0..1	The service class that service belongs to supplied by the SCEF.	
serviceLanguages	array(string)	0..N	List of language of the service content supplied by the SCEF.	
serviceNames	array(string)	0..N	List of Service Names supplied by the SCEF	
receiveOnlyMode	boolean	0..1	When set to 'true', the Content Provider indicates that the service is a Receive Only Mode service. This parameter is supplied by the SCEF	
serviceAnnouncement Mode	ServiceAnnouncem entMode	0..1	Enumeration of Service Announcement Mode supplied by the SCEF.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.8.3.1.1.3   Type: GMDViaMBMSByxMB

This type represents the group message delivery via MBMS by xMB.

Table 5.8.3.1.1.3-1: Definition of type GMDViaMBMSByxMB

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual GMD via MBMS by xMB". This parameter shall be supplied by the SCEF in HTTP responses.	
notificationDestination	Link	1	A URI indicating the notification destination where T8 notification requests shall be delivered	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
messageDeliveryStartTime	DateTime	0..1	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
messageDeliveryStopTime	DateTime	0..1	Identifies the absolute time at which the SCS/As is expected to stop distributing the data. If absent, configuration time will be used.	
groupMessagePayload	Bytes	0..1	Indicates the payload the SCS/AS intends to deliver to the UEs.	
scefMessageDeliveryIPv4	Ipv4AddrRo	0..1	Indicates the Ipv4 address where the SCEF wants to receive the data.	
scefMessageDeliveryIPv6	Ipv6AddrRo	0..1	Indicates the Ipv6 address where the SCEF wants to receive the data.	
scefMessageDeliveryPort	PortRo	0..1	Indicates the port number where the SCEF wants to receive the data.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.8.3.1.1.4   Type: GMDByxMBNotification

This type represents the group message delivery notification.

Table 5.8.3.1.1.4-1: Definition of type GMDByxMbNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
transaction	Link	1	Link to the transaction resource to which this notification is related.	
deliveryTriggerStatus	boolean	1	Indicates whether delivery of group message payload was successful (TRUE) or not (FALSE)	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.3.1.1.5   Type: GMDViaMBMSByxMBPatch

This type represents group message delivery via MBMS request. The structure is used for PATCH request.

Table 5.8.3.1.1.5-1: Definition of the GMDViaMBMSByxMBPatch data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
mbmsLocArea	MbmsLocArea	0..1	Restricts the distribution of the group message.	
messageDeliveryStartTime	DateTime	0..1	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
messageDeliveryStopTime	DateTime	0..1	Identifies the absolute time at which the SCS/As is expected to stop distributing the data. If absent, the configuration value will be used.	
groupMessagePayload	Bytes	0..1	Indicates the payload the SCS/AS intends to deliver to the UEs.	
NOTE: Properties marked with a feature as defined in subclause 5.8.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.8.3.1.1.6 Type: MbmsLocArea

This data type represents the user location area which is sent from the SCS/AS to the SCEF by group message delivery via MBMS request.

Table 5.8.3.1.1.6-1: Definition of the MbmsLocArea data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
cellId	array(string)	0..N	Indicates a Cell Global Identification of the user which identifies the cell the UE is registered.	
enodeBId	array(string)	0..N	Indicates an eNodeB in which the UE is currently located.	
geographicArea	array(GeographicArea)	0..N	Identifies a geographic area of the user where the UE is located.	
mbmsServiceAreaId	array(string)	0..N	Identifies an MBMS Service Area Identity of the user where the UE is located.	
civicAddress	array(CivicAddress)	0..N	Identifies a civic address of the user where the UE is located.	
NOTE: Properties marked with a feature as defined in subclause 5.8.2.3 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.8.3.1.2 Referenced simple data types and enumerations

5.8.3.1.2.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.8.3.1.2.2 Simple data types

The simple data types defined in table 5.8.3.1.2.2-1 shall be supported.

Table 5.8.3.1.2.2-1: Simple data types

Type name	Description

5.8.3.1.2.3 Enumeration: ServiceAnnouncementMode

The enumeration ServiceAnnouncementMode represents the service annoucement mode

Table 5.8.3.1.2.3-1: Enumeration ServiceAnnouncementMode

Enumeration value	Description	Applicability (NOTE)
SACH	BM-SC performs the service announcement for the current service using the SACH channel.	
CONTENT_P ROVIDER	BM-SC provides the necessary service access information used by the Content Provider to create the service announcement information.	
NOTE:	Properties marked with a feature as defined in subclause 5.7.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.	

5.8.3.2   Resource structure

5.8.3.2.1   General

All resource URIs of this API should have the following root:

> **{apiRoot}/3gpp-group-message-delivery-xmb/v1/**

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-group-message-delivery-xmb" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.8.3.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
xMB Services	/{scsAsId} /services/	POST	SCS/AS	Create a service when xMB is used as a southbound interface.
		GET	SCS/AS	Read all active service resources for a given SCS/AS.
Individual xMB Service	/{scsAsId} /services/{serviceId}	GET	SCS/AS	Read an active service resource for a given SCS/AS and Service Id.
		DELETE	SCS/AS	Delete an existing service resource for agiven SCS/AS and Service Id.
GMD via MBMS by xMB	/{scsAsId} /services/{serviceId}/delivery-via-mbms	GET	SCS/AS	Read all group message delivery resources for a given SCS/AS and Service Id.
		POST	SCS/AS	Create a group message delivery resource for given SCS/AS and Service Id when xMB is used as a southbound interface.
Individual GMD via MBMS by xMB	/{scsAsId} /services/{serviceId}/delivery-via-mbms/{transactionId}	PUT	SCS/AS	Replace a group message delivery resource
		PATCH	SCS/AS	Modify a group message delivery resource.
		GET	SCS/AS	Read a group message delivery resource.
		DELETE	SCS/AS	Delete a group message delivery resource.

5.8.3.2.2 Resource: xMB Services

5.8.3.2.2.1 Introduction

This resource allows the SCS/AS to create service resource when the xMB is used as a southbound interface.

5.8.3.2.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-xmb/v1/{scsAsId}/services**

This resource shall support the resource URI variables defined in table 5.8.3.2.2.2-1.

Table 5.8.3.2.2.2-1: Resource URI variables for resource "GMD via MBMS by xMB"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.8.3.2.2.3 Resource methods

5.8.3.2.2.3.1 GET

The GET method allows the SCS/AS read all active service resources for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.2.3.1-1.

Table 5.8.3.2.2.3.1-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	none.			
Response body	Data type	Cardinality	Response codes	Remarks
	array(ServiceCreation)	0..N	200 OK	The service resource for the SCS/AS in the request URI is returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.8.3.2.2.3.2 PUT

This HTTP method is not supported for the resource.

5.8.3.2.2.3.3 PATCH

This HTTP method is not supported for the resource.

5.8.3.2.2.3.4 POST

The POST method creates a new service resource for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.2.3.4-1.

Table 5.8.3.2.2.3.4-1: Data structures supported by the POST request/response by the resource

	Data type	Cardinality		Remarks
Request body	ServiceCreation	1		Parameters to create and authorize a service with the SCEF.
Response body	Data type	Cardinality	Response codes	Remarks
	ServiceCreation	1	201 Created	The resource of a service was created successfully. The SCEF shall return a data structure of type "ServiceCreation" in the response payload body. On success, the HTTP response shall include a "Location" HTTP header that points to the created resource URI identified by the ScsAsId and the ServiceId.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.8.3.2.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-group-message-delivery-xmb/v1/{scsAsId}/services/{serviceId}

5.8.3.2.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.8.3.2.3   Resource: Individual xMB Service

5.8.3.2.3.1   Introduction

This resource allows the SCS/AS to delete a service resource.

5.8.3.2.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp_device_triggering_xmb/v1/{scsAsId}/services/{serviceId}**

This resource shall support the resource URI variables defined in table 5.8.3.2.3.2-1.

Table 5.8.3.2.3.2-1: Resource URI variables for resource "Individual Service Creation"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
serviceId	string	Identifier of the service.

5.8.3.2.3.3   Resource methods

5.8.3.2.3.3.1   GET

The GET method reads a active service resource for a given SCS/AS and a service Id. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.3.3.1-1.

Table 5.8.3.2.3.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks	
	none				
Response body	Data type	Cardinality	Response codes	Remarks	
	ServiceCreation	0..1	200 OK	The service resource for the SCS/AS and Service Id in the request URI is returned.	
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

5.8.3.2.3.3.2 PUT

This HTTP method is not supported for the resource.

5.8.3.2.3.3.3 PATCH

This HTTP method is not supported for the resource.

5.8.3.2.3.3.4 POST

This HTTP method is not supported for the resource.

5.8.3.2.3.3.5 DELETE

To delete a service resource, the SCS/AS shall use the HTTP DELETE method on the "ServiceCreation" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.8.3.2.3.3.5-1.

Table 5.8.3.2.3.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks	
	none				
Response body	Data type	Cardinality	Response codes	Remarks	
	none		204 No Content	The group message delivery subscription was cancelled successfully.	
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply					

5.8.3.2.4 Resource: GMD via MBMS by xMB

5.8.3.2.4.1 Introduction

This resource allows the SCS/AS to:

- read all of the group message delivery via MBMS by xMB resources for a given SCS/AS and a service identifier; or

- create a group message delivery when the xMB is used as a southbound interface.

5.8.3.2.4.2 Resource definition

Resource URI: **{apiRoot}/3gpp-group-message-delivery-xmb/v1/{scsAsId}/services/{serviceId}/delivery-via-mbms**

This resource shall support the resource URI variables defined in table 5.8.3.2.4.2-1.

Table 5.8.3.2.4.2-1: Resource URI variables for resource "GMD via MBMS by xMB"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
ServiceId	string	Identifier of the service

5.8.3.2.4.3   Resource methods

5.8.3.2.4.3.1   GET

The GET method reads all of the group message delivery via MBMS by xMB resources for a given SCS/AS and a service identifier. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.4.3.1-1.

Table 5.8.3.2.4.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality	Remarks		
	None				
Response body	Data type	Cardinality	Response codes	Remarks	
	array(GMDViaMBMSByxMB)	0..N	200 OK	The list of "GMDViaMBMSByxMB" data for the SCS/AS and the service identifier are returned.	
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

5.8.3.2.4.3.2   PUT

This HTTP method is not supported for the resource.

5.8.3.2.4.3.3   PATCH

This HTTP method is not supported for the resource.

5.8.3.2.4.3.4   POST

The POST method creates a new group message delivery via MBMS resource for a given SCS/AS and service Id selected by the SCS/AS. It is initiated by the SCS/AS and answered by the SCEF. This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.4.3.4-1.

Table 5.8.3.2.4.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks		
	GMDViaMBMSByxMB	1	Parameters to create and authorize a group message delivery via MBMS with the SCEF.		
Response body	Data type	Cardinality	Response codes	Remarks	
	GMDViaMBMSByxMB	1	201 Created	The creation of a group message delivery was created successfully. The SCEF shall return a data structure of type "GMDViaMBMSByxMB" in the response payload body. On success, the HTTP response shall include a "Location" HTTP header that points to the created resource URI identified by the ScsAsId and the Transaction Id	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.					

Table 5.8.3.2.4.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-group-message-delivery-xmb/v1/{scsAsId}/services/{serviceId}/delivery-via-mbms/{transactionId}

5.8.3.2.4.3.5   DELETE

This HTTP method is not supported for the resource.

5.8.3.2.5   Resource: Individual GMD via MBMS by xMB

5.8.3.2.5.1   Introduction

This resource allows the SCS/AS to modify or delete a group message delivery via MBMS resource.

5.8.3.2.5.2   Resource definition

Resource URI: **{apiRoot}/3gpp-device-triggering-xmb/v1/{scsAsId}/services/{serviceId}/delivery-via-mbms/{transactionId}**

This resource shall support the resource URI variables defined in table 5.8.3.2.5.2-1.

Table 5.8.3.2.5.2-1: Resource URI variables for resource "Individual GMD via MBMS by xMB"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
serviceIdId	string	Identifier of the service selected by the SCEF. The transactionId corresponds to the stage 2 TLTRI.

5.8.3.2.5.3   Resource methods

5.8.3.2.5.3.1   GET

The GET method reads a group message delivery via MBMS resource for a given SCS/AS, a service Id and a transactionId. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.3.3.1-1.

Table 5.8.3.2.5.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality	Remarks		
	none				
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**	
	GMDViaMBMSByxMB	0..1	200 OK	The group message delivery resource for the SCS/AS in the request URI is returned.	
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

5.8.3.2.5.3.2 PUT

Assuming that a group message delivery has been created using the HTTP POST method described in subclause 5.8.3.2.4.3.4, replace of its properties can be performed by the SCS/AS by using the HTTP PUT method on the "delivery-via-mbms" instance resource as follows:

- the body of the message is encoded in JSON format with the data structure defined in table 5.8.3.1.1.3-1.

The content body of the group message delivery via MBMS update request shall contain updated full representation of the group message delivery resource. Only the properties "locationinfo", "accuracy", "messageDeliverystarttime", "messageDeliverystoptime" and "groupMessagepayload" can be modified.

The possible response messages from the SCEF, depending on whether the PUT request is successful or unsuccessful, are shown in Table 5.8.3.2.5.3.2-1.

Table 5.8.3.2.5.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks		
	GMDViaMBMSByxMB	1	Parameters to replace group message delivery resource with the SCEF.		
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**	
	GMDViaMBMSByxMB	1	200 OK	The group message delivery was modified successfully. The SCEF shall return an updated data structure of type "GMDViaMBMSByxMB" in the response payload body.	
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.					

5.8.3.2.5.3.3 PATCH

Assuming that a group message delivery has been created using the HTTP POST method described in subclause 5.8.3.2.4.3.4, partial updating of its properties can be performed by the SCS/AS by using the HTTP PATCH method on the "delivery-via-mbms" instance resource.

This method shall support request and response data structures, and response codes, as specified in the table 5.8.3.2.5.3.3-1.

Table 5.8.3.2.5.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	GMDViaMBMSByxMB Patch	1		Parameters to partially update a group message delivery with the SCEF.
Response body	Data type	Cardinality	Response codes	Remarks
	GMDViaMBMSByxMB	1	200 OK	The group message delivery was modified successfully. The SCEF shall return an updated data structure of type "GMDViaMBMSByxMB" in the response payload body.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

5.8.3.2.5.3.4 POST

This HTTP method is not supported for the resource.

5.8.3.2.5.3.5 DELETE

To cancel a group message delivery, the SCS/AS shall use the HTTP DELETE method on the individual "delivery_via_mbms" resource which is indicated by the URI in the Location header of the HTTP POST response:

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.8.3.2.5.3.5-1.

Table 5.8.3.2.5.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	none		204 No Content	The group message delivery subscription was cancelled successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

5.8.3.2.6 Void

5.8.3.2a Notifications

5.8.3.2a.1 General

The notifications provided by the GMDviaMBMSbyxMB API are specified in this clause.

Table 5.8.3.2a.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
GMD via MBMS by xMB Notification	{notificationDestination}	POST	Report a specific group message delivery result to the SCS/AS for a given Transaction Id selected by the SCEF.

5.8.3.2a.2 GMD via MBMS by xMB Notification

5.8.3.2a.2.1 Description

The GMD via MBMS by xMB Notification allows the SCEF report the delivery trigger status to the SCS/AS to indicate whether group message delivery was triggered successful.

5.8.3.2a.2.2 Target URI

The Callback URI **"{**notificationDestination**}"** shall be used with the callback URI variables defined in table 5.8.3.2a.2.2-1.

Table 5.8.3.2a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	A URI indicating the notification destination where T8 notification requests shall be delivered. This URI shall be provided within the field "notificationDestination" in the GMDViaMBMSByxMB type.

5.8.3.2a.2.3 Standard Methods

5.8.3.2a.2.3.1 Notification via POST

To report the status of the delivery trigger status to the SCS/AS, the SCEF shall use the HTTP POST method on the notification point as follows:

-    the body of the message is encoded in JSON format with the data structure defined in table 5.8.3.1.1.4-1.

This method shall support the request data structures specified in table 5.8.3.2a.2.3.1-1 and the response data structures and response codes specified in table 5.8.3.2a.2.3.1-2.

Table 5.8.3.2a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
GMDByxMBNotification	1	The delivery status notification.

Table 5.8.3.2a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
Acknowledgement	1	200 OK	The successful acknowledgement of the notification with a body.
(None)		204 No Content	The successful acknowledgement of the notification without a body.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

5.8.3.2a.2.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the GMDByxMBNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.8.3.3 Used Features

The table below defines the features applicable to the GMDviaMBMSbyxMB API. Those features are negotiated as described in subclause 5.2.7.

Table 5.8.3.3-1: Features used by GMDviaMBMSbyxMB API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event feature is also supported.
2	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".		
Description: A clear textual description of the feature.		

5.9 ReportingNetworkStatus API

5.9.1 Overview

The ReportingNetworkStatus API is a RESTful API that allows the SCS/AS to be one-time or continuous notified of the network status in a geographic area. The ReportingNetworkStatus API defines a set of data models, resources and the related procedures for the creation and management of the network status reporting request. The corresponding JSON schema for the representation of the resources and operations defined by the ReportingNetworkStatus API is provided in its complete form in Annex A.9.

5.9.2 Data model

5.9.2.1 Resource data types

5.9.2.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.9.2.1.1-1 specifies data types re-used by the ReportingNetworkStatus API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the ReportingNetworkStatus API.

Table 5.9.2.1.1-1: ReportingNetworkStatus API re-used Data Types

Data type	Reference	Comments
GeographicArea	3GPP TS 29.572 [42]	Identifies the geographical information of the user(s).
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.9.4-1.

5.9.2.1.2 Type: NetworkStatusReportingSubscription

This type represents the subscription of reporting the network status. The same structure is used in the subscription request and subscription response.

Table 5.9.2.1.2-1: Definition of type NetworkStatusReportingSubscription

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	0..1	Link to the resource "Individual Network Status Reporting subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
notificationDestination	Link	1	A URI indicating the notification destination where T8 notification requests shall be delivered	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
locationArea	LocationArea	1	Identifies a location area. It can be either a list of cell IDs, or a list of Tracking Areas, or civic addresses, or a geographic area, or a combination of any of the above.	
timeDuration	DateTime	0..1	Identifies the time for which a continuous reporting is requested. Shall not be provided for one time reporting case.	
thresholdValues	array(CongestionValue)	0..N	Identifies a list of congestion level(s) with exact value that the SCS/AS requests to be informed of when reached. (NOTE 2)	
thresholdTypes	array(CongestionType)	0..N	Identifies a list of congestion level(s) with abstracted value that the SCS/AS requests to be informed of when reached. (NOTE 2)	
NOTE 1: Properties marked with a feature as defined in subclause 5.9.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: thresholdValues and thresholdTypes shall be mutually exclusive.				

5.9.2.2   Notification data types

5.9.2.2.1   Introduction

This clause defines data structures to be used in notifications.

5.9.2.2.2   Type: NetworkStatusReportingNotification

This data type represents a network status reporting notification which is sent from the SCEF to the SCS/AS.

Table 5.9.2.2.2-1: Definition of type NetworkStatusReportingNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
subscription	Link	1	Link to the subscription resource to which this notification is related.	
nsiValue	CongestionValue	0..1	Network Status Indicator based on exact value for congestion status received from RCAF(s). (NOTE 2)	
nsiType	CongestionType	0..1	Network Status Indicator based on abstracted value for congestion status. (NOTE 2)	
NOTE 1: Properties marked with a feature as defined in subclause 5.9.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: nsiValue and nsiType shall be mutually exclusive.				

5.9.2.3 Referenced simple data types and enumerations

5.9.2.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.9.2.3.2 Simple data types

The simple data types defined in table 5.9.2.3.2-1 shall be supported.

Table 5.9.2.3.2-1: Simple data types

Type name	Description
CongestionValue	Unsigned integer with valid values between 0 and 31. The value 0 indicates that there is no congestion. The value 1 is the lowest congestion level and value 31 is the highest congestion level.

5.9.2.3.3 Enumeration: CongestionType

The enumeration CongestionType represents abstracted values for congestion status.

Table 5.9.2.3.3-1: Enumeration CongestionType

Enumeration value	Description	Applicability (NOTE)
HIGH	The congestion status is high.	
MEDIUM	The congestion status is medium.	
LOW	The congestion status is low.	
NOTE: Properties marked with a feature as defined in subclause 5.9.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.9.3 Resource structure

5.9.3.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-net-stat-report/v1/

"apiRoot" is set as described in subclause 5.2.4. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.9.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
Network Status Reporting Subscriptions	/{scsAsId}/subscriptions	GET	Read all network status reporting subscription resources for a given SCS/AS.
		POST	Create a new network status reporting subscription resource.
Individual Network Status Reporting subscription	/{scsAsId}/subscriptions/{subscriptionId}	GET	Read a network status reporting subscription resource.
		PUT	Modify an existing continuous network status reporting subscription resource.
		DELETE	Delete an existing continuous network status reporting subscription resource.

5.9.3.2   Resource: Network Status Reporting Subscriptions

5.9.3.2.1   Introduction

This resource allows the SCS/AS to read all active long-term subscriptions related to a network status reporting.

5.9.3.2.2   Resource definition

Resource URI: **{apiRoot}/3gpp-net-stat-report/v1/{scsAsId}/subscriptions/**

This resource shall support the resource URI variables defined in table 5.9.3.2.2-1.

Table 5.9.3.2.2-1: Resource URI variables for resource "Network Status Reporting Subscriptions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.9.3.2.3   Resource methods

5.9.3.2.3.1   GET

The GET method allows to read all active network status reporting subscriptions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.2.3.1-1 and table 5.9.3.2.3.1-2.

Table 5.9.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(NetworkStatusReportingSubscription)	0..N	200 OK	The information about the network status reporting subscriptions related to the request URI is returned.
NOTE:	The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

5.9.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.9.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.9.3.2.3.4   POST

The POST method creates a new network status reporting subscription resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.2.3.4-1 and table 5.9.3.2.3.4-2.

Table 5.9.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.2.3.4-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	NetworkStatusReportingSubscription	1		Parameters to register a subscription to request notifications about network status information report with the SCEF.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	NetworkStatusReportingSubscription	1	201 Created	The subscription was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created due to exceeded quota limit. (NOTE 2)
NOTE 1:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			
NOTE 2:	The "cause" attribute within the "ProblemDetails" data structure may be set to "QUOTA_EXCEED" as defined in subclause 5.9.5.3.			

Table 5.9.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-net-stat-report/v1/{scsAsId}/subscriptions/{subscriptionId}

5.9.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.9.3.3   Resource: Individual Network Status Reporting Subscription

5.9.3.3.1   Introduction

This resource allows the SCS/AS to request for being notified about the network status using a long-term subscription.

5.9.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-net-stat-report/v1/{scsAsId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.9.3.3.2-1.

Table 5.9.3.3.2-1: Resource URI variables for resource "Individual Network Status Reporting Subscription"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
subscriptionId	string	Identifier of the subscription resource. The subscriptionId corresponds to the stage 2 TLTRI.

5.9.3.3.3   Resource methods

5.9.3.3.3.1   GET

The GET method allows to read an active network status reporting subscription resource. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.3.3.1-1 and table 5.9.3.3.3.1-2.

Table 5.9.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality	Remarks		
	none				
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**	
	NetworkStatusReporting Subscription	1	200 OK	The subscription information related to the request URI is returned.	
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

5.9.3.3.3.2   PUT

The PUT method modifies an existing subscription resource to update a subscription. The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.3.3.2-1 and table 5.9.3.3.3.2-2.

Table 5.9.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.3.3.2-2: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks	
	NetworkStatusReporting Subscription	1	Parameters to register a subscription to request notifications about network status information report with the SCEF.	
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	NetworkStatusReporting Subscription	1	200 OK	The subscription was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

5.9.3.3.3.3   PATCH

This HTTP method is not supported for the resource.

5.9.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.9.3.3.3.5   DELETE

The DELETE method deletes the resource and terminates the related network status reporting subscription. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.3.3.5-1 and table 5.9.3.3.3.5-2.

Table 5.9.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality	Remarks	
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	none		204 No Content	The subscription was terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

5.9.3.4 Void

5.9.3a Notifications

5.9.3a.1 General

The notifications provided by the ReportingNetworkStatus API are specified in this clause.

Table 5.9.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Network Status Reporting Notification	{notificationDestination}	POST	Report a detected network status for a subscription from the SCEF to the SCS/AS

5.9.3a.2 Network Status Reporting Notification

5.9.3a.2.1 Description

The Network Status Reporting Notification allows the SCEF to send notifications about the detected network status to the SCS/AS.

5.9.3a.2.2 Target URI

The Callback URI **"{notification_uri}"** shall be used with the callback URI variables defined in table 5.9.3a.2.2-1.

Table 5.9.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the SCS/AS during creation or modification of the network status reporting subscription.

5.9.3a.2.3 Standard Methods

5.9.3a.2.3.1 Notification via POST

The HTTP POST method reports the detected network status for a network status subscription. The SCEF shall initiate the HTTP POST request message and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.9.3a.2.3.1-1 and the response data structures and response codes specified in table 5.9.3a.2.3.1-2.

Table 5.9.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
NetworkStatusReportingNotification	1	The network status reporting notification provided by the SCEF.

Table 5.9.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	The network status reporting notification is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

5.9.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the NetworkStatusReportingNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.9.4   Used Features

The table below defines the features applicable to the ReportingNetworkStatus API. Those features are negotiated as described in subclause 5.2.7.

Table 5.9.4-1: Features used by ReportingNetworkStatus API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event feature is also supported.
2	Notification_test_event	The testing of notifications connections is supported according to subclause 5.2.5.3.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".		
Description: A clear textual description of the feature.		

5.9.5   Error handling

5.9.5.1   General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.9.5.2   Protocol Errors

In this release of the specification, there are no additional protocol errors applicable for the ReportingNetworkStatus API.

5.9.5.3   Application Errors

The application errors defined for the ReportingNetworkStatus API are listed in table 5.9.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.9.5.3-1.

Table 5.9.5.3-1: Application errors

Application Error	HTTP status code	Description
QUOTA_EXCEEDED	403 Forbidden	Not enough quota for SCS/AS.

5.10 CpProvisioning API

5.10.1 Overview

The CpProvisioning API is a RESTful API that allows the SCS/AS to add, change or delete the communication pattern parameter sets of the UE. The CpProvisioning API defines a set of data models, resources and the related procedures for the creation and management of the resources for communication pattern parameter provisioning. The corresponding JSON schema for the representation of the resources and operations defined by the CpProvisioning API is provided in its complete form in Annex A.10.

5.10.2 Data model

5.10.2.1 Resource data types

5.10.2.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.10.2.1.1-1 specifies data types re-used by the CpProvisioning API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the CpProvisioning API.

Table 5.10.2.1.1-1: CpProvisioning API re-used Data Types

Data type	Reference	Comments
NetworkAreaInfo	3GPP TS 29.554 [50]	Identifies a network area information.
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.10.4-1.

5.10.2.1.2 Type: CpInfo

This type represents the resources for communication pattern parameter provisioning. The same structure is used in the subscription request and subscription response.

Table 5.10.2.1.2-1: Definition of type CpInfo

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 2)
self	Link	0..1	Link to the resource "Individual CP Provisioning Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
mtcProviderId	string	0..1	Identifies the MTC Service Provider and/or MTC Application. (NOTE 3)	
externalId	ExternalId	0..1	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
msisdn	Msisdn	0..1	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
cpParameterSets	map(CpParameterSet)	1..N	Identifies a set of CP parameter information that may be part of this CpInfo structure.	
cpReports	map(CpReport)	0..N	Supplied by the SCEF and contains the CP set identifiers for which CP parameter(s) are not added or modified successfully. The failure reason is also included.	
NOTE 1: One of the properties "externalId", "msisdn" or "externalGroupId" shall be included.				
NOTE 2: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 3: The SCEF should check received MTC provider identifier and then the SCEF may: - override it with local configured value and send it to HSS; - send it directly to the HSS; or - reject the communication pattern parameter provisioning request.				

5.10.2.2   Referenced structured data types

5.10.2.2.1   Introduction

This clause defines structured data types that are referenced from data structures defined in the previous clauses.

5.10.2.2.2   Type: CpParameterSet

This data type represents an offered communication pattern parameter set sent from the SCC/AS to the SCEF.

Table 5.10.2.2.2-1: Definition of type CpParameterSet

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
setId	string	1	SCS/AS-chosen correlator provided by the SCS/AS in the request to create a resource fo CP parameter set(s). (NOTE 4)	
self	Link	0..1	Link to the resource "Individual CP set Provisioning". This parameter shall be supplied by the SCEF in HTTP responses.	
validityTime	DateTime	0..1	Identifies when the CP parameter set expires and shall be deleted. If absent, it indicates that there is no expiration time for this CP parameter set.	
periodicCommunicationIndicator	CommunicationIndicator	0..1	Identifies whether UE communicates periodically or on demand.	
communicationDurationTime	DurationSec	0..1	Identifies duration time of periodic communication	
periodicTime	DurationSec	0..1	Identifies interval time of periodic communication	
scheduledCommunicationTime	ScheduledCommunicationTime	0..1	Identifies time zone and day of the week when the UE is available for communication.	
scheduledCommunicationType	ScheduledCommunicationType	0..1	Indicates the Scheduled Communication Type. May only be present if the "scheduledCommunicationTime" attribute is provided.	ScheduledCommType_5G
stationaryIndication	StationaryIndication	0..1	Identifies whether the UE is stationary or mobile.	
batteryInds	array(BatteryIndication)	0..N	Indicates the power consumption type(s) of the UE. (NOTE 3)	
trafficProfile	TrafficProfile	0..1	Identifies the type of data transmission.	
expectedUmts	array(UmtLocationArea5G)	0..N	Identifies the UE's expected geographical movement. The attribute is only applicable in 5G. (NOTE 2)	ExpectedUMT_5G ExpectedUmtTime_5G
expectedUmtDays	DayOfWeek	0..1	Identifies the day of the week. If absent, it indicates every day of the week.	ExpectedUmtTime_5G
NOTE 1: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: The first instance of the attribute represents the start of the location, and the last one represents the stop of the location.				
NOTE 3: If "BATTERY_RECHARGE" is provided, "BATTERY_NO_RECHARGE" shall not be provided simultaneously, vice versa; If "BATTERY_REPLACE" is provided, "BATTERY_NO_REPLACE" shall not be provided simultaneously, vice versa; If "NO_BATTERY" is provided, any value indicating UE powered with battery shall not be provided simultaneously, vice versa.				
NOTE 4: A setId can only belong to one "Individual CP Provisioning Subscription" resource.				

5.10.2.2.3   Type: ScheduledCommunicationTime

This data type represents an offered scheduled communication time.

Table 5.10.2.2.3-1: Definition of type ScheduledCommunicationTime

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
daysOfWeek	array(DayOfWeek)	0..6	Identifies the day(s) of the week. If absent, it indicates every day of the week.	
timeOfDayStart	TimeOfDay	0..1	Identifies the start time of the day.	
timeOfDayEnd	TimeOfDay	0..1	Identifies the end time of the day.	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.10.2.2.4 Type: CpReport

This type represents a CP report to indicate the CP set identifier(s) which CP parameter(s) are not added or modified successfully and corresponding failure reason.

Table 5.10.2.2.4-1: Definition of type CpReport

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
setIds	array(string)	0..N	Identifies the CP set identifier(s) which CP parameter(s) are not added or modified successfully	
failureCode	CpFailureCode	1	Identifies the failure reason	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.10.2.2.5 Type: UmtLocationArea5G

This data type represents the user location area describing the UE moving trajectory which is sent from the AF.

Table 5.10.2.2.5-1: Definition of the UmtLocationArea5G data Type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
umtTime	TimeOfDay	0..1	This IE identifies the time of the day when the UE arrives the location.	ExpectedUmt Time_5G
umtDuration	DurationSec	0..1	This IE identifies the time duration the UE stays in the location.	ExpectedUmt Time_5G
NOTE 1: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: This data type also contains all the properties defined for LocationArea5G data type, these properties are applicable for ExpectedUMT_5G.				

5.10.2.3 Referenced simple data types and enumerations

5.10.2.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.10.2.3.2 Simple data types

The simple data types defined in table 5.10.2.3.2-1 shall be supported.

Table 5.10.2.3.2-1: Simple data types

Type name	Description

5.10.2.3.3 Enumeration: CommunicationIndicator

Table 5.10.2.3.3-1: Enumeration CommunicationIndicator

Enumeration value	Description	Applicability (NOTE)
PERIODICALLY	Identifies the UE communicates periodically	
ON_DEMAND	Identifies the UE communicates on demand	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.10.2.3.4 Enumeration: StationaryIndication

Table 5.10.2.3.4-1: Enumeration StationaryIndication

Enumeration value	Description	Applicability (NOTE)
STATIONARY	Identifies the UE is stationary	
MOBILE	Identifies the UE is mobile	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.10.2.3.5 Enumeration: CpFailureCode

The enumeration FailureCode represents the failure reason of the CP parameter provisioning.

Table 5.10.2.3.5-1: Enumeration CpFailureCode

Enumeration value	Description	Applicability (NOTE)
MALFUNCTION	This value indicates that something functions wrongly in CP parameter provisioning or the CP parameter provisioning does not function at all.	
SET_ID_DUPLICATED	The received CP set identifier(s) are already provisioned.	
OTHER_REASON	Other reason unspecified.	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.10.2.3.6 Enumeration: BatteryIndication

The enumeration BatteryIndication represents the type of power consumption.

Table 5.10.2.3.6-1: Enumeration BatteryIndication

Enumeration value	Description	Applicability (NOTE)
BATTERY_RECHARGE	UE powered with rechargeable battery.	
BATTERY_REPLACE	UE powered with replaceable battery.	
BATTERY_NO_RECHARGE	UE powered with no rechargeable battery.	
BATTERY_NO_REPLACE	UE powered with no replaceable battery.	
NO_BATTERY	UE not battery powered.	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.10.2.3.7 Enumeration: TrafficProfile

The enumeration TrafficProfile represents the type of data transmission.

Table 5.10.2.3.7-1: Enumeration TrafficProfile

Enumeration value	Description	Applicability (NOTE)
SINGLE_TRANS_UL	Uplink single packet transmission.	
SINGLE_TRANS_DL	Downlink single packet transmission.	
DUAL_TRANS_UL_FIRST	Dual packet transmission, firstly uplink packet transmission with subsequent downlink packet transmission.	
DUAL_TRANS_DL_FIRST	Dual packet transmission, firstly downlink packet transmission with subsequent uplink packet transmission.	
MULTI_TRANS	Multiple packet transmission.	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.10.2.3.8a Enumeration: ScheduledCommunicationType

The enumeration ScheduledCommunicationType represents the type of scheduled communication.

Table 5.10.2.3.8a-1: Enumeration ScheduledCommunicationType

Enumeration value	Description
DOWNLINK	Downlink only
UPLINK	Uplink only
BIDIRECTIONAL	Bi-directional

5.10.3 Resource structure

5.10.3.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-cp-parameter-provisioning/v1/

"apiRoot" is set as described in subclause 5.2.4. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.10.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
CP provisioning Subscriptions	/{scsAsId}/subscriptions	GET	Read all active CP parameter provisioning subscription resources for a given SCS/AS
		POST	Create new subscription resources of provisioning CP parameter set(s)
Individual CP Provisioning Subscription	/{scsAsId}/subscriptions/{subscriptionId}	GET	Read a CP parameter provisioning subscription resource
		PUT	Modify a CP parameter provisioning subscription resource
		DELETE	Delete a CP parameter provisioning subscription resource
Individual CP set Provisioning	/{scsAsId}/subscriptions/{subscriptionId}/cpSets/{setId} (NOTE)	PUT	Update CP at individual CP set(s) level associated with a CP parameter set Id.
		GET	Read CP at individual CP set(s) level associated with a CP parameter set Id.
		DELETE	Delete CP at individual CP set(s) level associated with a CP parameter set Id.
NOTE: This setId as a resource identifier is not necessarily identical as the CP parameter set Id received from the SCS/AS.			

5.10.3.2 Resource: CP Provisioning Subscriptions

5.10.3.2.1 Introduction

This resource allows the SCS/AS to read all active long-term transactions related to CP parameter provisioning resource management.

5.10.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-cp-parameter-provisioning/v1/{scsAsId}/subscriptions/**

This resource shall support the resource URI variables defined in table 5.10.3.2.2-1.

Table 5.10.3.2.2-1: Resource URI variables for resource "CP Provisioning Subscriptions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.10.3.2.3 Resource methods

5.10.3.2.3.1 GET

The GET method allows to read all active subscriptions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.10.3.2.3.1-1 and table 5.10.3.2.3.1-2.

Table 5.10.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.10.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	array(CpInfo)	0..N	200 OK	The subscription information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.10.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.2.3.2 PUT

This HTTP method is not supported for the resource.

5.10.3.2.3.3 PATCH

This HTTP method is not supported for the resource.

5.10.3.2.3.4 POST

The POST method allows to create subscription for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.10.3.2.3.4-1.

Table 5.10.3.2.3.4-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	CpInfo	1		Change information in CP parameter set.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	CpInfo	1	201 Created	The subscription was created successfully. The SCEF shall return the created subscription in the response payload body. CpReport may be included to provide detailed failure information for some CP sets.
	array(CpReport)	1..N	500 Internal Server Error	The CP parameters for all CP sets were not created successfully. CpReport is included with detailed information.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.10.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-cp-parameter-provisioning/v1/{scsAsId}/subscriptions/{subscriptionId}

5.10.3.2.3.5 DELETE

This HTTP method is not supported for the resource.

5.10.3.3 Resource: Individual CP Provisioning Subscription

5.10.3.3.1 Introduction

This resource allows the SCS/AS to manage resources for CP parameter provisioning using a subscription Id.

5.10.3.3.2 Resource definition

Resource URI: **{apiRoot}/3gpp-cp-parameter-provisioning/v1/{scsAsId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.10.3.3.2-1.

Table 5.10.3.3.2-1: Resource URI variables for resource "Individual CP Provisioning Subscription"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
subscriptionId	string	Identifier of the subscription resource. The subscriptionId corresponds to the stage 2 TLTRI.

5.10.3.3.3 Resource methods

5.10.3.3.3.1 GET

The GET method allows to read the subscription for a given SCS/AS and subscription Id. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.10.3.3.3.1-1 and table 5.10.3.3.3.1-2.

Table 5.10.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.10.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			

		Data type	Cardinality	Response codes	Remarks
Response body		CpInfo	1	200 OK	The subscription information related to the request URI is returned.
		none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
		none		308 Permanen t Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

Table 5.10.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.3.3.2   PUT

The PUT method allows to change (add/update/remove) one ore more CP parameter set(s) resource(s). The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.14.3.3.3.2-1.

Table 5.10.3.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	CpInfo	1		Change information in CP parameter set(s).
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	CpInfo	1	200 OK	The subscription was modified successfully. The SCEF shall return an updated subscription in the response payload body. CpReport may be included to provide detailed failure information for some CP sets.
	array(CpReport)	1..N	500 Internal Server Error	The CP parameters for all CP sets were not created successfully. CpReport is included with detailed information.
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

Table 5.10.3.3.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.3.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.3.3.3   PATCH

This HTTP method is not supported for the resource.

5.10.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.10.3.3.3.5   DELETE

The DELETE method allows to remove an active subscription. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.10.3.3.3.5-1.

Table 5.10.3.3.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks	
	none				
Response body		**Data type**	**Cardinality**	**Response codes**	**Remarks**
	none			204 No Content	The subscription was deleted successfully. The payload body shall be empty.
	none			307 Temporary Redirect	Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none			308 Permanent Redirect	Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.					

Table 5.10.3.3.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.3.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.4   Resource: Individual CP Set Provisioning

5.10.3.4.1   Introduction

This resource allows the SCS/AS to manage resources for CP parameter set provisioning associated with a CP parameter set Id.

5.10.3.4.2   Resource definition

Resource URI: **{apiRoot}/3gpp-cp-parameter-provisioning/v1/{scsAsId}/subscriptions/{subscriptionId}/cpSets/{setId}**

This resource shall support the resource URI variables defined in table 5.10.3.3.2-1.

Table 5.10.3.3.2-1: Resource URI variables for resource "Individual CP Set Provisioning"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
subscriptionId	string	Identifier of the subscription resource.
setId	string	Identifier of the CP parameter set

5.10.3.4.3   Resource methods

5.10.3.4.3.1   GET

The GET method allows to read a CP parameter set resource. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.10.3.4.3.1-1 and table 5.10.3.4.3.1-2.

Table 5.10.3.4.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.10.3.4.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	CpParameterSet	1	200 OK	The subscription information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.10.3.4.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.4.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.4.3.2   PUT

The PUT method allows to update a CP parameter set resource. The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.10.3.4.3.2-1.

Table 5.10.3.4.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks		
	CpParameterSet	1	Change information in CP parameter set.		
Response body					
	Data type	Cardinality	Response codes	Remarks	
	CpParameterSet	1	200 OK	The CP parameter set resource was modified successfully. The SCEF shall return an updated CP parameter set resource in the response payload body.	
	CpReport	1	409 Conflict	The CP parameters for the CP set were not updated successfully, applicable for error SET_ID_DUPLICATED in table 5.10.2.3.5-1.	
	CpReport	1	500 Internal Server Error	The CP parameters for the CP set were not updated successfully, applicable for other errors in table 5.10.2.3.5-1.	
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.					

Table 5.10.3.4.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.4.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.3.4.3.3   PATCH

This HTTP method is not supported for the resource.

5.10.3.4.3.4   POST

This HTTP method is not supported for the resource.

5.10.3.4.3.5   DELETE

The DELETE method allows to remove an active subscription. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support request and response data structures, and response codes, as specified in the table 5.10.3.4.3.5-1.

Table 5.10.3.4.3.5-1.: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body		Data type	Cardinality	Response codes	Remarks

	Data type	Cardinality	Response codes	Remarks
	none		204 No Content	The subscription was deleted successfully. The payload body shall be empty.
	none		307 Temporary Redirect	Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.10.3.4.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.10.3.4.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.10.4 Used Features

The table below defines the features applicable to the CpProvisioning API. Those features are negotiated as described in subclause 5.2.7.

Table 5.10.4-1: Features used by CpProvisioning API

Feature Number	Feature	Description
1	ExpectedUMT_5G	The UE's expected geographical movement is supported. This feature may only be supported in 5G.
2	ExpectedUmtTime_5G	The UE's expected geographical movement with recurrence time is supported. This feature requires the ExpectedUMT_5G feature support and may only be supported in 5G.
3	ScheduledCommType_5G	Support of scheduled communication type. This feature may only be supported in 5G.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.11 PfdManagement API

5.11.1 Overview

The PfdManagement API allows the SCS/AS to manage the PFDs via the SCEF. The PfdManagement API defines a set of data models, resources and the related procedures for the creation and management of the PFD management request. The corresponding JSON schema for the representation of the resources and operations defined by the PfdManagement API is provided in its complete form in Annex A.11.

5.11.2 Data model

5.11.2.1 Resource data types

5.11.2.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.11.2.1.1-1 specifies data types re-used by the PfdManagement API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the PfdManagement API.

Table 5.11.2.1.1-1: PfdManagement API re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.11.4-1.
Dnai	3GPP TS 29.571 [45]	DNAI

5.11.2.1.2 Type: PfdManagement

This type represents a PFD management resource for a PFD management request.

Table 5.11.2.1.2-1: Definition of type PfdManagement

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual PFD Management Transaction". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
pfdDatas	map(PfdData)	1..N	Each element uniquely identifies the PFDs for an external application identifier. Each element is identified in the map via an external application identifier as key. The response shall include successfully provisioned PFD data of application(s).	
pfdReports	map(PfdReport)	0..N	Supplied by the SCEF and contains the external application identifiers for which PFD(s) are not added or modified successfully. The failure reason is also included. Each element provides the related information for one or more external application identifier(s) and is identified in the map via the failure identifier as key.	
notificationDestination	Link	0..1	A URI indicating the notification destination for T8 notifications.	PfdMgmtNotification
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
NOTE: Properties marked with a feature as defined in subclause 5.11.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.11.2.1.3   Type: PfdData

This type represents a PFD request to add, update or remove PFD(s) for one external application identifier provided by the SCS/AS to the SCEF via T8 interface.

Table 5.11.2.1.3-1: Definition of type PfdData

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
externalAppId	string	1	Each element uniquely external application identifier (NOTE 2)	
self	Link	0..1	Link to the resource "Individual Application PFD Management". This parameter shall be supplied by the SCEF in HTTP responses.	
pfds	map(Pfd)	1..N	Contains the PFDs of the external application identifier. Each PFD is identified in the map via a key containing the PFD identifier. (NOTE x)	
allowedDelay	DurationSecRm	0..1	Indicates that the list of PFDs in this request should be deployed within the time interval indicated by the Allowed Delay	
cachingTime	DurationSecRo	0..1	SCEF supplied property, inclusion of this property means the allowed delayed cannot be satisfied, i.e. it is smaller than the caching time, but the PFD data is still stored.	
NOTE 1: Properties marked with a feature as defined in subclause 5.11.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: An externalAppId can only belong to one "individual PFD Management Transaction" resource.				
NOTE x: When multiple PFDs are associated with application identifier, the application is detected when any of the PFDs associated with the application identifier is matched.				

5.11.2.1.4 Type: Pfd

This data type represents a PFD for an external Application Identifier.

Table 5.11.2.1.4-1: Definition of type Pfd

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
pfdId	string	1	Identifies a PFD of an application identifier.	
flowDescriptions	array(string)	0..N	Represents a 3-tuple with protocol, server ip and server port for UL/DL application traffic. The content of the string has the same encoding as the IPFilterRule AVP value as defined in IETF RFC 6733 [46]. (NOTE 2)	
urls	array(string)	0..N	Indicates a URL or a regular expression which is used to match the significant parts of the URL. (NOTE 2)	
domainNames	array(string)	0..N	Indicates an FQDN or a regular expression as a domain name matching criteria. (NOTE 2)	
dnProtocol	DomainNameProtocol	0..1	Indicates the additional protocol and protocol field for domain names to be matched, it may only be provided when domainNames attribute is present.	DomainName Protocol
NOTE 1: Properties marked with a feature as defined in subclause 5.11.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: At least one of the properties "flowDescriptions", "urls" or "domainNames" shall be included. If a PFD contains multiple filter types, the PFD is only matched when every filter type contained in the PFD has a matching value.				

5.11.2.1.5 Type: PfdReport

This type represents a PFD report to indicate the external application identifier(s) which PFD(s) are not added or modified successfully and corresponding failure reason.

Table 5.11.2.1.5-1: Definition of type PfdReport

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
externalAppIds	array(string)	1..N	Identifies the external application identifier(s) which PFD(s) are not added or modified successfully	
failureCode	FailureCode	1	Identifies the failure reason	
cachingTime	DurationSec	0..1	It shall be included when the allowed delayed cannot be satisfied, i.e. it is smaller than the caching time configured in fetching PFD.	
locationArea	UserPlaneLocationArea	0..1	Identifies a location area of the user plane(s) which are unable to enforce the PFD(s).	
NOTE: Properties marked with a feature as defined in subclause 5.11.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

5.11.2.1.6 Type: UserPlaneLocationArea

This data type represents location area(s) of the user plane which is unable to enforce the provisioned PFD(s) successfully. It is sent from the SCEF to the SCS/AS.

Table 5.11.2.1.6-1: Definition of the UserPlaneLocationArea data Type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
locationArea	LocationArea	0..1	Identifies the network area information served by the user planes functions which are unable to enforce the provisioned PFD(s) successfully. It can be either a list of cell IDs, or a list of Tracking Areas, or civic addresses, or a geographic area, or a combination of any of the above.	
locationArea5G	LocationArea5G	0..1	Identifies the network area information served by the user planes functions which are unable to enforce the provisioned PFD(s) successfully. It can be either a list of E-UTRA cell IDs, or a list of NR cell ID, or a list of Tracking Areas, or civic addresses, or a geographic area, or a combination of any of the above.	FailureLocation_5G
dnais	array(DNAI)	0..N	Identifies a list of DNAI supported by the user plane functions which are unable to enforce the provisioned PFD(s) successfully.	FailureLocation_5G

5.11.2.2   Referenced simple data types and enumerations

5.11.2.2.1   Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.11.2.2.2   Simple data types

The simple data types defined in table 5.11.2.2.2-1 shall be supported.

Table 5.11.2.2.2-1: Simple data types

Type name	Description

5.11.2.2.3   Enumeration: FailureCode

The enumeration FailureCode represents the failure reason of the PFD management.

Table 5.11.2.2.3-1: Enumeration FailureCode

Enumeration value	Description	Applicability (NOTE)
MALFUNCTION	This value indicates that something functions wrongly in PFD provisioning or the PFD provisioning does not function at all.	
RESOURCE_LIMITATION	This value indicates there is resource limitation for PFD storage.	
SHORT_DELAY	This value indicates that the allowed delay is too short and PFD(s) are not stored.	
APP_ID_DUPLICATED	The received external application identifier(s) are already provisioned.	
PARTIAL_FAILURE	The PFD(s) are not provisioned to all PCEFs/TDFs/SMFs.	PfdMgmtNotification
OTHER_REASON	Other reason unspecified.	
NOTE: Properties marked with a feature as defined in subclause 5.11.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.		

5.11.2.2.4 Enumeration: DomainNameProtocol

Table 5.14.2.2.4-1: Enumeration DomainNameProtocol

Enumeration value	Description	Applicability (NOTE)
DNS_QNAME	Identifies the DNS protocol and the question name in DNS query.	
TLS_SNI	Identifies the Server Name Indication in TLS ClientHello message.	
TLS_SAN	Identifies the Subject Alternative Name in TLS ServerCertificate message.	
TLS_SCN	Identifies the Subject Common Name in TLS ServerCertificate message.	
NOTE: Properties marked with a feature as defined in subclause 5.10.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.11.3 Resource structure

5.11.3.1 General

All resource URIs of this API should have the following root:

> **{apiRoot}/3gpp-pfd-management/v1/**

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-pfd-management" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.11.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
PFD Management Transactions	/{scsAsId}/transactions/	GET	Read all PFDs for a given SCS/AS
		POST	Create PFDs for a given SCS/AS and one or more external Application Identifier(s)
Individual PFD Management Transaction	/{scsAsId}/transactions/{transactionId}	GET	Read all PFDs for a given SCS/AS and a transaction for one or more external Application Identifier(s)
		PUT	Update PFDs for a given SCS/AS and a transaction for one or more external Application Identifier(s)
		DELETE	Delete PFDs for a given SCS/AS and a transaction for one or more external Application Identifier(s)
Individual Application PFD Management	/{scsAsId}/transactions/{transactionId}/applications/{appId} (NOTE)	PUT	Update PFDs at individual application level
		PATCH	Update PFDs at individual application level
		GET	Read PFDs at individual application level
		DELETE	Delete PFDs at individual application level
NOTE: The appId as the resource identifier is not necessarily identical as the external application identifier received from the SCS/AS.			

5.11.3.2 Resource: PFD Management Transactions

5.11.3.2.1 Introduction

This resource allows an SCS/AS to read all PFDs for a given SCS/AS or create PFDs for a given SCS/AS with one or more external Application Identifier(s).

5.11.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-pfd-management/v1/{scsAsId}/transactions/**

This resource shall support the resource URI variables defined in table 5.11.3.2.2-1.

Table 5.11.3.2.2-1: Resource URI variables for resource "PFD Management Transactions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.11.3.2.3 Resource methods

5.11.3.2.3.1 GET

The GET method allows to read all active PFDs for a given SCS/AS. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the request and response data structures, and response codes, as specified in the table 5.11.3.2.3.1-1.

Table 5.11.3.2.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(PfdManagement)	0..N	200 OK	All transactions including the PFDs for the SCS/AS in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.11.3.2.3.1-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.2.3.1-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.2.3.2 PUT

This HTTP method is not supported for the resource.

5.11.3.2.3.3 POST

The POST method creates new PFDs resource(s) for a given SCS/AS with one or more external Application Identifier provided by the SCS/AS. It is initiated by the SCS/AS and answered by the SCEF. The SCS/AS shall provide the external Application Identifier in the message body and upon receipt of the HTTP POST message, the SCEF shall generate the resource "Individual PFD Management Transaction" and also the sub-resource(s) "Individual Application PFD Management", the SCEF shall send these resource URI in the HTTP response to the SCS/AS.

This method shall support the request and response data structures, and response codes, as specified in the table 5.11.3.2.3.3-1.

Table 5.11.3.2.3.3-1: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks
	PfdManagement	1		
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	PfdManagement	1	201 Created	The PFDs resource was created successfully. PfdReport may be included to provide detailed failure information for some applications.
	array(PfdReport)	1..N	500 Internal Server Error	The PFDs for all applications were not created successfully. PfdReport is included with detailed information.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

Table 5.11.3.2.3.3-2: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-pfd-management/v1/{scsAsId}/transactions/{transactionId}

5.11.3.2.3.4 PATCH

This HTTP method is not supported for the resource.

5.11.3.2.3.5 DELETE

To remove all PFDs for a given SCS/AS, the SCS/AS shall use the HTTP DELETE method on the "PFD Management Transactions" resource.

The possible response messages from the SCEF, depending on whether the DELETE request is successful or unsuccessful, are shown in Table 5.11.3.2.3.5-1.

Table 5.11.3.2.3.5-1: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	none		204 No Content	All PFDs were removed successfully. The SCEF shall not return a response payload.
	none		307 Temporary Redirect	Temporary redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.11.3.2.3.5-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.2.3.5-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.3   Resource: Individual PFD Management Transaction

5.11.3.3.1   Introduction

This resource allows an SCS/AS to read, or update or delete PFDs for a given SCS/AS and a transaction Id for one or more application identifier(s) at the SCEF.

5.11.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-pfd-management/v1/{scsAsId}/transactions/{transactionId}**

This resource shall support the resource URI variables defined in table 5.11.3.3.2-1.

Table 5.11.3.3.2-1: Resource URI variables for resource "Individual PFD Management Transaction"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
transactionId	string	Identifier of the transaction. The transactionId corresponds to the stage 2 TLTRI.

5.11.3.3.3   Resource methods

5.11.3.3.3.1   GET

The GET method allows to read all PFDs for a given SCS/AS and a transaction Id generated by the SCEF. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.11.3.3.3.1-1.

Table 5.11.3.3.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body		Data type	Cardinality	Response codes	Remarks

Response body	Data type	Cardinality	Response codes	Remarks
	PfdManagement	1	200 OK	The PFDs for the SCS/AS and the transaction Id for one or more application identifier(s) in the request URI are returned.
	none		307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.11.3.3.3.1-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.3.3.1-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.3.3.2   PUT

The PUT method modifies the PFDs for a given SCS/AS and an existing transaction Id generated by the SCEF. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the request and response data structures, and response codes, as specified in the table 5.11.3.3.3.2-1.

Table 5.11.3.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks	
	PfdManagement	1		update of PFD(s) for an existing transaction Id.	
Response body	Data type	Cardinality	Response codes	Remarks	
	PfdManagement	1	200 OK	The PFDs were updated successfully. PfdReport may be included to provide detailed failure information for some applications.	
	array(PfdReport)	1..N	500 Internal Server Error	The PFDs for all applications were not updated successfully. PfdReport is included with detailed information.	
	none		307 Temporary Redirect	Temporary redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
	none		308 Permanent Redirect	Permanent redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.	
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.					

Table 5.11.3.3.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.3.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.3.3.3 PATCH

This HTTP method is not supported for the resource.

5.11.3.3.3.4 POST

This HTTP method is not supported for the resource.

5.11.3.3.3.5 DELETE

The DELETE method deletes the PFDs for a given SCS/AS and an transaction Id generated by the SCEF. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.11.3.3.3.5-1 and table 5.11.3.3.3.5-2.

Table 5.11.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
N/A			

Table 5.11.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body				
	Data type	**Cardinality**	**Response codes**	**Remarks**
	None		204 No Content	The PFDs for an existing transaction Id were removed successfully.
	none		307 Temporary Redirect	Temporary redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.11.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.4 Resource: Individual Application PFD Management

5.11.3.4.1 Introduction

This resource allows an SCS/AS to read, update or remove the PFDs for a given SCS/AS and an external Application Identifier at the SCEF.

5.11.3.4.2 Resource definition

Resource URI: **{apiRoot}/3gpp-pfd-management/v1/{scsAsId}/transactions/{transactionId}/applications/{appId}**

This resource shall support the resource URI variables defined in table 5.11.3.4.2-1.

Table 5.11.3.3.4-1: Resource URI variables for resource "Individual Application PFD Management"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
transactionId	string	Identifier of the transaction.
appId	string	External Application Identifier.

5.11.3.4.3 Resource methods

5.11.3.4.3.1 GET

The GET method allows to read all PFDs at individual application level. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support request and response data structures, and response codes, as specified in the table 5.11.3.4.3.1-1.

Table 5.11.3.4.3.1-1: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks	
	None				
Response body		Data type	Cardinality	Response codes	Remarks
	PfdData	1		200 OK	The PFDs at individual application level in the request URI are returned.
	none			307 Temporary Redirect	Temporary redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none			308 Permanent Redirect	Permanent redirection, during transaction retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

Table 5.11.3.4.3.1-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.4.3.1-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.4.3.2 PUT

The PUT method modifies the PFDs at individual application level. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the request and response data structures, and response codes, as specified in the table 5.11.3.4.3.2-1.

Table 5.11.3.4.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	PfdData	1		Update of PFD(s) for an existing external application identifier.
Response body	Data type	Cardinality	Response codes	Remarks
	PfdData	1	200 OK	The PFDs for an existing external application identifier were updated successfully.
	PfdReport	1	403 Forbidden	The PFDs for the application were not updated successfully, applicable for error SHORT_DELAY in table 5.11.2.2.3-1.
	PfdReport	1	409 Conflict	The PFDs for the application were not updated successfully, applicable for error APP_ID_DUPLICATED in table 5.11.2.2.3-1.
	PfdReport	1	500 Internal Server Error	The PFDs for the application were not updated successfully, applicable for other errors in table 5.11.2.2.3-1.
	none		307 Temporary Redirect	Temporary redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

Table 5.11.3.4.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.4.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.4.3.3   PATCH

The PATCH method modifies the PFDs at individual application level. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the request and response data structures, and response codes, as specified in the table 5.11.3.3.3-1.

Table 5.11.3.3.3.3-1: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality		Remarks
	PfdData	1		Update of PFD(s) for an existing external application identifier.
Response body	Data type	Cardinality	Response codes	Remarks
	PfdData	1	200 OK	The PFDs for an existing external application identifier were updated successfully.
	PfdReport	1	403 Forbidden	The PFDs for the application were not updated successfully, applicable for error SHORT_DELAY in table 5.11.2.2.3-1.
	PfdReport	1	409 Conflict	The PFDs for the application were not updated successfully, applicable for error APP_ID_DUPLICATED in table 5.11.2.2.3-1.
	PfdReport	1	500 Internal Server Error	The PFDs for the application were not updated successfully, applicable for other errors in table 5.11.2.2.3-1.
	none		307 Temporary Redirect	Temporary redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during transaction modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

Table 5.11.3.4.3.3-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.4.3.3-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.4.3.4   POST

This HTTP method is not supported for the resource.

5.11.3.4.3.5   DELETE

The DELETE method deletes all the PFDs at individual application level. It is initiated by the SCS/AS and answered by the SCEF.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.11.3.4.3.5-1 and table 5.11.3.4.3.5-2.

Table 5.11.3.4.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
N/A			

Table 5.11.3.4.3.5-2: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks	
	none				
Response body		Data type	Cardinality	Response codes	Remarks
	none			204 No Content	The PFDs were removed successfully.
	none			307 Temporary Redirect	Temporary redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none			308 Permanen t Redirect	Permanent redirection, during transaction termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.					

Table 5.11.3.4.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.11.3.4.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.11.3.5 Void

5.11.3a Notifications

5.11.3a.1 General

The notifications provided by the PfdManagement API are specified in this clause.

Table 5.11.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
PFD Management Notification	{notificationDestination}	POST	Send asynchronous PFD management result.

5.11.3a.2 PFD Management Notification

5.11.3a.2.1 Description

The PFD Management Notification allows the SCEF to send notification about PFD management result to the SCS/AS, if the PFD provisioning fails within the allowed delay.

5.11.3a.2.2 Target URI

The Callback URI **"{notificationDestination}"** shall be used with the callback URI variables defined in table 5.11.3a.2.2-1.

Table 5.11.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the SCS/AS during creation or modification of the PFD management transaction.

5.11.3a.2.3 Standard Methods

5.11.3a.2.3.1 Notification via POST

The HTTP POST method reports the asynchronous PFD management result. The SCEF shall initiate the HTTP POST request message and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.11.3a.2.3.1-1 and the response data structures and response codes specified in table 5.11.3a.2.3.1-2.

Table 5.11.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
PfdReport	1..N	The PFD management notification provided by the SCEF.

Table 5.11.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	The PFD management notification is received successfully.
none		307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS instance where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.11.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.11.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.11.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the PfdReport may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.11.4   Used Features

The table below defines the features applicable to the PfdManagement API. Those features are negotiated as described in subclause 5.2.7.

Table 5.11.4-1: Features used by PfdManagement API

Feature Number	Feature	Description
1	DomainNameProtocol	This feature supports the additional protocol matching condition for the domain name in PFD data.
2	PfdMgmtNotification	This feature supports PFD management notification.
3	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
4	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
5	FailureLocation_5G	This feature supports the notification of specific failure location area of UPF for PFD management in 5G. This feature is applicable only if PfdMgmtNotification feature is also supported. The feature supports the 5G requirement and may only be supported in 5G.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.12   ECRControl API

5.12.1   Overview

The ECRControl API is a custom API (RPC interaction) that allows the SCS/AS to query or configure the enhanced converage restriction over 3GPP networks. The ECRControl API defines a set of data models and related custom operation procedures for the enhanced coverage restriction control request. The corresponding JSON schema for the representation of the operations defined by the ECRControl API is provided in its complete form in Annex A.12.

5.12.2   Data model

5.12.2.1   Data types

5.12.2.1.1   Introduction

This clause defines data structures to be used in the request and response.

Table 5.12.2.1.1-1 specifies data types re-used by the ECRControl API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the ECRControl API.

Table 5.12.2.1.1-1: ECRControl API re-used Data Types

Data type	Reference	Comments
EcRestrictionDataWb	3GPP TS 29.503 [63]	
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.12.4-1.

5.12.2.1.2 Type: ECRControl

This type represents the Enhanced Coverage Restriction control request. The structure is used only for request.

Table 5.12.2.1.2-1: Definition of type ECRControl

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
supportedFeatures	SupportedFeatures	1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7.	
mtcProviderId	string	0..1	Identifies the MTC Service Provider and/or MTC Application. (NOTE 4).	
scsAsId	string	0..1	Identifier of the SCS/AS.	
externalId	ExternalId	0..1	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	0..1	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
ecrDataWbs	array(PlmnEcRestrictionDataWb)	0..N	Identifies whether enhanced coverage mode are restricted or not. This attribute shall not be present for the query custom operation.	ECR_WB_5G
restrictedPlmnIds	array(PlmnId)	0..N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be restricted. This attribute shall not be present for the query custom operation. (NOTE 3)	
allowedPlmnIds	array(PlmnId)	0..N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be allowed. This attribute shall not be present for the query custom operation. (NOTE 3)	

NOTE 1: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.
NOTE 2: One of the properties "externalId" or "msisdn" shall be included.
NOTE 3: "restrictedPlmnIds" and "allowedPlmnIds" shall be mutually exclusive.
NOTE 4: The SCEF should check received MTC provider identifier and then the SCEF may:
   - override it with local configured value and send it to HSS;
   - send it directly to the HSS; or
   - reject the Enhanced Coverage Restriction control request.				

5.12.2.1.3 Type: ECRData

This data type represents the current visited PLMN (if any) and the current settings of enhanced coverage restriction. The structure is used only for response.

Table 5.12.2.1.3-1: Definition of type ECRData

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
supportedFeatures	SupportedFeatures	1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7.	
visitedPlmnId	PlmnId	0..1	Indicates the current visited PLMN.	
ecrDataWbs	array(PlmnEcRestrictionDataWb)	0..N	Identifies whether enhanced coverage mode are restricted or not.	ECR_WB_5G
restrictedPlmnIds	array(PlmnId)	0..N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be restricted. (NOTE 2)	
allowedPlmnIds	array(PlmnId)	0..N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be allowed. (NOTE 2)	
NOTE 1: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 2: "restrictedPlmnIds" and "allowedPlmnIds" shall be mutually exclusive.				

5.12.2.1.4   Type: PlmnEcRestrictionDataWb

Table 5.12.2.1.4-1: Definition of type PlmnEcRestrictionDataWb

Attribute name	Data type	Cardinality	Description	Applicability
plmnId	PlmnId	1	Indicates the PLMN where enhanced coverage mode shall be restricted or not.	
plmnEcrDataWb	EcRestrictionDataWb	0..1	Identifies whether enhanced coverage mode are restricted or not.	

5.12.3   Custom Operations without associated resources

5.12.3.1   Overview

Custom operations used for this API are summarized in table 5.12.3.1-1. "apiRoot" is set as described in subclause 5.2.4.

Table 5.12.3.1-1: Custom operations without associated resources

Operation name	Custom operation URI	Mapped HTTP method	Description
query	/query	POST	Query the status of enhanced converage restriction for a UE
configure	/configure	POST	Configure the enhanced converage restriction for a UE

5.12.3.2   Operation: query

5.12.3.2.1   Description

This custom operation allows an SCS/AS to query the current status of enhanced converage restriction for a UE via the T8 interface as defined in 3GPP TS 23.682 [2].

5.12.3.2.2   Operation Definition

This operation shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.12.3.2.2-1 and table 5.12.3.2.2-2.

Table 5.12.3.2.2-1: URI query parameters supported by the POST on this operation

Name	Data type	Cardinality	Remarks
none specified			

Table 5.12.3.2.2-2: Data structures supported by the POST request/response on this operation

	Data type	Cardinality		Remarks
Request body	ECRControl	1		Parameters to query the current status of Enhanced Coverage Restriction.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	ECRData	1	200 OK	The requested information was returned successfully.
	ProblemDetails	0..1	403 Forbidden	The requested information was rejected due to exceeded quota limit. (NOTE 2)
	none		307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				
NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "QUOTA_EXCEED" as defined in subclause 5.12.5.3.				

Table 5.12.3.2.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.12.3.2.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.12.3.3   Operation: configure

5.12.3.3.1   Description

This custom operation allows an SCS/AS to configure the current setting of enhanced converage restriction for a UE via the T8 interface as defined in 3GPP TS 23.682 [2].

5.12.3.3.2 Operation Definition

This operation shall support the request data structures specified in table 5.12.3.3.2-1 and the response data structure and response codes specified in table 5.12.3.3.2-2.

Table 5.12.3.3.2-1: URI query parameters supported by the POST on this operation

Name	Data type	Cardinality	Remarks
none specified			

Table 5.12.3.3.2-2: Data structures supported by the POST request/response on this operation

	Data type	Cardinality		Remarks
Request body	ECRControl	1		Parameters to configure the setting of Enhanced Coverage Restriction.
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	ECRData	1	200 OK	The Enhanced Coverage Restriction setting was configured successfully
	ProblemDetails	0..1	403 Forbidden	The requested information was rejected due to exceeded quota limit. (NOTE 2)
	none		307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				
NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "QUOTA_EXCEED" as defined in subclause 5.12.5.3.				

Table 5.12.3.3.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.12.3.3.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.12.4 Used Features

The table below defines the features applicable to the ECRControl API. Those features are negotiated as described in subclause 5.2.7.

Table 5.12.4-1: Features used by ECRControl API

Feature Number	Feature	Description
1	ECR_WB_5G	The enhanced coverage restriction control information indicates whether the enhanced coverage modes are restricted or not for the WB UE. The feature is not applicable to the pre-5G.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.12.5 Error handling

5.12.5.1 General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.12.5.2 Protocol Errors

In this release of the specification, there are no additional protocol errors applicable for the ECRControl API.

5.12.5.3 Application Errors

The application errors defined for the ECRControl API are listed in table 5.12.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.12.5.3-1.

Table 5.12.5.3-1: Application errors

Application Error	HTTP status code	Description
QUOTA_EXCEEDED	403 Forbidden	Not enough quota for SCS/AS.

5.13 NpConfiguration API

5.13.1 Overview

The NpConfiguration API is a RESTful API that allows the SCS/AS to send suggested network parameters to influence certain aspects of UE/network behaviour such as the UE's PSM, extended idle mode DRX, and extended buffering configurations. The NpConfiguration API defines a set of data models, resources and the related procedures for the creation and management of the network parameter configuration. The corresponding JSON schema for the representation of the resources and operations defined by the NpConfiguration API is provided in its complete form in Annex A.13.

5.13.2 Data model

5.13.2.1 Resource data types

5.13.2.1.1 Introduction

This clause defines data structures to be used in resource representations.

Table 5.13.2.1.1-1 specifies data types re-used by the NetworkParameterConfiguration API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the NetworkParameterConfiguration API.

Table 5.13.2.1.1-1: NetworkParameterConfiguration API re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.13.4-1.

5.13.2.1.2 Type: NpConfiguration

This type represents a configuration of network parameters. The same structure is used in the configuration request and response.

Table 5.13.2.1.2-1: Definition of type NpConfiguration

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 2)
self	Link	0..1	Link to the resource "Individual NP Configuration". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
mtcProviderId	string	0..1	Identifies the MTC Service Provider and/or MTC Application. (NOTE 4)	
externalId	ExternalId	0..1	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
msisdn	Msisdn	0..1	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	
externalGroupId	ExternalGroupId	0..1	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
maximumLatency	DurationSec	0..1	This parameter may be included to identify the maximum delay acceptable for downlink data transfers.	
maximumResponseTime	DurationSec	0..1	This parameter may be included to identify the length of time for which the UE stays reachable to allow the SCS/AS to reliably deliver the required downlink data.	
suggestedNumberOfDlPackets	integer	0..1	This parameter may be included to identify the number of packets that the serving gateway shall buffer in case that the UE is not reachable.	
groupReportingGuardTime	DurationSec	0..1	Identifies the time for which the SCEF can aggregate the reports detected by the UEs in a group and report them together to the SCS/AS, as specified in subclause 5.6.0 of 3GPP TS 23.682 [2].	
notificationDestination	Link	0..1	A URI indicating the notification destination where T8 notification requests shall be delivered. The attribute shall be provided if the attribute "externalGroupId" is provided.	
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise. The attribute may only be provided if the attribute "externalGroupId" is provided.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4. The attribute may only be provided if the attribute "externalGroupId" is provided.	Notification_websocket
validityTime	DateTime	0..1	Identifies when the network parameter expires and shall be deleted locally if it expires. The attribute is only applicable in 5G. (NOTE 3)	NpExpiry_5G
NOTE 1: Only one of the properties "externalId", "msisdn" or "externalGroupId" shall be included.				
NOTE 2: Properties marked with a feature as defined in subclause 5.13.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				
NOTE 3: If this attribute is omitted, no expiry for network parameter configuration applies.				
NOTE 4: The SCEF should check received MTC provider identifier and then the SCEF may: - override it with local configured value and send it to HSS; - send it directly to the HSS; or - reject the network parameter configuration request.				

5.13.2.1.3　　　　Type: NpConfigurationPatch

This type represents a configuration of network parameters provided by the SCS/AS to the SCEF. The structure is used for HTTP PATCH request.

Table 5.13.2.1.3-1: Definition of type NpConfigurationPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
maximumLatency	DurationSecRm	0..1	This parameter may be included to identify the maximum delay acceptable for downlink data transfers.	
maximumResponseTime	DurationSecRm	0..1	This parameter may be included to identify the length of time for which the UE stays reachable to allow the SCS/AS to reliably deliver the required downlink data.	
suggestedNumberOfDlPackets	integer	0..1	This parameter may be included to identify the number of packets that the serving gateway shall buffer in case that the UE is not reachable.	
groupReportGuardTime	DurationSecRm	0..1	Identifies the time for which the SCEF can aggregate the reports detected by the UEs in a group and report them together to the SCS/AS, as specified in subclause 5.6.0 of 3GPP TS 23.682 [2].	
validityTime	DateTimeRm	0..1	Identifies when the network parameter expires and shall be deleted locally if it expires. The attribute is only applicable in 5G.	NpExpiry_5G
NOTE:	Properties marked with a feature as defined in subclause 5.13.4 are applicable as described in subclause 5.2.7. If no feature are indicated, the related property applies for all the features.			

5.13.2.1.4　　　　Type: ConfigurationNotification

This type represents a configuration result notification.

Table 5.13.2.1.4-1: Definition of the ConfigurationNotification data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
configuration	Link	1	Link to the configuration resource to which this notification is related.	
configResults	array(ConfigResult)	0..N	Each element identifies a notification of grouping configuration result.	
appliedParam	AppliedParameterConfiguration	0..1	Indicates the applied parameter configuration in the network. The "maximumDetectionTime" attribute in AppliedParameterConfiguration data type is not applicable for Network Parameter configuration.	Enhanced_param_config
NOTE:	Properties marked with a feature as defined in subclause 5.13.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.			

5.13.3　　Resource structure

5.13.3.1　　　　General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-network-parameter-configuration/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-network-parameter-configuration" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.13.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
NP Configurations	/{scsAsId}/configurations/	GET	Read all NP configurations for a given SCS/AS
		POST	Create a new NP configuration
Individual NP Configuration	/{scsAsId}/configurations/{configurationId}	PUT	Replace all of the properties in an existing NP configuration
		PATCH	Modify some properties in an existing NP configuration
		GET	Read an existing NP configuration
		DELETE	Delete a NP configuration

5.13.3.2   Resource: NP Configurations

5.13.3.2.1   Introduction

This resource allows an SCS/AS to read all active network parameter configurations or create a new configuration to configure network parameters.

5.13.3.2.2   Resource definition

Resource URI: **{apiRoot}/3gpp-network-parameter-configuration /v1/{scsAsId}/configurations/**

This resource shall support the resource URI variables defined in table 5.13.3.2.2-1.

Table 5.13.3.2.2-1: Resource URI variables for resource "NP Configurations"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.13.3.2.3   Resource methods

5.13.3.2.3.1   GET

The GET method allows to read all active configurations indicated by the resource URI as defined in subclause 5.13.3.2.2. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.2.3.1-1 and table 5.13.3.2.3.1-2.

Table 5.13.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	array(NpConfiguration)	0..N	200 OK	The NP configuration information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.13.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.13.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.13.3.2.3.2   PUT

This HTTP method is not supported for the resource.

5.13.3.2.3.3   PATCH

This HTTP method is not supported for the resource.

5.13.3.2.3.4   POST

The POST method creates a new configuration resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message. The SCEF shall construct the URI of the created resource.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.2.3.4-1 and table 5.13.3.2.3.4-2.

Table 5.13.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.2.3.4-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks	
	NpConfiguration	1		Parameters to create a new configuration to configure network parameters with the SCEF.	
Response body	Data type	Cardinality	Response codes	Remarks	
	NpConfiguration	1	201 Created	The configuration was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.	
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created since one or more of the received parameters are out of the range defined by operator policies. (NOTE 2)	
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply. NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "PARAMETER_OUT_OF_RANGE" as defined in subclause 5.13.5.3. In such case, the "invalidParams" attribute may be included within the "ProblemDetails" data structure to indicate which parameters are out of range.					

Table 5.13.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-network-parameter-configuration/v1/{scsAsId}/configurations/{configurationId}

5.13.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.13.3.3   Resource: Individual NP Configuration

5.13.3.3.1   Introduction

This resource allows an SCS/AS to query, update and delete a network parameter configuration indicated by the resource URI as defined in subclause 5.13.3.3.2.

5.13.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-network-parameter-configuration/v1/{scsAsId}/configurations/{configurationId}**

This resource shall support the resource URI variables defined in table 5.13.3.3.2-1.

Table 5.13.3.2.2-1: Resource URI variables for resource "Individual NP Configuration"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration resource.

5.13.3.3.3   Resource methods

5.13.3.3.3.1   GET

The GET method allows to read an active configuration indicated by the resource URI as defined in subclause 5.13.3.3.2. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.3.3.1-1 and table 5.13.3.3.3.1-2.

Table 5.13.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks

Table 5.13.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	NpConfiguration	1	200 OK	The configuration information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.13.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.13.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.13.3.3.3.2   PUT

The PUT method modifies an existing configuration indicated by the resource URI as defined in subclause 5.13.3.3.2. The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.3.3.2-1 and table 5.13.3.3.3.2-2.

Table 5.13.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.3.3.2-2: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	NpConfiguration	1		Update of network parameter(s) for an existing Configuration.
Response body	Data type	Cardinality	Response codes	Remarks
	NpConfiguration	1	200 OK	The resource was updated successfully. The SCEF shall return an updated Configuration information in the response.
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created since one or more of the received parameters are out of the range defined by operator policies. (NOTE 2)
	none		307 Temporary Redirect	Temporary redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				
NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "PARAMETER_OUT_OF_RANGE" as defined in subclause 5.13.5.3. In such case, the "invalidParams" attribute may be included within the "ProblemDetails" data structure to indicate which parameters are out of range.				

Table 5.13.3.3.3.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.13.3.3.3.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.13.3.3.3.3 PATCH

The PATCH method shall be used to update some properties in an existing configuration indicated by the Resource URI as defined in subclause 5.13.3.3.2. The SCS/AS shall initiate the HTTP PATCH request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.3.3.3-1 and table 5.13.3.3.3.3-2.

Table 5.13.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.3.3.3-2: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality	Remarks	
	NpConfigurationPatch	1	Partial update an existing network parameter configuration.	

Response body	Data type	Cardinality	Response codes	Remarks
	NpConfiguration	1	200 OK	The configuration was updated successfully. The SCEF shall return an updated configuration information in the response.
	ProblemDetails	0..1	403 Forbidden	The subscription resource is not allowed to be created since one or more of the received parameters are out of the range defined by operator policies. (NOTE 2)
	none		307 Temporary Redirect	Temporary redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during configuration modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE 1: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				
NOTE 2: The "cause" attribute within the "ProblemDetails" data structure may be set to "PARAMETER_OUT_OF_RANGE" as defined in subclause 5.13.5.3. In such case, the "invalidParams" attribute may be included within the "ProblemDetails" data structure to indicate which parameters are out of range.				

Table 5.13.3.3.3.3-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.13.3.3.3.3-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.13.3.3.3.4 POST

This HTTP method is not supported for the resource.

5.13.3.3.3.5 DELETE

The DELETE method deletes an existing configuration resource "Individual NP Configuration". The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.3.3.5-1 and table 5.13.3.3.3.5-2.

Table 5.13.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
N/A			

Table 5.13.3.3.3.5-2: Data structures supported by the DELETE request/response on the resource

Request body	Data type	Cardinality		Remarks
	none			

	Data type	Cardinality	Response codes	Remarks
	none		204 No Content	The configuration was terminated successfully. The response body shall be empty.
	array(ConfigResult)	1..N	200 OK	The configuration was terminated successfully, the configuration failure information for group members shall be included if received.
Response body	none		307 Temporary Redirect	Temporary redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during configuration termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.13.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.13.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.13.3.4 Void

5.13.3a Notifications

5.13.3a.1 General

The notifications provided by the NpConfiguration API are specified in this clause.

Table 5.13.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Configuration Notification	{notificationDestination}	POST	Report a grouping configuration result from the SCEF to the SCS/AS

5.13.3a.2 Configuration Notification

5.13.3a.2.1 Description

The Configuration Notification allows the SCEF to send notifications about grouping configuration result to the SCS/AS.

5.13.3a.2.2 Target URI

The Callback URI **"{notificationDestination}"** shall be used with the callback URI variables defined in table 5.13.3a.2.2-1.

Table 5.13.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the SCS/AS during creation or modification of the NP configuration subscription.

5.13.3a.2.3 Standard Methods

5.13.3a.2.3.1 Notification via POST

The HTTP POST method reports the grouping configuration results for a NP configuration subscription. The SCEF shall initiate the HTTP POST request message and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.13.3a.2.3.1-1 and the response data structures and response codes specified in table 5.13.3a.2.3.1-2.

Table 5.13.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
ConfigurationNotification	1	The grouping configuration result notification provided by the SCEF.

Table 5.13.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	The notification is received successfully.
none		307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.13.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.13.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.13.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the ConfigurationNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.13.4   Used Features

The table below defines the features applicable to the NpConfiguration API. Those features are negotiated as described in subclause 5.2.7.

Table 5.13.4-1: Features used by NpConfiguration API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
2	Notification_test_event	The testing of notification connection is supported according to subclause 5.2.5.3.
3	NpExpiry_5G	The network parameter expiry is supported. This feature may only be supported in 5G.
4	Enhanced_param_config	This feature supports the co-existence of multiple event configurations for target UE(s) if there are parameters affecting periodic RAU/TAU timer and/or Active Time.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.13.5 Error handling

5.13.5.1 General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.13.5.2 Protocol Errors

In this release of the specification, there are no additional protocol errors applicable for the NpConfiguration API.

5.13.5.3 Application Errors

The application errors defined for the NpConfiguration API are listed in table 5.13.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.13.5.3-1.

Table 5.13.5.3-1: Application errors

Application Error	HTTP status code	Description
PARAMETER_OUT_OF_RANGE	403 Forbidden	Indicates that the resource is not allowed to be created since one or more of the received parameter are out of range defined by operator policies.

5.14 AsSessionWithQoS API

5.14.1 Overview

The AsSessionWithQoS API is a RESTful API that allows the SCS/AS to set up a session with SCEF with required QoS based on the application and service requirement. The AsSessionWithQoS API defines a set of data models, resources and the related procedures for the creation and management of the AS sessions with required QoS. The corresponding JSON schema for the representation of the resources and operations defined by the AsSessionWithQoS API is provided in its complete form in Annex A.14.

5.14.2 Data model

5.14.2.1 Resource data types

5.14.2.1.1 Introduction

This clause defines data structures to be used in resource representations, including subscription resources.

Table 5.14.2.1.1-1 specifies data types re-used by the AsSessionWithQoS API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the AsSessionWithQoS API.

Table 5.14.2.1.1-1: AsSessionWithQoS API re-used Data Types

Data type	Reference	Comments
EthFlowDescription	3GPP TS 29.514 [52]	Defines a packet filter for an Ethernet flow.(NOTE 1)
MacAddr48	3GPP TS 29.571 [45]	MAC Address.
ReportingFrequency	3GPP TS 29.512 [8]	Indicates the frequency for the reporting, such as event triggered, periodic, when the PDU Session is released, and/or any combination. (NOTE 2)
RequestedQosMonitoringParameter	3GPP TS 29.512 [8]	Indicate the UL packet delay, DL packet delay or round trip packet delay between the UE and the UPF is to be monitored when the QoS Monitoring for URLLC is enabled for the service data flow. (NOTE 2)
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.14.4-1.
NOTE 1: In order to support a set of MAC addresses with a specific range in the traffic filter, feature MacAddressRange_5G as specified in clause 5.14.4 shall be supported.		
NOTE 2: In order to support QoS Monitoring, feature QoSMonitoring_5G as specified in clause 5.14.4 shall be supported.		

5.14.2.1.2 Type: AsSessionWithQoSSubscription

This type represents an AS session request with specific QoS for the service provided by the SCS/AS to the SCEF via T8 interface. The structure is used for subscription request and response.

Table 5.14.2.1.2-1: Definition of type AsSessionWithQoSSubscription

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	0..1	Link to the resource "Individual AS Session with Required QoS Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
notificationDestination	Link	1	Contains the URL to receive the notification bearer level event(s) from the SCEF.	
flowInfo	array(FlowInfo)	0..N	Describe the IP data flow which requires QoS. (NOTE 2)	
ethFlowInfo	array(EthFlowDescription)	0..N	Identifies Ethernet packet flows. (NOTE 2)	EthAsSessionQoS_5G
qosReference	string	0..1	Identifies a pre-defined QoS information	
altQoSReferences	array(string)	0..N	Identifies an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority.	AlternativeQoS_5G
disUeNotif	boolean	0..1	Indicates whether to disable QoS flow parameters signalling to the UE when the SMF is notified by the NG-RAN of changes in the fulfilled QoS situation. The fulfilled situation is either the QoS profile or an Alternative QoS Profile. - true: the QoS flow parameters signalling to the UE is disabled; - false (default): the QoS flow parameters signalling to the UE is not disabled.	DisableUENotification_5G
ueIpv4Addr	Ipv4Addr	0..1	The Ipv4 address of the UE. (NOTE 2)	
ipDomain	string	0..1	The IPv4 address domain identifier. The attribute may only be provided if the ueIpv4Addr attribute is present.	
ueIpv6Addr	Ipv6Addr	0..1	The Ipv6 address of the UE. (NOTE 2)	
macAddr	MacAddr48	0..1	Identifies the MAC address. (NOTE 2)	EthAsSessionQoS_5G
usageThreshold	UsageThreshold	0..1	Time period and/or traffic volume in which the QoS is to be applied.	
sponsorInfo	SponsorInformation	0..1	Indicates a sponsor information	
qosMonInfo	QosMonitoringInformation	0..1	Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed.	QoSMonitoring_5G
requestTestNotification	boolean	0..1	Set to true by the SCS/AS to request the SCEF to send a test notification as defined in subclause 5.2.5.3. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_websocket
NOTE 1: Properties marked with a feature as defined in subclause 5.14.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: One of "ueIpv4Addr", "ueIpv6Addr" or "macAddr" shall be included. If ipv4 or ipv6 address is provided, IP flow information shall be provided. If MAC address is provided, Ethernet flow information shall be provided.				

5.14.2.1.3 Type: AsSessionWithQoSSubscriptionPatch

This type represents an AS session request with specific QoS for the service provided by the SCS/AS to the SCEF via T8 interface. The structure is used for PATCH request.

Table 5.14.2.1.3-1: Definition of type AsSessionWithQoSSubscriptionPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
flowInfo	array(FlowInfo)	0..N	Describe the data flow which requires QoS.	
ethFlowInfo	array(EthFlowDescription)	0..N	Describes Ethernet packet flows.	EthAsSessionQoS_5G
qosReference	string	0..1	Pre-defined QoS reference	
altQoSReferences	array(string)	0..N	Identifiers an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority.	AlternativeQoS_5G
disUeNotif	boolean	0..1	Indicates whether to disable QoS flow parameters signalling to the UE when the SMF is notified by the NG-RAN of changes in the fulfilled QoS situation. The fulfilled situation is either the QoS profile or an Alternative QoS Profile. - true: the QoS flow parameters signalling to the UE is disabled; - false: the QoS flow parameters signalling to the UE is not disabled.	DisableUENotification_5G
usageThreshold	UsageThresholdRm	0..1	Time period and/or traffic volume in which the QoS is to be applied.	
qosMonInfo	QosMonitoringInformationRm	0..1	Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed.	QoSMonitoring_5G
NOTE: Properties marked with a feature as defined in subclause 5.14.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.14.2.1.4 Type: UserPlaneNotificationData

This type represents the parameters which shall be notify the SCS/AS for user plane event(s).

Table 5.14.2.1.4-1: Definition of the UserPlaneNotificationData data type

Attribute name	Data type	Cardinality	Description
transaction	Link	1	Link to the transaction resource to which this notification is related.
eventReports	array(UserPlaneEventReport)	1..N	Contains the reported event and applicable information

5.14.2.1.5 Type: UserPlaneEventReport

This type represents an event report for user plane. It shall comply with the provisions defined in table 5.14.2.1.5-1.

Table 5.14.2.1.5-1: Definition of the UserPlaneEventReport data type

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
event	UserPlaneEvent	1	Indicates the event reported by the SCEF.	
accumulatedUsage	AccumulatedUsage	0..1	Contains the applicable information corresponding to the event.	
flowIds	array(integer)	0..N	Identifies the flows that were sent during event subscription	
appliedQosRef	string	0..1	The currently applied QoS reference. Applicable for event QOS_NOT_GUARANTEED or SUCCESSFUL_RESOURCES_ALLOCATION. When it is omitted and the "event" attribute is QOS_NOT_GUARANTEED, the event report indicates that the lowest priority alternative QoS profile could not be fulfilled either.	AlternativeQoS_5G
qosMonReports	array(QosMonitoringReport)	0..N	Contains the QoS Monitoring Reporting information.	QoSMonitoring_5G
NOTE: Properties marked with a feature as defined in subclause 5.14.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.14.2.1.6   Type: QosMonitoringInformation

Table 5.14.2.1.6-1: Definition of type QosMonitoringInformation

Attribute name	Data type	Cardinality	Description	Applicability
reqQosMonParams	array(RequestedQosMonitoringParameter)	1..N	Indicates the UL packet delay, DL packet delay and/or round trip packet delay between the UE and the UPF is to be monitored when the QoS Monitoring for URLLC is enabled for the service data flow.	
repFreqs	array(ReportingFrequency)	1..N	Indicates the frequency for the reporting, such as event triggered, periodic, when the PDU Session is released, and/or any combination.	
repThreshDl	Uinteger	0..1	Unsigned integer identifying a threshold in units of milliseconds for DL packet delay. It shall be present when the AF requests to report the downlink delay when a delay is exceeding the DL delay threshold.	
repThreshUl	Uinteger	0..1	Unsigned integer identifying a threshold in units of milliseconds for UL packet delay. It shall be present when the AF requests to report the uplink delay when a delay is exceeding the UL delay threshold.	
repThreshRp	Uinteger	0..1	Unsigned integer identifying a threshold in units of milliseconds for round trip packet delay. It shall be present when the AF requests to report the round trip delay when a delay is exceeding the round trip delay threshold.	
waitTime	DurationSec	0..1	Indicates the minimum waiting time between subsequent reports. Only applicable when the "repFreqs" attribute includes "EVENT_TRIGGERED".	
repPeriod	DurationSec	0..1	Indicates the time interval between successive reporting. It shall be present when the AF requests to report the delay periodically.	

5.14.2.1.7 Type: QosMonitoringInformationRm

This type represents a QoS Monitoring Information which is defined in subclause 5.14.2.1.7 but defined with "nullable: true" property so it can be removed in "JSON Merge Patch", as defined in IETF RFC 7396 [39]. It shall comply with the provisions defined in table 5.14.2.1.7-1.

Duration and volume are also removable in "JSON Merge Patch".

Table 5.14.2.1.7-1: Definition of type QosMonitoringInformationRm

Attribute name	Data type	Cardinality	Description	Applicability
reqQosMonParams	array(RequestedQosMonitoringParameter)	0..N	Indicates the UL packet delay, DL packet delay and/or round trip packet delay between the UE and the UPF is to be monitored when the QoS Monitoring for URLLC is enabled for the service data flow.	
repFreqs	array(ReportingFrequency)	0..N	Indicates the frequency for the reporting, such as event triggered, periodic, when the PDU Session is released, and/or any combination.	
repThreshDl	UintegerRm	0..1	Unsigned integer identifying a threshold in units of milliseconds for DL packet delay. It shall be present when the AF requests to report the downlink delay when a delay is exceeding the DL delay threshold.	
repThreshUl	UintegerRm	0..1	Unsigned integer identifying a threshold in units of milliseconds for UL packet delay. It shall be present when the AF requests to report the uplink delay when a delay is exceeding the UL delay threshold.	
repThreshRp	UintegerRm	0..1	Unsigned integer identifying a threshold in units of milliseconds for round trip packet delay. It shall be present when the AF requests to report the round trip delay when a delay is exceeding the round trip delay threshold.	
waitTime	DurationSecRm	0..1	Indicates the minimum waiting time between subsequent reports. Only applicable when the "repFreqs" attribute includes "EVENT_TRIGGERED".	
repPeriod	DurationSecRm	0..1	Indicates the time interval between successive reporting. It shall be present when the AF requests to report the delay periodically.	

5.14.2.1.8 Type: QosMonitoringReport

Table 5.14.2.1.8-1: Definition of type QosMonitoringReport

Attribute name	Data type	Cardinality	Description	Applicability
ulDelays	array(Uinteger)	0..N	Uplink packet delay in units of milliseconds. (NOTE)	
dlDelays	array(Uinteger)	0..N	Downlink packet delay in units of milliseconds. (NOTE)	
rtDelays	array(Uinteger)	0..N	Round trip delay in units of milliseconds. (NOTE)	
NOTE: In this release of the specification the maximum number of elements in the array is 2.				

5.14.2.2 Referenced simple data types and enumerations

5.14.2.2.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.14.2.2.2 Simple data types

The simple data types defined in table 5.14.2.2.2-1 shall be supported.

Table 5.14.2.2.2-1: Simple data types

Type name	Description

5.14.2.2.3 Enumeration: UserPlaneEvent

The enumeration UserPlaneEvent represents the user plane event.

Table 5.14.2.2.3-1: Enumeration UserPlaneEvent

Enumeration value	Description	Applicability (NOTE)
SESSION_TERMINATION	Indicates that Rx session is terminated.	
LOSS_OF_BEARER	Indicates a loss of a bearer.	
RECOVERY_OF_BEARER	Indicates a recovery of a bearer.	
RELEASE_OF_BEARER	Indicates a release of a bearer.	
USAGE_REPORT	Indicates the usage report event.	
FAILED_RESOURCES_ALLOCATION	Indicates the resource allocation is failed.	
SUCCESSFUL_RESOURCES_ALLOCATION	Indicates the resource allocation is successful.	
QOS_GUARANTEED	The QoS targets of one or more SDFs are guaranteed again.	AlternativeQoS_5G
QOS_NOT_GUARANTEED	The QoS targets of one or more SDFs are not being guaranteed.	AlternativeQoS_5G
QOS_MONITORING	Indicates a QoS monitoring event.	QoSMonitoring_5G
NOTE: Properties marked with a feature as defined in subclause 5.14.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.		

5.14.3 Resource structure

5.14.3.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-as-session-with-qos/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-as-session-with-qos" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.14.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
AS Session with Required QoS Subscriptions	/{scsAsId}/subscriptions/	GET	Get all subscription resources for a given SCS/AS.
		POST	Create a new AS session.
Individual AS Session with Required QoS Subscription	/{scsAsId}/subscriptions/{subscriptionId}	GET	Read a subscription resource for a given SCS/AS and a subscription Id.
		PUT	Modify a subscription resource for a given SCS/AS and a subscription Id.
		PATCH	Modify a subscription resource for a given SCS/AS and a subscription Id.
		DELETE	Delete a subscription resource for a given SCS/AS and a subscription Id.

5.14.3.2 Resource: AS Session with Required QoS subscriptions

5.14.3.2.1 Introduction

This resource allows the SCS/AS to read all active AS session with required QoS subscription resources, or create a new subscription resource for the SCS/AS.

5.14.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-as-session-with-qos /v1/{scsAsId}/subscriptions/**

This resource shall support the resource URI variables defined in table 5.14.3.2.2-1.

Table 5.14.3.2.2-1: Resource URI variables for resource "AS Session with Required QoS Subscriptions"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.14.3.2.3 Resource methods

5.14.3.2.3.1 GET

The GET method allows to read all active subscriptions for a given SCS/AS. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.14.3.2.3.1-1 and table 5.14.3.2.3.1-2.

Table 5.14.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks

Table 5.14.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			

	Data type	Cardinality	Response codes	Remarks
Response body	array(AsSessionWithQoSSubscription)	0..N	200 OK	The subscription information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.14.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.14.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.14.3.2.3.2 PUT

This HTTP method is not supported for the resource.

5.14.3.2.3.3 PATCH

This HTTP method is not supported for the resource.

5.14.3.2.3.4 POST

The POST method creates a new subscription resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message. The SCEF shall construct the URI of the created resource using that URI.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.14.3.2.3.4-1 and table 5.14.3.2.3.4-2.

Table 5.14.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks

Table 5.14.3.2.3.4-2: Data structures supported by the POST request/response by the resource

	Data type	Cardinality		Remarks
Request body	AsSessionWithQoSSubscription	1		Parameters to create a subscription for an AS session with required QoS for the service requirement.
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	AsSessionWithQoSSubscription	1	201 Created	The subscription was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.14.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-as-session-with-qos /v1/{scsAsId}/subscriptions/{subscriptionId}

5.14.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.14.3.3   Resource: Individual AS Session with Required QoS Subscription

5.14.3.3.1   Introduction

This resource allows an SCS/AS to query, update and delete an AS session with required QoS subscription.

5.14.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-as-session-with-qos /v1/{scsAsId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.14.3.3.2-1.

Table 5.14.3.2.2-1: Resource URI variables for resource "Individual AS Session with Required QoS Subscription"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS of type ScsAsId.
subscriptionId	string	Identifier of the subscription resource of type string. The subscriptionId corresponds to the stage 2 TLTRI.

5.14.3.3.3   Resource methods

5.14.3.3.3.1   GET

The GET method allows to read a subscription resource. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.14.3.3.3.1-1 and table 5.14.3.3.3.1-2.

Table 5.14.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks

Table 5.14.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	Data type	Cardinality	Response codes	Remarks
	AsSessionWithQoSSubscription	1	200 OK	The subscription information related to the resource URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.14.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.14.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.14.3.3.3.2   PUT

The PUT method allows changing the service information of an active subscription. The properties "ueIpv4Addr" or "ueIpv6Addr" shall remain unchanged from previously provided value.

This method shall support request and response data structures, and response codes, as specified in the table 5.14.3.3.3.2-1.

Table 5.14.3.3.3.2-1: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality		Remarks
	AsSessionWithQoSSubscription	1		Set up AS session with required QoS.
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	AsSessionWithQoSSubscription	1	200 OK	The subscription was modified successfully. The SCEF shall return an updated subscription in the response payload body.
	none		307 Temporary Redirect	Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

Table 5.14.3.3.3.2-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.14.3.3.3.2-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.14.3.3.3.3   PATCH

The PATCH method allows to change the service information of an active subscription.

This method shall support request and response data structures, and response codes, as specified in the table 5.14.3.3.3.3-1.

Table 5.14.3.3.3.3-1: Data structures supported by the PATCH request/response by the resource

<table>
<tr><td rowspan="2">**Request body**</td><td>**Data type**</td><td>**Cardinality**</td><td colspan="2">**Remarks**</td></tr>
<tr><td>AsSessionWithQoSSubscriptionPatch</td><td>1</td><td colspan="2">Partial update of an AS session with required QoS.</td></tr>
<tr><td rowspan="4">**Response body**</td><td>**Data type**</td><td>**Cardinality**</td><td>**Response codes**</td><td>**Remarks**</td></tr>
<tr><td>AsSessionWithQoSSubscription</td><td>1</td><td>200 OK</td><td>The subscription was modified successfully.

The SCEF shall return an updated subscription in the response payload body.</td></tr>
<tr><td>none</td><td></td><td>307 Temporary Redirect</td><td>Temporary redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.</td></tr>
<tr><td>none</td><td></td><td>308 Permanent Redirect</td><td>Permanent redirection, during subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.</td></tr>
<tr><td colspan="5">NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.</td></tr>
</table>

Table 5.14.3.3.3.3-2: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.14.3.3.3.3-3: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.14.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.14.3.3.3.5   DELETE

The DELETE method deletes the AsSessionWithQoSSubscription resource and terminates the related subscription. The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.14.3.3.3.5-1 and table 5.14.3.3.3.5-2.

Table 5.14.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks

Table 5.14.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
	Data type	**Cardinality**	**Response codes**	**Remarks**
Response body	none		204 No Content	The subscription was terminated successfully. The response body shall be empty.
	UserPlaneNotificationData	1	200 OK	The subscription was terminated successfully. The user plane notification data shall be included in the response.
	none		307 Temporary Redirect	Temporary redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during subscription termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.			

Table 5.14.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.14.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.14.3.4 Void

5.14.3a Notifications

5.14.3a.1 General

The notifications provided by the AsSessionWithQoS API are specified in this clause.

Table 5.14.3a-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notificationUri}	POST	Notify the bearer level event(s) from the SCEF to the SCS/AS

5.14.3a.2   Event Notification

5.14.3a.2.1   Description

The Event Notification allows the SCEF to notify the SCS/AS of the bearer level event(s).

5.14.3a.2.2   Target URI

The Callback URI **"{notificationUri}"** shall be used with the callback URI variables defined in table 5.14.3a.2.2-1.

Table 5.14.3a.2.2-1: Callback URI variables

Name	Data type	Definition
notificationUri	Link	Reference provided by the SCS/AS when the SCS/AS requests to sponsor the traffic from the beginning or to become the chargeable party at a later point. This URI shall be provided within the "notificationDestination" attribute in the AsSessionWithQoSSubscription type.

5.14.3a.2.3   Standard Methods

5.14.3a.2.3.1   Notification via POST

The POST method allows to notify SCS/AS of the bearer level event(s) by the SCEF and the SCS/AS shall respond to the message.

This method shall support the request data structures specified in table 5.14.3a.2.3.1-1 and the response data structures and response codes specified in table 5.14.3a.2.3.1-2.

Table 5.14.3a.2.3.1-1: Data structures supported by the POST Request Body

Data type	Cardinality	Description
UserPlaneNotificationData	1	Representation of the bearer level notification.

Table 5.14.3a.2.3.1-2: Data structures supported by the POST Response Body

Data type	Cardinality	Response codes	Description
none		204 No Content	This case represents a successful notification of bearer level event(s).
none		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
none		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.14.3a.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.14.3a.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.14.3a.2.3.2   Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the UserPlaneNotificationData may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4.

5.14.4   Used Features

The table below defines the features applicable to the AsSessionWithQoS API. Those features are negotiated as described in subclause 5.2.7.

Table 5.14.4-1: Features used by AsSessionWithQoS API

Feature Number	Feature	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported according to subclause 5.2.5.4. This feature requires that the Notification_test_event featute is also supported.
2	Notification_test_event	The testing of notifications connections is supported according to subclause 5.2.5.3.
3	EthAsSessionQoS_5G	Setting up required QoS for Ethernet UE. This feature may only be supported in 5G.
4	MacAddressRange_5G	Indicates the support of a set of MAC addresses with a specific range in the traffic filter. This feature may only be supported in 5G.
5	AlternativeQoS_5G	Indicates the support of alternative QoS requirements and the QoS notification (i.e. whether the QoS targets for SDF(s) are not guaranteed or guaranteed again). This feature may only be supported in 5G.
6	QoSMonitoring_5G	Indicates the support of QoS Monitoring. This feature may only be supported in 5G.
7	DisableUENotification_5G	Indicates the support of disabling QoS flow parameters signalling to the UE when the SMF is notified by the NG-RAN of changes in the fulfilled QoS situation. This feature may only be supported in 5G. This feature requires that the AlternativeQoS_5G featute is also supported.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.15   MsisdnLessMoSms API

5.15.1   Overview

The MsisdnLessMoSms API allows the delivery of MSISDN-less mobile originated SMSs from the SCEF to the SCS/AS. The corresponding JSON schema for the representation of the resources and operations defined by the MsisdnLessMoSms API is provided in its complete form in Annex A.15.

5.15.2   Data model

5.15.2.1   Notification data types

5.15.2.1.1   Introduction

This clause defines data structures to be used in notifications.

Table 5.15.2.1.1-1 specifies data types re-used by the MsisdnLessMoSms API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the MsisdnLessMoSms API.

Table 5.15.2.1.1-1: MsisdnLessMoSms API re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.15.4-1.

5.15.2.1.2 Type: MsisdnLessMoSmsNotification

This data type represents a MSISDN-less MO SMS, which is sent from the SCEF to the SCS/AS.

Table 5.15.2.1.2-1: Definition of type MsisdnLessMoSmsNotification

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
supportedFeatures	SupportedFeatures	1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7.	
sms	Bytes	1	The MSISDN-less MO SMS containing a short message transfer protocol data unit (TPDU) which is defined in 3GPP TS 23.040 [43] and represents the user data field carried by the short message service relay sub-layer protocol.	
externalId	string	1	External identifier has the form username@realm.	
applicationPort	Port	1	Unsigned integer used to uniquely identify the triggering application addressed in the device, see subclause 9.2.3.24.4 in TS 23.040 [43] for further details.	
NOTE: Properties marked with a feature as defined in subclause 5.15.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.15.2.1.3 Type: MsisdnLessMoSmsNotificationReply

This data type represents a reply to an MSISDN-less MO SMS notification and is sent from the SCS/AS to the SCEF.

Table 5.15.2.1.3-1: Definition of type MsisdnLessMoSmsNotificationReply

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
supportedFeatures	SupportedFeatures	1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7.	
NOTE: Properties marked with a feature as defined in subclause 5.3.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.15.3 Resource structure

5.15.3.1 General

All resource URIs of this API should have the following root:

> **{notificationDestination}**

"{notificationDestination}" is determined based on preconfigured information in the SCEF as described in subclause 4.4.14.2. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.15.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
MSISDN-less MO SMS Notification	{notificationDestination}	POST	Deliver a received MSIDN-less MO SMS from the SCEF to the SCS/AS

5.15.3.2 MSISDN-less MO SMS Notification

5.15.3.2.1 Introduction

The MSISDN-less MO SMS Notification allows the SCEF to deliver a received MSIDN-less MO SMS to the SCS/AS.

5.15.3.2.2 Resource definition

The Callback URI: **{notificationDestination}** shall support the callback URI variables defined in table 5.15.3.2.2-1.

Table 5.15.3.2.2-1: Callback URI variables for resource "MSISDN-less MO SMS Notification"

Name	Data type	Definition
notificationDestination	Link	A URI indicating the notification destination where T8 notification requests shall be delivered to. This URI shall be preconfigured in the SCEF.

5.15.3.2.3 Standard methods

5.15.3.2.3.1 Notification via POST

The HTTP POST method delivers a received MSISDN-less MO SMS. The SCEF shall initiate the HTTP POST request message and the SCS/AS shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.15.3.2.3.1-1 and table 5.15.3.2.3.1-2.

Table 5.15.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.15.3.2.3.1-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality		Remarks	
	MsisdnLessMoSmsNotification	1		The MSISDN-less MO SMS.	
Response body	Data type	Cardinality	Response codes	Remarks	
	MsisdnLessMoSmsNotificationReply		200 OK	The MSISDN-less MO SMS is received successfully.	
	none		307 Temporary Redirect	Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.	
	none		308 Permanent Redirect	Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SCS/AS where the notification should be sent. Redirection handling is described in subclause 5.2.10.	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.					

Table 5.15.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

Table 5.15.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SCS/AS towards which the notification should be redirected.

5.15.4   Used Features

The table below defines the features applicable to the MsisdnLessMoSms API. Those features are negotiated as described in subclause 5.2.7.

Table 5.15.4-1: Features used by MsisdnLessMoSms API

Feature Number	Feature	Description
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.16   RacsParameterProvisioning API

5.16.1   Overview

The RacsParameterProvisioning API is a RESTful API that allows the SCS/AS to provision manufacturer specific UE radio capability parameters. The RacsParameterProvisioning API defines a set of data models, resources and the related procedures for the creation and management of the parameters. The corresponding JSON schema for the representation of the resources and operations defined by the RacsParameterProvisioning API is provided in its complete form in Annex A.16.

5.16.2   Data model

5.16.2.1   Resource data types

5.16.2.1.1   Introduction

This clause defines data structures to be used in resource representations.

Table 5.16.2.1.1-1 specifies data types re-used by the RacsParameterProvisioning API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the RacsParameterProvisioning API.

Table 5.16.2.1.1-1: RacsParameterProvisioning API re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [45]	Used to negotiate the applicability of the optional features defined in table 5.16.4-1.
TypeAllocationCode	3GPP TS 29.571 [45]	Used to signal UE model's IMEI-TAC values in table 5.16.2.1.4-1.

5.16.2.1.2   Type: RacsProvisioningData

This type represents a UE radio capability data provided by the SCS/AS to the SCEF.

Table 5.16.2.1.2-1: Definition of type RacsProvisioningData

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	0..1	Link to the resource "Individual RACS parameter provisioning". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	0..1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7. This attribute shall be provided in the POST request and in the response of successful resource creation.	
racsConfigs	map(RacsConfiguration)	1..N	Identifies the configuration related to manufacturer specific UE radio capability. Each element uniquely identifies an RACS configuration for an RACS ID and is identified in the map via the RACS ID as key. The response shall include successfully provisioned RACS data.	
racsReports	map(RacsFailureReport)	0..N	Supplied by the SCEF. Contains the RACS IDs for which the RACS data are not provisioned successfully.	
NOTE: Properties marked with a feature as defined in subclause 5.16.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.16.2.1.3   Type: RacsFailureReport

This type represents a radio capability data provisioning report provided by the SCEF.

Table 5.16.2.1.3-1: Definition of type RacsFailureReport

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
racsIds	array(string)	1..N	Identifies the RACS ID(s) for which the RACS data are not provisioned successfully.	
failureCode	RacsFailureCode	1	It indicates the failure reason.	
NOTE: Properties marked with a feature as defined in subclause 5.16.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.16.2.1.4   Type: RacsConfiguration

This type represents a single UE radio capability configuration data provided by the SCS/AS to the SCEF.

Table 5.16.2.1.4-1: Definition of type RacsConfiguration

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
racsId	string	1	The UE radio capability ID provided by the SCS/AS to identify the UE radio capability data. See 3GPP TS 23.003 [14] for the encoding. (NOTE 3)	
racsParamEps	string	0..1	The UE radio capability data in EPS, its encoding shall comply with the UE-CapabilityRAT-ContainerList as defined in subclause 6.3.6 of 3GPP TS 36.331 [59]. (NOTE 2, NOTE 4)	
racsParam5Gs	string	0..1	The UE radio capability data in 5GS, its encoding shall comply with the UE-CapabilityRAT-ContainerList as defined in subclause 6.3.3 of 3GPP TS 38.331 [60]. (NOTE 2, NOTE 4)	
imeiTacs	array(TypeAllocationCode)	1..N	Related UE model's IMEI-TAC values	
NOTE 1: Properties marked with a feature as defined in subclause 5.16.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				
NOTE 2: At least one of racsParamEps or racsParam5Gs shall be provided.				
NOTE 3: A racsId shall only belong to one "Individual RACS Parameter Provisioning" resource.				
NOTE 4: UTRAN capabilities shall not be included within the "racsParamEps" attribute and/or the "racsParam5Gs" attribute.				

5.16.2.1.5   Type: RacsProvisioningDataPatch

This type represents a UE radio capability data provided by the SCS/AS to the SCEF. This structure is used in the PATCH request.

Table 5.16.2.1.5-1: Definition of type RacsProvisioningDataPatch

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
racsConfigs	map(RacsConfigurationRm)	0..N	Identifies the configuration related to manufactuer specific UE radio capability. Each element uniquely identifies an RACS configuration for an RACS ID and is identified in the map via the RACS ID as key.	
NOTE: Properties marked with a feature as defined in subclause 5.16.4 are applicable as described in subclause 5.2.7. If no features are indicated, the related property applies for all the features.				

5.16.2.1.6   Type: RacsConfigurationRm

This type represents a single UE radio capability configuration data provided by the SCS/AS to the SCEF. It is defined with "nullable: true" property.

Table 5.16.2.1.6-1: Definition of type RacsConfigurationRm

Attribute name	Data type	Cardinality	Description	Applicability
racsParamEps	string	0..1	The UE radio capability data in EPS, its encoding shall comply with the UE-CapabilityRAT-ContainerList as defined in subclause 6.3.6 of 3GPP TS 36.331 [59].	
racsParam5Gs	string	0..1	The UE radio capability data in 5GS, its encoding shall comply with the UE-CapabilityRAT-ContainerList as defined in subclause 6.3.3 of 3GPP TS 38.331 [60].	
imeiTacs	array(TypeAllocationCode)	0..N	Related UE model's IMEI-TAC values.	

5.16.2.2 Referenced simple data types and enumerations

5.16.2.2.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses. In addition, data types and enumerations defined in subclause 5.2.1 can be referenced.

5.16.2.2.2 Simple data types

The simple data types defined in table 5.16.2.2.2-1 shall be supported.

Table 5.16.2.2.2-1: Simple data types

Type name	Description

5.16.2.2.3 Enumeration: RacsFailureCode

The enumeration RacsFailureCode represents the failure result of UE radio capability provisioning.

Table 5.16.2.2.3-1: Enumeration RacsFailureCode

Enumeration value	Description	Applicability
MALFUNCTION	This value indicates that something functions wrongly in RACS provisioning or the RACS provisioning does not function at all.	
RESOURCE_LIMITATION	This value indicates there is resource limitation for RACS data storage.	
RACS_ID_DUPLICATED	The received RACS identifier(s) are already provisioned.	
OTHER_REASON	Other reason unspecified.	

5.16.3 Resource structure

5.16.3.1 General

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-racs-pp/v1/

"apiRoot" is set as described in subclause 5.2.4. "apiName" shall be set to "3gpp-racs-pp" and "apiVersion" shall be set to "v1" for the version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

The following resources and HTTP methods are supported for this API:

Table 5.16.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Meaning
RACS Parameter Provisionings	/{scsAsId}/provisionings/	GET	Read all RACS parameter provisionings for a given AF
		POST	Create a new RACS parameter provisioning
Individual RACS Parameter Provisioning	/{scsAsId}/provisionings/{provisioningId}	PUT	Modify all properties in an existing RACS parameter provisioning
		PATCH	Modify some properties in an existing RACS parameter provisioning
		GET	Read an existing RACS parameter provisioning
		DELETE	Delete a RACS parameter provisioning

5.16.3.2 Resource: RACS Parameter Provisionings

5.16.3.2.1 Introduction

This resource allows an SCS/AS to read all active RACS parameter provisionings or create a new RACS parameter provisioning.

5.16.3.2.2 Resource definition

Resource URI: **{apiRoot}/3gpp-racs-pp/v1/{scsAsId}/provisionings/**

This resource shall support the resource URI variables defined in table 5.16.3.2.2-1.

Table 5.16.3.2.2-1: Resource URI variables for resource "Parameter Provisioning"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.

5.16.3.2.3 Resource methods

5.16.3.2.3.1 GET

The GET method allows to read all active RACS parameter provisionings indicated by the resource URI as defined in subclause 5.16.3.2.2. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.2.3.1-1 and table 5.16.3.2.3.1-2.

Table 5.16.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.16.3.2.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	array(RacsProvisioningData)	0..N	200 OK	The provisioning information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.16.3.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.16.3.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.16.3.2.3.2 PUT

This HTTP method is not supported for the resource.

5.16.3.2.3.3 PATCH

This HTTP method is not supported for the resource.

5.16.3.2.3.4 POST

The POST method creates a new parameter provisioning resource for a given SCS/AS. The SCS/AS shall initiate the HTTP POST request message and the SCEF shall respond to the message. The SCEF shall construct the URI of the created resource.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.2.3.4-1 and table 5.16.3.2.3.4-2.

Table 5.16.3.2.3.4-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.16.3.2.3.4-2: Data structures supported by the POST request/response by the resource

Request body	Data type	Cardinality	Remarks	
	RacsProvisioningData	1	Parameters to create a new provisioning.	
Response body	**Data type**	**Cardinality**	**Response codes**	**Remarks**
	RacsProvisioningData	1	201 Created	The provisioning was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
	array(RacsFailureReport)	1..N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
NOTE:	The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.16.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-racs-pp/v1/{scsAsId}/provisionings/{provisioningId}

5.16.3.2.3.5   DELETE

This HTTP method is not supported for the resource.

5.16.3.3   Resource: Individual RACS Parameter Provisioning

5.16.3.3.1   Introduction

This resource allows an SCS/AS to query, update and delete a parameter provisioning indicated by the resource URI as defined in subclause 5.16.3.3.2.

5.16.3.3.2   Resource definition

Resource URI: **{apiRoot}/3gpp-racs-pp/v1/{scsAsId}/provisionings/{provisioningId}**

This resource shall support the resource URI variables defined in table 5.16.3.3.2-1.

Table 5.16.3.2.2-1: Resource URI variables for resource "Individual RACS Parameter Provisioning"

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS of type ScsAsId.
provisioningId	string	Identifier of the provisioning resource of type string.

5.16.3.3.3   Resource methods

5.16.3.3.3.1   GET

The GET method allows to read an active parameter provisioning indicated by the resource URI as defined in subclause 5.16.3.3.2. The SCS/AS shall initiate the HTTP GET request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.3.3.1-1 and table 5.16.3.3.3.1-2.

Table 5.16.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks

Table 5.16.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request body	Data type	Cardinality		Remarks
	none			

Response body	Data type	Cardinality	Response codes	Remarks
	RacsProvisioningData	1	200 OK	The provisioning information related to the request URI is returned.
	none		307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

Table 5.16.3.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.16.3.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.16.3.3.3.2   PATCH

The PATCH method shall be used to update some properties in an existing provisioning indicated by the Resource URI as defined in subclause 5.16.3.3.2. The SCS/AS shall initiate the HTTP PATCH request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.3.3.2-1 and table 5.16.3.3.3.2-2.

Table 5.16.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.16.3.3.3.2-2: Data structures supported by the PATCH request/response by the resource

Request body	Data type	Cardinality	Remarks
	RacsProvisioningDataPatch	1	Partial update an existing parameter provisioning.

		Data type	Cardinality	Response codes	Remarks
Response body		RacsProvisioningData	1	200 OK	The provisioning data was updated successfully. The SCEF shall return an updated provisioning information in the response.
		array(RacsFailureReport)	1..N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
		none		307 Temporary Redirect	Temporary redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
		none		308 Permanent Redirect	Permanent redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.				

Table 5.16.3.3.3.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.16.3.3.3.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.16.3.3.3.3   PUT

The PUT method shall be used to update all properties in an existing provisioning indicated by the Resource URI as defined in subclause 5.16.3.3.2. The SCS/AS shall initiate the HTTP PUT request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.3.3.3-1 and table 5.16.3.3.3.3-2.

Table 5.16.3.3.3.3-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.16.3.3.3.3-2: Data structures supported by the PUT request/response by the resource

Request body	Data type	Cardinality	Remarks
	RacsProvisioningData	1	Replace an existing parameter provisioning.

	Data type	Cardinality	Response codes	Remarks
Response body	RacsProvisioningData	1	200 OK	The provisioning data was replaced successfully. The SCEF shall return an updated provisioning information in the response.
	array(RacsFailureReport)	1..N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
	none		307 Temporary Redirect	Temporary redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE:	The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.			

Table 5.16.3.3.3.3-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.16.3.3.3.3-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.16.3.3.3.4   POST

This HTTP method is not supported for the resource.

5.16.3.3.3.5   DELETE

The DELETE method deletes an existing provisioning resource "Individual RACS Parameter Provisioning". The SCS/AS shall initiate the HTTP DELETE request message and the SCEF shall respond to the message.

This method shall support the URI query parameters, request and response data structures, and response codes, as specified in the table 5.16.3.3.3.5-1 and table 5.16.3.3.3.5-2.

Table 5.16.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
N/A			

Table 5.16.3.3.3.5-2: Data structures supported by the DELETE request/response on the resource

	Data type	Cardinality	Remarks
Request body	none		

	Data type	Cardinality	Response codes	Remarks
Response body	none		204 No Content	The provisioning was terminated successfully. The response body shall be empty.
	none		307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
	none		308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SCEF. Redirection handling is described in subclause 5.2.10.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

Table 5.16.3.3.3.5-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

Table 5.16.3.3.3.5-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SCEF.

5.16.4   Used Features

The table below defines the features applicable to the RacsParameterProvisioning API. Those features are negotiated as described in subclause 5.2.7.

Table 5.16.4-1: Features used by RacsParameterProvisioning API

Feature Number	Feature	Description
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".		
Description: A clear textual description of the feature.		

5.16.5   Error handling

5.16.5.1   General

HTTP error handling shall be supported as specified in subclause 5.2.6.

In addition, the requirements in the following subclauses shall apply.

5.16.5.2   Protocol Errors

In this release of the specification, there are no additional protocol errors applicable for the RacsParameterProvisioning API.

5.16.5.3 Application Errors

The application errors defined for the RacsParameterProvisioning API are listed in table 5.16.5.3-1. The SCEF shall include in the HTTP status code a "ProblemDetails" data structure with the "cause" attribute indicating the application error as listed in table 5.16.5.3-1.

Table 5.16.5.3-1: Application errors

Application Error	HTTP status code	Description

6 Security

TLS (IETF RFC 5246 [4]) shall be used to support the security communication between the SCEF and the SCS/AS over T8 as defined in subclause 5.5 of 3GPP TS 33.187 [35]. The access to the SCEF northbound APIs shall be authorized by means of OAuth2 protocol (see IETF RFC 6749 [51]), based on local configuration, using the "Client Credentials" authorization grant. If OAuth2 is used, a client, prior to consuming services offered by the SCEF Northbound APIs, shall obtain a "token" from the authorization server.

7 Using Common API Framework

7.1 General

When CAPIF is used with the SCEF, the SCEF shall support the following as defined in 3GPP TS 29.222 [48]:

- the API exposing function and related APIs over CAPIF-2/2e and CAPIF-3 reference points;

- the API publishing function and related APIs over CAPIF-4 reference point;

- the API management function and related APIs over CAPIF-5 reference point; and

- at least one of the the security methods for authentication and authorization, and related security mechanisms.

In a centralized deployment as defined in 3GPP TS 23.222 [47], where the CAPIF core function and API provider domain functions are co-located, the interactions between the CAPIF core function and API provider domain functions may be independent of CAPIF-3, CAPIF-4 and CAPIF-5 reference points.

When CAPIF is used with the SCEF, the SCEF shall register all the features for northbound APIs in the CAPIF Core Function.

7.2 Security

When CAPIF is used for external exposure, before invoking the API exposed by the SCEF, the SCS/AS as API invoker shall negotiate the security method (PKI, TLS-PSK or OAUTH2) with CAPIF core function and ensure the SCEF has enough credential to authenticate the SCS/AS (see 3GPP TS 29.222 [48], subclause 5.6.2.2 and subclause 6.2.2.2).

If PKI or TLS-PSK is used as the selected security method between the AF and the NEF, upon API invocation, the NEF shall retrieve the authorization information from the CAPIF core function as described in 3GPP TS 29.222 [48], subclause 5.6.2.4.

As indicated in 3GPP TS 33.122 [53], the access to the T8 APIs may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [51]), using the "Client Credentials" authorization grant, where the CAPIF core function (see 3GPP TS 29.222 [48]) plays the role of the authorization server.

NOTE 1: In this release, only "Client Credentials" authorization grant is supported.

If OAuth2 is used as the selected security method between the SCS/AS and the SCEF, the SCS/AS, prior to consuming services offered by the T8 APIs, shall obtain a "token" from the authorization server, by invoking the Obtain_Authorization service, as described in 3GPP TS 29.222 [48], subclause 5.6.2.3.2.

The T8 APIs do not define any scopes for OAuth2 authorization. It is the SCEF responsibility to check whether the SCS/AS is authorized to use an API based on the "token". Once the SCEF verifies the "token", it shall check whether the NEF identifier in the "token" matches its own published identifier, and whether the API name in the "token" matches its own published API name. If those checks are passed, the AF has full authority to access any resource or operation for the invoked API.

NOTE 2: The security requirement in the current subclause does not apply for the MsisdnLessMoSms API since it is the SCEF initiated interaction with the SCS/AS. How the security scheme works for the MsisdnLessMoSms API is left to configuration.

NOTE 3: For aforementioned security methods, the SCEF needs to apply admission control according to access control policies after performing the authorization checks.

Annex A (normative):
OpenAPI representation for the APIs defined in the present document

A.1   General

This Annex is based on the OpenAPI 3.0.0 specification [27] and provides corresponding representations of all APIs defined in the present specification.

NOTE 1: An OpenAPIs representation embeds JSON Schema representations of HTTP message bodies.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 2: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [58] and subclause 5.3.1 of the 3GPP TS 29.501 [49] for further information).

A.2   Data Types applicable to several APIs

For the purpose of referencing entities in the Open API file defined in this Annex, it shall be assumed that this Open API file is contained in a physical file named "TS29122_CommonData.yaml".

NOTE: For the purpose of referencing the error status codes in the Open API file defined in this Annex, this Open API file contains all the mandatory status codes as defined in table 5.2.6-1, all the API specific error status codes defined for T8 APIs, in addition, some error status codes not used in the current release of this specification but for the purpose of referencing by other specifications.

```
openapi: 3.0.0
info:
  title: TS 29.122 Common Data Types
  version: 1.1.1
  description: |
    Data types applicable to several APIs.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
paths: {}
components:
  schemas:
    SponsorInformation:
      type: object
      properties:
        sponsorId:
          type: string
          description: It indicates Sponsor ID.
        aspId:
          type: string
          description: It indicates Application Service Provider ID.
      required:
        - sponsorId
        - aspId
    UsageThreshold:
      type: object
      properties:
        duration:
          $ref: '#/components/schemas/DurationSec'
        totalVolume:
          $ref: '#/components/schemas/Volume'
```

```
          downlinkVolume:
            $ref: '#/components/schemas/Volume'
          uplinkVolume:
            $ref: '#/components/schemas/Volume'
    UsageThresholdRm:
      type: object
      properties:
        duration:
          $ref: '#/components/schemas/DurationSecRm'
        totalVolume:
          $ref: '#/components/schemas/VolumeRm'
        downlinkVolume:
          $ref: '#/components/schemas/VolumeRm'
        uplinkVolume:
          $ref: '#/components/schemas/VolumeRm'
      nullable: true
    TimeWindow:
      type: object
      properties:
        startTime:
          $ref: '#/components/schemas/DateTime'
        stopTime:
          $ref: '#/components/schemas/DateTime'
      required:
        - startTime
        - stopTime
    Acknowledgement:
      type: object
      properties:
        details:
          type: string
          description: A human-readable explanation specific to this successful acknowledgement
      required:
        - details
    NotificationData:
      type: object
      properties:
        transaction:
          $ref: '#/components/schemas/Link'
        eventReports:
          type: array
          items:
            $ref: '#/components/schemas/EventReport'
          minItems: 1
          description: Contains the reported event and applicable information
      required:
        - transaction
        - eventReports
    EventReport:
      type: object
      properties:
        event:
          $ref: '#/components/schemas/Event'
        accumulatedUsage:
          $ref: '#/components/schemas/AccumulatedUsage'
        flowIds:
          type: array
          items:
            type: integer
          minItems: 1
          description: Identifies the IP flows that were sent during event subscription
      required:
        - event
    AccumulatedUsage:
      type: object
      properties:
        duration:
          $ref: '#/components/schemas/DurationSec'
        totalVolume:
          $ref: '#/components/schemas/Volume'
        downlinkVolume:
          $ref: '#/components/schemas/Volume'
        uplinkVolume:
          $ref: '#/components/schemas/Volume'
    FlowInfo:
      type: object
      properties:
        flowId:
```

```
            type: integer
            description: Indicates the IP flow.
        flowDescriptions:
          type: array
          items:
            type: string
          description: Indicates the packet filters of the IP flow. Refer to subclause 5.3.8 of
3GPP TS 29.214 for encoding. It shall contain UL and/or DL IP flow description.
          minItems: 1
          maxItems: 2
      required:
        - flowId
    TestNotification:
      type: object
      properties:
        subscription:
          $ref: '#/components/schemas/Link'
      required:
        - subscription
    WebsockNotifConfig:
      type: object
      properties:
        websocketUri:
          $ref: '#/components/schemas/Link'
        requestWebsocketUri:
          type: boolean
          description: Set by the SCS/AS to indicate that the Websocket delivery is requested.
    LocationArea:
      type: object
      properties:
        cellIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Indicates a list of Cell Global Identities of the user which identifies the
cell the UE is registered.
        enodeBIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Indicates a list of eNodeB identities in which the UE is currently located.
        routingAreaIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies a list of Routing Area Identities of the user where the UE is
located.
        trackingAreaIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies a list of Tracking Area Identities of the user where the UE is
located.
        geographicAreas:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
          minItems: 1
          description: Identifies a list of geographic area of the user where the UE is located.
        civicAddresses:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
          minItems: 1
          description: Identifies a list of civic addresses of the user where the UE is located.
    LocationArea5G:
      type: object
      properties:
        geographicAreas:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
          minItems: 0
          description: Identifies a list of geographic area of the user where the UE is located.
```

```
          civicAddresses:
            type: array
            items:
              $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
            minItems: 0
            description: Identifies a list of civic addresses of the user where the UE is located.
          nwAreaInfo:
            $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
    ProblemDetails:
      type: object
      properties:
        type:
          $ref: '#/components/schemas/Uri'
        title:
          type: string
          description: A short, human-readable summary of the problem type. It should not change
from occurrence to occurrence of the problem.
        status:
          type: integer
          description: The HTTP status code for this occurrence of the problem.
        detail:
          type: string
          description: A human-readable explanation specific to this occurrence of the problem.
        instance:
          $ref: '#/components/schemas/Uri'
        cause:
          type: string
          description: A machine-readable application error cause specific to this occurrence of the
problem. This IE should be present and provide application-related error information, if available.
        invalidParams:
          type: array
          items:
            $ref: '#/components/schemas/InvalidParam'
          minItems: 1
          description: Description of invalid parameters, for a request rejected due to invalid
parameters.
    InvalidParam:
      type: object
      properties:
        param:
          type: string
          description: Attribute's name encoded as a JSON Pointer, or header's name.
        reason:
          type: string
          description: A human-readable reason, e.g. "must be a positive integer".
      required:
        - param
    PlmnId:
      type: object
      properties:
        mcc:
          $ref: '#/components/schemas/Mcc'
        mnc:
          $ref: '#/components/schemas/Mnc'
      required:
        - mcc
        - mnc
    ConfigResult:
      type: object
      properties:
        externalIds:
          type: array
          items:
            $ref: '#/components/schemas/ExternalId'
          minItems: 1
          description: Each element indicates an external identifier of the UE.
        msisdns:
          type: array
          items:
            $ref: '#/components/schemas/Msisdn'
          minItems: 1
          description: Each element identifies the MS internal PSTN/ISDN number allocated for the
UE.
        resultReason:
          $ref: '#/components/schemas/ResultReason'
      required:
        - resultReason
      oneOf:
```

```
            - required: [externalIds]
            - required: [msisdns]
      Bandwidth:
        type: integer
        minimum: 0
        description: integer indicating a bandwidth in bits per second.
      BdtReferenceId:
        type: string
        description: string identifying a BDT Reference ID as defined in subclause 5.3.3 of
3GPP TS 29.154.
      BdtReferenceIdRm:
        type: string
        description: This data type is defined in the same way as the BdtReferenceId data type, but
with the nullable property set to true.
        nullable: true
      Binary:
        type: string
        description: string with format "binary" as defined in OpenAPI Specification.
      Bytes:
        type: string
        description: String with format "byte" as defined in OpenAPI Specification, i.e, base64-
encoded characters.
      DayOfWeek:
        type: integer
        minimum: 1
        maximum: 7
        description: integer between and including 1 and 7 denoting a weekday. 1 shall indicate
Monday, and the subsequent weekdays shall be indicated with the next higher numbers. 7 shall
indicate Sunday.
      DateTime:
        type: string
        description: string with format "date-time" as defined in OpenAPI.
      DateTimeRm:
        type: string
        description: string with format "date-time" as defined in OpenAPI with "nullable=true"
property.
        nullable: true
      DateTimeRo:
        type: string
        description: string with format "date-time" as defined in OpenAPI with "readOnly=true"
property.
        readOnly: true
      DurationSec:
        type: integer
        minimum: 0
        description: Unsigned integer identifying a period of time in units of seconds.
      DurationSecRm:
        type: integer
        minimum: 0
        description: Unsigned integer identifying a period of time in units of seconds with
"nullable=true" property.
        nullable: true
      DurationSecRo:
        type: integer
        minimum: 0
        description: Unsigned integer identifying a period of time in units of seconds with
"readOnly=true" property.
        readOnly: true
      DurationMin:
        type: integer
        format: int32
        minimum: 0
        description: Unsigned integer identifying a period of time in units of minutes.
      ExternalId:
        type: string
        description: string containing a local identifier followed by "@" and a domain identifier.
Both the local identifier and the domain identifier shall be encoded as strings that do not contain
any "@" characters. See Clause 4.6.2 of 3GPP TS 23.682 for more information.
      ExternalGroupId:
        type: string
        description: string containing a local identifier followed by "@" and a domain identifier.
Both the local identifier and the domain identifier shall be encoded as strings that do not contain
any "@" characters. See Clauses 4.6.2 and 4.6.3 of 3GPP TS 23.682 for more information.
      Ipv4Addr:
        type: string
        description: string identifying a Ipv4 address formatted in the "dotted decimal" notation as
defined in IETF RFC 1166.
      Ipv6Addr:
```

```
      type: string
      description: string identifying a Ipv6 address formatted according to clause 4 in
IETF RFC 5952. The mixed Ipv4 Ipv6 notation according to clause 5 of IETF RFC 5952 shall not be
used.
    Ipv4AddrRo:
      type: string
      description: string identifying a Ipv4 address formatted in the "dotted decimal" notation as
defined in IETF RFC 1166, with "readOnly=true" property.
      readOnly: true
    Ipv6AddrRo:
      type: string
      description: string identifying a Ipv6 address formatted according to clause 4 in
IETF RFC 5952, with "readOnly=true" property. The mixed Ipv4 Ipv6 notation according to clause 5 of
IETF RFC 5952 shall not be used.
      readOnly: true
    Link:
      type: string
      description: string formatted according to IETF RFC 3986 identifying a referenced resource.
    Mcc:
      type: string
      description: String encoding a Mobile Country Code part of the PLMN, comprising 3 digits, as
defined in 3GPP TS 38.413.
    Mnc:
      type: string
      description: String encoding a Mobile Network Code part of the PLMN, comprising 2 or 3 digits,
as defined in 3GPP TS 38.413.
    Msisdn:
      type: string
      description: string formatted according to subclause 3.3 of 3GPP TS 23.003 that describes an
MSISDN.
    Port:
      type: integer
      description: Unsigned integer with valid values between 0 and 65535.
      minimum: 0
      maximum: 65535
    PortRo:
      type: integer
      description: Unsigned integer with valid values between 0 and 65535, with "readOnly=true"
property.
      minimum: 0
      maximum: 65535
      readOnly: true
    ResourceId:
      type: string
      description: string chosen by the SCEF to serve as identifier in a resource URI.
    ScsAsId:
      type: string
      description: string that identifies an SCS/AS.
    TimeOfDay:
      type: string
      description: String with format partial-time or full-time as defined in subclause 5.6 of IETF
RFC 3339. Examples, 20:15:00, 20:15:00-08:00 (for 8 hours behind UTC).
    Uri:
      type: string
      description: string providing an URI formatted according to IETF RFC 3986.
    Volume:
      type: integer
      format: int64
      minimum: 0
      description: Unsigned integer identifying a volume in units of bytes.
    VolumeRm:
      type: integer
      format: int64
      minimum: 0
      description: Unsigned integer identifying a volume in units of bytes with "nullable=true"
property.
      nullable: true
    Event:
      anyOf:
      - type: string
        enum:
          - SESSION_TERMINATION
          - LOSS_OF_BEARER
          - RECOVERY_OF_BEARER
          - RELEASE_OF_BEARER
          - USAGE_REPORT
          - FAILED_RESOURCES_ALLOCATION
      - type: string
```

```
              description: >
                This string provides forward-compatibility with future
                extensions to the enumeration but is not used to encode
                content defined in the present version of this API.
          description: >
            Possible values are
            - SESSION_TERMINATION: Indicates that Rx session is terminated.
            - LOSS_OF_BEARER : Indicates a loss of a bearer.
            - RECOVERY_OF_BEARER: Indicates a recovery of a bearer.
            - RELEASE_OF_BEARER: Indicates a release of a bearer.
            - USAGE_REPORT: Indicates the usage report event.
            - FAILED_RESOURCES_ALLOCATION: Indicates the resource allocation is failed.
    ResultReason:
      anyOf:
      - type: string
        enum:
          - ROAMING_NOT_ALLOWED
          - OTHER_REASON
      - type: string
        description: >
          This string provides a failure reason.
        description: >
          Possible values are
          - ROAMING_NOT_ALLOWED: Identifies the configuration parameters are not allowed by roaming
agreement.
          - OTHER_REASON: Identifies the configuration parameters are not configured due to other
reason.
#
# HTTP responses
#
  responses:
    '307':
      description: Temporary Redirect
      headers:
        Location:
          description: 'An alternative URI of the resource.'
          required: true
          schema:
            type: string
    '308':
      description: Permanent Redirect
      headers:
        Location:
          description: 'An alternative URI of the resource.'
          required: true
          schema:
            type: string
    '400':
      description: Bad request
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '401':
      description: Unauthorized
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '403':
      description: Forbidden
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '404':
      description: Not Found
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '406':
      description: Not Acceptable
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/ProblemDetails'
    '409':
```

```
            description: Conflict
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '411':
            description: Length Required
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '412':
            description: Precondition Failed
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '413':
            description: Payload Too Large
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '414':
            description: URI Too Long
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '415':
            description: Unsupported Media Type
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '429':
            description: Too Many Requests
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '500':
            description: Internal Server Error
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          '503':
            description: Service Unavailable
            content:
              application/problem+json:
                schema:
                  $ref: '#/components/schemas/ProblemDetails'
          default:
            description: Generic Error
```

A.3   MonitoringEvent API

```
openapi: 3.0.0
info:
  title: 3gpp-monitoring-event
  version: 1.1.3
  description: |
    API for Monitoring Event.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-monitoring-event/v1'
    variables:
      apiRoot:
        default: https://example.com
```

```
            description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/subscriptions:
    get:
      summary: read all of the active subscriptions for the SCS/AS
      tags:
        - MonitoringEvent API SCS/AS level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get all of the active subscriptions for the SCS/AS)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/MonitoringEventSubscription'
                minItems: 0
                description: Monitoring event subscriptions
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new subscription resource for monitoring event notification
      tags:
        - MonitoringEvent API Subscription level POST Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
      requestBody:
        description: Subscription for notification about monitoring event
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MonitoringEventSubscription'
      callbacks:
        notificationDestination:
          '{request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/MonitoringNotification'
              responses:
                '204':
```

```
                      description: No Content (successful notification)
                    '307':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                    '308':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                    '400':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                    '401':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                    '403':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                    '404':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                    '411':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                    '413':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                    '415':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                    '429':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                    '500':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                    '503':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                    default:
                      $ref: 'TS29122_CommonData.yaml#/components/responses/default'
          responses:
            '201':
              description: Created (Successful creation of subscription)
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/MonitoringEventSubscription'
              headers:
                Location:
                  description: 'Contains the URI of the newly created resource'
                  required: true
                  schema:
                    type: string
            '200':
              description: The operation is successful and immediate report is included.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/MonitoringEventReport'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/subscriptions/{subscriptionId}:
    get:
      summary: read an active subscriptions for the SCS/AS and the subscription Id
      tags:
        - MonitoringEvent API Subscription level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
```

```
            required: true
            schema:
              type: string
          - name: subscriptionId
            in: path
            description: Identifier of the subscription resource
            required: true
            schema:
              type: string
        responses:
          '200':
            description: OK (Successful get the active subscription)
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/MonitoringEventSubscription'
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '406':
            $ref: 'TS29122_CommonData.yaml#/components/responses/406'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing subscription resource
      tags:
        - MonitoringEvent API subscription level PUT Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing subscription
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MonitoringEventSubscription'
      responses:
        '200':
          description: OK (Successful update of the subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MonitoringEventSubscription'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing monitoring event subscription
      tags:
        - MonitoringEvent API Subscription level DELETE Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '200':
          description: OK (Successful deletion of the existing subscription)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/MonitoringEventReport'
                minItems: 1
                description: The subscription was terminated successfully, the monitoring event
report(s) shall be included if received.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
```

```
    schemas:
      MonitoringEventSubscription:
        type: object
        properties:
          self:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
          supportedFeatures:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          mtcProviderId:
            type: string
            description: Identifies the MTC Service Provider and/or MTC Application.
          externalId:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
          msisdn:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
          externalGroupId:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
          addExtGroupId:
            type: array
            items:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
            minItems: 2
          ipv4Addr:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
          ipv6Addr :
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
          notificationDestination:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
          requestTestNotification:
            type: boolean
            description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
          websockNotifConfig:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
          monitoringType:
            $ref: '#/components/schemas/MonitoringType'
          maximumNumberOfReports:
            type: integer
            minimum: 1
            description: Identifies the maximum number of event reports to be generated by the HSS,
MME/SGSN as specified in subclause 5.6.0 of 3GPP TS 23.682 [2].
          monitorExpireTime:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
          repPeriod:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          groupReportGuardTime:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          maximumDetectionTime:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          reachabilityType:
            $ref: '#/components/schemas/ReachabilityType'
          maximumLatency:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          maximumResponseTime:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          suggestedNumberOfDlPackets:
            type: integer
            minimum: 0
            description: If "monitoringType" is "UE_REACHABILITY", this parameter may be included to
identify the number of packets that the serving gateway shall buffer in case that the UE is not
reachable.
          idleStatusIndication:
            type: boolean
            description: If "monitoringType" is set to "UE_REACHABILITY" or
"AVAILABILITY_AFTER_DDN_FAILURE", this parameter may be included to indicate the notification of
when a UE, for which PSM is enabled, transitions into idle mode. - "true"  indicate enabling of
notification -  "false"  indicate no need to notify Default  "false".
          locationType:
            $ref: '#/components/schemas/LocationType'
          accuracy:
            $ref: '#/components/schemas/Accuracy'
          minimumReportInterval:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          maxRptExpireIntvl:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          samplingInterval:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
          reportingLocEstInd:
```

```
            type: boolean
            description: Indicates whether to request the location estimate for event reporting.
          linearDistance:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LinearDistance'
          locQoS:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LocationQoS'
          svcId:
            $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/ServiceIdentity'
          ldrType:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrType'
          velocityRequested:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityRequested'
          maxAgeOfLocEst:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
          locTimeWindow:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
          supportedGADShapes:
            type: array
            items:
              $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/SupportedGADShapes'
          codeWord:
            $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/CodeWord'
          associationType:
            $ref: '#/components/schemas/AssociationType'
          plmnIndication:
            type: boolean
            description: If "monitoringType" is "ROAMING_STATUS", this parameter may be included to
indicate the notification of UE's Serving PLMN ID. -    "true"  The value shall be used to indicate
enabling of notification; - "false"  The value shall be used to indicate disabling of notification.
Default  "false".
          locationArea:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea'
          locationArea5G:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
          dddTraDescriptors:
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/DddTrafficDescriptor'
            minItems: 1
          dddStati:
            type: array
            items:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/DlDataDeliveryStatus'
            minItems: 1
          apiNames:
            type: array
            items:
              type: string
            minItems: 1
          monitoringEventReport:
            $ref: '#/components/schemas/MonitoringEventReport'
        required:
          - notificationDestination
          - monitoringType
        anyOf:
          - required: [maximumNumberOfReports]
          - required: [monitorExpireTime]
    MonitoringNotification:
      type: object
      properties:
        subscription:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        configResults:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ConfigResult'
          minItems: 1
          description: Each element identifies a notification of grouping configuration result.
        monitoringEventReports:
          type: array
          items:
            $ref: '#/components/schemas/MonitoringEventReport'
          minItems: 1
          description: Monitoring event reports.
        cancelInd:
          type: boolean
          description: Indicates whether to request to cancel the corresponding monitoring
subscription. Set to false or omitted otherwise.
```

```
          appliedParam:
            $ref: '#/components/schemas/AppliedParameterConfiguration'
        required:
          - subscription
    MonitoringEventReport:
      type: object
      properties:
        imeiChange:
          $ref: '#/components/schemas/AssociationType'
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        idleStatusInfo:
          $ref: '#/components/schemas/IdleStatusInfo'
        locationInfo:
          $ref: '#/components/schemas/LocationInfo'
        locFailureCause:
          $ref: '#/components/schemas/LocationFailureCause'
        lossOfConnectReason:
          type: integer
          description: If "monitoringType" is "LOSS_OF_CONNECTIVITY", this parameter shall be
included if available to identify the reason why loss of connectivity is reported. Refer to 3GPP TS
29.336 [11] Subclause 8.4.58.
        maxUEAvailabilityTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        monitoringType:
          $ref: '#/components/schemas/MonitoringType'
        uePerLocationReport:
          $ref: '#/components/schemas/UePerLocationReport'
        plmnId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
        reachabilityType:
          $ref: '#/components/schemas/ReachabilityType'
        roamingStatus:
          type: boolean
          description: If "monitoringType" is "ROAMING_STATUS", this parameter shall be set to
"true" if the UE is on roaming status. Set to false or omitted otherwise.
        failureCause:
          $ref: '#/components/schemas/FailureCause'
        eventTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        pdnConnInfoList:
          type: array
          items:
            $ref: '#/components/schemas/PdnConnectionInformation'
          minItems: 1
        dddStatus:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DlDataDeliveryStatus'
        dddTrafDescriptor:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DddTrafficDescriptor'
        maxWaitTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        apiCaps:
          type: array
          items:
            $ref: '#/components/schemas/ApiCapabilityInfo'
          minItems: 0
      required:
        - monitoringType
    IdleStatusInfo:
      type: object
      properties:
        activeTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        edrxCycleLength:
          format: float
          type: number
          minimum: 0
        suggestedNumberOfDlPackets:
          type: integer
          minimum: 0
          description: Identifies the number of packets shall be buffered in the serving gateway. It
shall be present if the idle status indication is requested by the SCS/AS with
"idleStatusIndication" in the "monitoringEventSubscription" sets to "true".
        idleStatusTimestamp:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        periodicAUTimer:
```

```
                $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
    UePerLocationReport:
      type: object
      properties:
        ueCount:
          type: integer
          minimum: 0
          description: Identifies the number of UEs.
        externalIds:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
          minItems: 1
          description: Each element uniquely identifies a user.
        msisdns:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
          minItems: 1
          description: Each element identifies the MS internal PSTN/ISDN number allocated for a UE.
      required:
        - ueCount
    LocationInfo:
      type: object
      properties:
        ageOfLocationInfo:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationMin'
        cellId:
          type: string
          description: Indicates the Cell Global Identification of the user which identifies the
cell the UE is registered.
        enodeBId:
          type: string
          description: Indicates the eNodeB in which the UE is currently located.
        routingAreaId:
          type: string
          description: Identifies the Routing Area Identity of the user where the UE is located.
        trackingAreaId:
          type: string
          description: Identifies the Tracking Area Identity of the user where the UE is located.
        plmnId:
          type: string
          description: Identifies the PLMN Identity of the user where the UE is located.
        twanId:
          type: string
          description: Identifies the TWAN Identity of the user where the UE is located.
        geographicArea:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        civicAddress:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
        positionMethod:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethod'
        qosFulfilInd:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
        ueVelocity:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
        ldrType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrType'
    FailureCause:
      type: object
      properties:
        bssgpCause:
          type: integer
          description: Identifies a non-transparent copy of the BSSGP cause code. Refer to 3GPP TS
29.128 [12].
        causeType:
          type: integer
          description: Identify the type of the S1AP-Cause. Refer to 3GPP TS 29.128 [12].
        gmmCause:
          type: integer
          description: Identifies a non-transparent copy of the GMM cause code. Refer to 3GPP TS
29.128 [12].
        ranapCause:
          type: integer
          description: Identifies a non-transparent copy of the RANAP cause code. Refer to 3GPP TS
29.128 [12].
        ranNasCause:
          type: string
```

```
              description: Indicates RAN and/or NAS release cause code information, TWAN release cause
      code information or untrusted WLAN release cause code information. Refer to 3GPP TS 29.214 [10].
            s1ApCause:
              type: integer
              description: Identifies a non-transparent copy of the S1AP cause code. Refer to 3GPP TS
      29.128 [12].
            smCause:
              type: integer
              description: Identifies a non-transparent copy of the SM cause code. Refer to 3GPP TS
      29.128 [12].
        PdnConnectionInformation:
          type: object
          properties:
            status:
              $ref: '#/components/schemas/PdnConnectionStatus'
            apn:
              type: string
              description: Identify the APN, it is depending on the SCEF local configuration whether or
      not this attribute is sent to the SCS/AS.
            pdnType:
              $ref: '#/components/schemas/PdnType'
            interfaceInd:
              $ref: '#/components/schemas/InterfaceIndication'
            ipv4Addr:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
            ipv6Addrs:
              type: array
              items:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
              minItems: 1
          required:
            - status
            - pdnType
        AppliedParameterConfiguration:
          type: object
          properties:
            externalIds:
              type: array
              items:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
              minItems: 1
              description: Each element uniquely identifies a user.
            msisdns:
              type: array
              items:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
              minItems: 1
              description: Each element identifies the MS internal PSTN/ISDN number allocated for a UE.
            maximumLatency:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
            maximumResponseTime:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
            maximumDetectionTime:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        ApiCapabilityInfo:
          type: object
          properties:
            apiName:
              type: string
            suppFeat:
              $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
          required:
            - apiName
            - suppFeat
      #
      # ENUMS
      #
        MonitoringType:
          anyOf:
          - type: string
            enum:
              - LOSS_OF_CONNECTIVITY
              - UE_REACHABILITY
              - LOCATION_REPORTING
              - CHANGE_OF_IMSI_IMEI_ASSOCIATION
              - ROAMING_STATUS
              - COMMUNICATION_FAILURE
              - AVAILABILITY_AFTER_DDN_FAILURE
```

```
                      - NUMBER_OF_UES_IN_AN_AREA
                      - PDN_CONNECTIVITY_STATUS
                      - DOWNLINK_DATA_DELIVERY_STATUS
                      - API_SUPPORT_CAPABILITY
                - type: string
                  description: >
                    This string provides forward-compatibility with future
                    extensions to the enumeration but is not used to encode
                    content defined in the present version of this API.
              description: >
                Possible values are
                - LOSS_OF_CONNECTIVITY: The SCS/AS requests to be notified when the 3GPP network detects
that the UE is no longer reachable for signalling or user plane communication
                - UE_REACHABILITY: The SCS/AS requests to be notified when the UE becomes reachable for
sending either SMS or downlink data to the UE
                - LOCATION_REPORTING: The SCS/AS requests to be notified of the current location or the last
known location of the UE
                - CHANGE_OF_IMSI_IMEI_ASSOCIATION: The SCS/AS requests to be notified when the association
of an ME (IMEI(SV)) that uses a specific subscription (IMSI) is changed
                - ROAMING_STATUS: The SCS/AS queries the UE's current roaming status and requests to get
notified when the status changes
                - COMMUNICATION_FAILURE: The SCS/AS requests to be notified of communication failure events
                - AVAILABILITY_AFTER_DDN_FAILURE: The SCS/AS requests to be notified when the UE has become
available after a DDN failure
                - NUMBER_OF_UES_IN_AN_AREA: The SCS/AS requests to be notified the number of UEs in a given
geographic area
                - PDN_CONNECTIVITY_STATUS: The SCS/AS requests to be notified when the 3GPP network detects
that the UE's PDN connection is set up or torn down
                - DOWNLINK_DATA_DELIVERY_STATUS: The AF requests to be notified when the 3GPP network
detects that the downlink data delivery status is changed.
                - API_SUPPORT_CAPABILITY: The SCS/AS requests to be notified of the availability of support
of service APIs.
        ReachabilityType:
          anyOf:
          - type: string
            enum:
              - SMS
              - DATA
          - type: string
            description: >
              This string provides forward-compatibility with future
              extensions to the enumeration but is not used to encode
              content defined in the present version of this API.
          description: >
            Possible values are
            - SMS : The SCS/AS requests to be notified when the UE becomes reachable for sending SMS to
the UE
            - DATA: The SCS/AS requests to be notified when the UE becomes reachable for sending
downlink data to the UE
        LocationType:
          anyOf:
          - type: string
            enum:
              - CURRENT_LOCATION
              - LAST_KNOWN_LOCATION
              - CURRENT_OR_LAST_KNOWN_LOCATION
              - INITIAL_LOCATION
          - type: string
            description: >
              This string provides forward-compatibility with future
              extensions to the enumeration but is not used to encode
              content defined in the present version of this API.
          description: >
            Possible values are
            - CURRENT_LOCATION: The SCS/AS requests to be notified for current location
            - LAST_KNOWN_LOCATION: The SCS/AS requests to be notified for last known location
            - CURRENT_OR_LAST_KNOWN_LOCATION: The AF requests the current or last known location
            - INITIAL_LOCATION: The AF requests the initial location
        AssociationType:
          anyOf:
          - type: string
            enum:
              - IMEI
              - IMEISV
          - type: string
            description: >
              This string provides forward-compatibility with future
              extensions to the enumeration but is not used to encode
```

```
                content defined in the present version of this API.
          description: >
            Possible values are
            - IMEI: The value shall be used when the change of IMSI-IMEI association shall be detected
            - IMEISV: The value shall be used when the change of IMSI-IMEISV association shall be
detected
      Accuracy:
        anyOf:
        - type: string
          enum:
            - CGI_ECGI
            - ENODEB
            - TA_RA
            - PLMN
            - TWAN_ID
            - GEO_AREA
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - CGI_ECGI: The SCS/AS requests to be notified at cell level location accuracy.
          - ENODEB: The SCS/AS requests to be notified at eNodeB level location accuracy.
          - TA_RA: The SCS/AS requests to be notified at TA/RA level location accuracy.
          - PLMN: The SCS/AS requests to be notified at PLMN level location accuracy.
          - TWAN_ID: The SCS/AS requests to be notified at TWAN identifier level location accuracy.
          - GEO_AREA: The SCS/AS requests to be notified of the geographical area accuracy.
      PdnConnectionStatus:
        anyOf:
        - type: string
          enum:
            - CREATED
            - RELEASED
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - CREATED: The PDN connection is created.
          - RELEASED: The PDN connection is released.
      PdnType:
        anyOf:
        - type: string
          enum:
            - IPV4
            - IPV6
            - IPV4V6
            - NON_IP
            - ETHERNET
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - IPV4: PDN connection of IPv4 type.
          - IPV6: PDN connection of IPv6 type.
          - IPV4V6: PDN connection of IPv4v6 type.
          - NON_IP: PDN connection of non-IP type.
          - ETHERNET: PDN connection of Ethernet type.
      InterfaceIndication:
        anyOf:
        - type: string
          enum:
            - EXPOSURE_FUNCTION
            - PDN_GATEWAY
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
```

```
              - EXPOSURE_FUNCTION: SCEF is used for the PDN connection towards the SCS/AS.
              - PDN_GATEWAY: PDN gateway is used for the PDN connection towards the SCS/AS.
        LocationFailureCause:
          anyOf:
            - type: string
              enum:
                - POSITIONING_DENIED
                - UNSUPPORTED_BY_UE
                - NOT_REGISTED_UE
                - UNSPECIFIED
            - type: string
          description: >
              This string Indicates the location positioning failure cause.
              Possible values are
              - POSITIONING_DENIED: Positioning is denied.
              - UNSUPPORTED_BY_UE: Positioning is not supported by UE.
              - NOT_REGISTED_UE: UE is not registered.
              - UNSPECIFIED: Unspecified.
```

A.4   ResourceManagementOfBdt API

```
openapi: 3.0.0
info:
  title: 3gpp-bdt
  version: 1.1.2
  description: |
    API for BDT resouce management.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.14.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-bdt/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/subscriptions:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: all BDT policy subscriptions.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/Bdt'
                minItems: 0
                description: individual BDT policy subscription.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
```

```
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    post:
      requestBody:
        description: Contains the data to create a BDT subscription.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/Bdt'
      callbacks:
        bDTWarningNotification:
          '{$request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/ExNotification'
              responses:
                '204':
                  description: No Content (successful notification)
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      responses:
        '201':
          description: Background data transfer policies offered to the SCS/AS.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/Bdt'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '409':
          $ref: 'TS29122_CommonData.yaml#/components/responses/409'
```

```
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/subscriptions/{subscriptionId}:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
      - name: subscriptionId
        description: String identifying the individual BDT policy resource in the SCEF.
        in: path
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: Background data transfer policies offered to and selected by the SCEF.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/Bdt'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      requestBody:
        description: Parameters to update/replace the existing BDT subscription
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/Bdt'
      responses:
        '200':
          description: OK (Successful update of the BDT subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/Bdt'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
```

```
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      patch:
        requestBody:
          description: Contains information to be performed on the Bdt data structure to select a
transfer policy.
          required: true
          content:
            application/merge-patch+json:
              schema:
                $ref: '#/components/schemas/BdtPatch'
        responses:
          '200':
            description: The Individual BDT Policy resource is modified with a selected policy and a
representation of that resource is returned.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/Bdt'
          '204':
            description: The Individual BDT Policy resource is modified with a selected policy.
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      delete:
        responses:
          '204':
            description: The Individual BDT Policy resource is deleted.
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    Bdt:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        volumePerUE:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThreshold'
        numberOfUEs:
          type: integer
          minimum: 1
          description: Identifies the number of UEs.
        desiredTimeWindow:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
        locationArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea'
        locationArea5G:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        referenceId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
        transferPolicies:
          type: array
          items:
            $ref: '#/components/schemas/TransferPolicy'
          minItems: 1
          description: Identifies an offered transfer policy.
          readOnly: true
        selectedPolicy:
          type: integer
          description: Identity of the selected background data transfer policy. Shall not be
present in initial message exchange, can be provided by NF service consumer in a subsequent message
exchange.
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        warnNotifEnabled:
          type: boolean
          description: Indicates whether the BDT warning notification is enabled (true) or not
(false). Default value is false.
        trafficDes:
          $ref: '#/components/schemas/TrafficDescriptor'
      required:
        - volumePerUE
        - numberOfUEs
        - desiredTimeWindow
    BdtPatch:
      type: object
      properties:
        selectedPolicy:
          type: integer
          description: Identity of the selected background data transfer policy.
        warnNotifEnabled:
          type: boolean
          description: Indicates whether the BDT warning notification is enabled (true) or not
(false).
```

```
           required:
             - selectedPolicy
       TransferPolicy:
         type: object
         properties:
           bdtPolicyId:
             type: integer
             description: Identifier for the transfer policy
           maxUplinkBandwidth:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/Bandwidth'
           maxDownlinkBandwidth:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/Bandwidth'
           ratingGroup:
             type: integer
             minimum: 0
             description: Indicates the rating group during the time window.
           timeWindow:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
         required:
           - bdtPolicyId
           - ratingGroup
           - timeWindow
       ExNotification:
         type: object
         properties:
           bdtRefId:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
           locationArea5G:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
           timeWindow:
             $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
           candPolicies:
             type: array
             items:
               $ref: '#/components/schemas/TransferPolicy'
             minItems: 1
             description: This IE indicates a list of the candidate transfer policies from which the AF
may select a new transfer policy due to network performance degradation.
         required:
           - bdtRefId
       TrafficDescriptor:
         type: string
         description: Identify a traffic descriptor as defined in Figure 5.2.2 of 3GPP TS 24.526,
octets v+5 to w.
```

A.5 ChargeableParty API

```
openapi: 3.0.0
info:
  title: 3gpp-chargeable-party
  version: 1.1.4
  description: |
    API for Chargeable Party management.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.14.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-chargeable-party/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/transactions:
    get:
      summary: Read all chargeable party transaction resources for a given SCS/AS
      tags:
        - Chargeable Party Transaction Operation
      parameters:
        - name: scsAsId
          in: path
```

```
                description: Identifier of SCS/AS
                required: true
                schema:
                  type: string
          responses:
            '200':
              description: OK (successful query of Chargeable Party resource)
              content:
                application/json:
                  schema:
                    type: array
                    items:
                      $ref: '#/components/schemas/ChargeableParty'
                    minItems: 0
                    description: individual BDT policy subscription.
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

      post:
        summary:  Create a new chargeable party transaction resource
        tags:
          - Chargeable Party Transaction Operation
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of SCS/AS
            required: true
            schema:
              type: string
        requestBody:
          description: representation of the Chargeable Party resource to be Created in the SCEF
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ChargeableParty'
        callbacks:
          eventNotification:
            '{$request.body#/notificationDestination}':
              post:
                requestBody:  # contents of the callback message
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/NotificationData'
                responses:
                  '204':
                    description: No Content (The successful acknowledgement of the notification)
                  '307':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                  '308':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                  '400':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                  '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
```

```
                          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                        '404':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                        '411':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                        '413':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                        '415':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                        '429':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                        '500':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                        '503':
                          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                        default:
                          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
              responses:
                '201':
                  description: successful creation of a chargeable party resource
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/ChargeableParty'
                  headers:
                    Location:
                      description: 'Contains the URI of the newly created resource'
                      required: true
                      schema:
                        type: string
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/transactions/{transactionId}:
    get:
      summary: read a chargeable party resource for a given SCS/AS and a transaction Id
      tags:
        - Individual chargeable party resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of a chargeable party resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ChargeableParty'
```

```yaml
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '406':
            $ref: 'TS29122_CommonData.yaml#/components/responses/406'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary:  Updates a existing chargeable party resource for a given SCS/AS and transaction Id.
      tags:
        - Individual chargeable party resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the chargeable party resource to be udpated in the SCEF
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/ChargeablePartyPatch'
      responses:
        '200':
          description: successful update of a chargeable party resource
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ChargeableParty'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
```

```yaml
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary:  deletes a chargeable party resource for a given SCS/AS and a transcation Id.
      tags:
        - Individual chargeable party resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      responses:
        '204':
          description: successful deletion of an resouce of chargeable party
        '200':
          description: OK (Successful deletion of the existing subscription)
          content:
            application/json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/NotificationData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    ChargeableParty:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        ipv4Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        ipDomain:
          type: string
        ipv6Addr :
```

```
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
                macAddr:
                    $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
                flowInfo:
                    type: array
                    items:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
                    minItems: 1
                    description: Describes the application flows.
                ethFlowInfo:
                    type: array
                    items:
                        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
                    minItems: 1
                    description: Identifies Ethernet packet flows.
                sponsorInformation:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/SponsorInformation'
                sponsoringEnabled:
                    type: boolean
                    description: Indicates whether the sponsoring data connectivity is enabled (true) or not
(false).
                referenceId:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
                usageThreshold:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThreshold'
            required:
                - notificationDestination
                - sponsorInformation
                - sponsoringEnabled
        ChargeablePartyPatch:
            type: object
            properties:
                flowInfo:
                    type: array
                    items:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
                    minItems: 1
                    description: Describes the application flows.
                ethFlowInfo:
                    type: array
                    items:
                        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
                    minItems: 1
                    description: Identifies Ethernet packet flows.
                sponsoringEnabled:
                    type: boolean
                    description: Indicates whether the sponsoring data connectivity is enabled (true) or not
(false).
                referenceId:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
                usageThreshold:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThresholdRm'
```

A.6   NIDD API

```
openapi: 3.0.0
info:
  title: 3gpp-nidd
  version: 1.1.2
  description: |
    API for non IP data delivery.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.14.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-nidd/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
```

```
/{scsAsId}/configurations:
  parameters:
    - name: scsAsId
      description: String identifying the SCS/AS.
      in: path
      required: true
      schema:
        type: string
  get:
    responses:
      '200':
        description: all NIDD configurations.
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/NiddConfiguration'
              minItems: 0
              description: individual NIDD configuration.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  post:
    requestBody:
      description: Contains the data to create a NIDD configuration.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NiddConfiguration'
    responses:
      '201':
        description: NIDD configuration is successfully created.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NiddConfiguration'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
```

```
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        callbacks:
            niddNotifications:
                '{$request.body#/notificationDestination}':
                    post:
                        requestBody:
                            description: Notification for NIDD configuration status, MO NIDD, MT NIDD delivery
report.
                            required: true
                            content:
                                application/json:
                                    schema:
                                        oneOf:
                                        - $ref: '#/components/schemas/NiddConfigurationStatusNotification'
                                        - $ref: '#/components/schemas/NiddUplinkDataNotification'
                                        - $ref: '#/components/schemas/NiddDownlinkDataDeliveryStatusNotification'
                                        - $ref: '#/components/schemas/GmdNiddDownlinkDataDeliveryNotification'
                                        - $ref: '#/components/schemas/ManagePortNotification'
                        responses:
                            '204':
                                description: Expected response to a successful callback processing without a body
                            '200':
                                description: Expected response to a successful callback processing with a body
                                content:
                                    application/json:
                                        schema:
                                            $ref: 'TS29122_CommonData.yaml#/components/schemas/Acknowledgement'
                            '307':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                            '308':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                            '400':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                            '401':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                            '403':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                            '404':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                            '411':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                            '413':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                            '415':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                            '429':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                            '500':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                            '503':
                                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                            default:
                                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    /{scsAsId}/configurations/{configurationId}:
        parameters:
            - name: scsAsId
                description: String identifying the SCS/AS.
                in: path
                required: true
                schema:
                    type: string
            - name: configurationId
                description: String identifying the individual NIDD configuration resource in the SCEF.
                in: path
                required: true
                schema:
                    type: string
        get:
            responses:
                '200':
                    description: The individual NIDD configuration is successfully retrieved.
                    content:
```

```
                application/json:
                  schema:
                    $ref: '#/components/schemas/NiddConfiguration'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    patch:
      requestBody:
        description: Contains information to be applied to the individual NIDD configuration.
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/NiddConfigurationPatch'
      responses:
        '200':
          description: The Individual NIDD configuration is modified successfully and a
representation of that resource is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NiddConfiguration'
        '204':
          description: The Individual NIDD configuration is modified successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      responses:
        '204':
          description: The Individual NIDD configuration is deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
```

```
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/configurations/{configurationId}/downlink-data-deliveries:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
      - name: configurationId
        description: String identifying the individual NIDD configuration resource in the SCEF.
        in: path
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: all NIDD downlink data deliveries.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/NiddDownlinkDataTransfer'
                minItems: 0
                description: individual NIDD downlink data delivery.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    post:
      requestBody:
        description: Contains the data to create a NIDD downlink data delivery.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NiddDownlinkDataTransfer'
      responses:
        '200':
          description: NIDD downlink data delivery is successful.
          content:
            application/json:
              schema:
```

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```
                        $ref: '#/components/schemas/NiddDownlinkDataTransfer'
            '201':
              description: NIDD downlink data delivery is pending.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/NiddDownlinkDataTransfer'
              headers:
                Location:
                  description: 'Contains the URI of the newly created resource'
                  required: true
                  schema:
                    type: string
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              description: The NIDD downlink data delivery request was not successful.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/NiddDownlinkDataDeliveryFailure'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/configurations/{configurationId}/downlink-data-deliveries/{downlinkDataDeliveryId}:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
      - name: configurationId
        description: String identifying the individual NIDD configuration resource in the SCEF.
        in: path
        required: true
        schema:
          type: string
      - name: downlinkDataDeliveryId
        description: String identifying the individual NIDD downlink data delivery in the SCEF.
        in: path
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: The individual NIDD downlink data delivery is successfully retrieved.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NiddDownlinkDataTransfer'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
```

```
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                  '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                  '406':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/406'
                  '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
          put:
            requestBody:
              description: Contains information to be applied to the individual NIDD downlink data
        delivery.
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/NiddDownlinkDataTransfer'
            responses:
              '200':
                description: The pending NIDD downlink data is replaced sucessfully but delivery is
        pending.
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NiddDownlinkDataTransfer'
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '409':
                $ref: 'TS29122_CommonData.yaml#/components/responses/409'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                description: The NIDD downlink data replacement request was not successful.
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NiddDownlinkDataDeliveryFailure'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
          delete:
            responses:
              '204':
                description: The pending NIDD downlink data is deleted.
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '409':
                $ref: 'TS29122_CommonData.yaml#/components/responses/409'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                description: The NIDD downlink data cancellation request was not successful.
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NiddDownlinkDataDeliveryFailure'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/configurations/{configurationId}/rds-ports:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
      - name: configurationId
        description: String identifying the individual NIDD configuration resource in the SCEF.
        in: path
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: all ManagePort configurations.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/ManagePort'
                minItems: 0
                description: individual ManagePort configuration.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/configurations/{configurationId}/rds-ports/{portId}:
    parameters:
      - name: scsAsId
        description: String identifying the SCS/AS.
        in: path
        required: true
        schema:
          type: string
      - name: configurationId
        description: String identifying the individual NIDD configuration resource in the SCEF.
        in: path
        required: true
        schema:
          type: string
```

```
        - name: portId
          description: The UE port number.
          in: path
          required: true
          schema:
            type: string
            pattern: '^(ue([0-9]|(1[0-5]))-ef([0-9]|(1[0-5])))$'
  get:
    responses:
      '200':
        description: The individual ManagePort configuration is successfully retrieved.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ManagePort'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    requestBody:
      description: Contains information to be applied to the individual ManagePort configuration.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/ManagePort'
    responses:
      '201':
        description: The individual ManagePort configuration is created.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ManagePort'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '202':
        description: The request is accepted and under processing.
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '409':
        $ref: 'TS29122_CommonData.yaml#/components/responses/409'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
```

```
              '500':
                description: The request was not successful.
                content:
                  application/problem+json:
                    schema:
                      $ref: '#/components/schemas/RdsDownlinkDataDeliveryFailure'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      responses:
        '202':
          description: The request is accepted and under processing.
        '204':
          description: The individual ManagePort configuration is deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '409':
          $ref: 'TS29122_CommonData.yaml#/components/responses/409'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          description: The request was not successful.
          content:
            application/problem+json:
              schema:
                $ref: '#/components/schemas/RdsDownlinkDataDeliveryFailure'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    NiddConfiguration:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        mtcProviderId:
          type: string
          description: Identifies the MTC Service Provider and/or MTC Application.
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        duration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        reliableDataService:
          type: boolean
          description: Indicates whether the reliable data service (as defined in subclause 4.5.14.3
of 3GPP TS 23.682) acknowledgement is requested (true) or not (false). Default value is false.
        rdsPorts:
          type: array
          items:
            $ref: '#/components/schemas/RdsPort'
```

```
              minItems: 1
              description: Indicates the static port configuration that is used for reliable data
transfer between specific applications using RDS (as defined in subclause 5.2.4 and 5.2.5 of 3GPP TS
24.250).
          pdnEstablishmentOption:
            $ref: '#/components/schemas/PdnEstablishmentOptions'
          notificationDestination:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
          requestTestNotification:
            type: boolean
            description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
          websockNotifConfig:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
          maximumPacketSize:
            type: integer
            minimum: 1
            description: The Maximum Packet Size is the maximum NIDD packet size that was transferred
to the UE by the SCEF in the PCO, see subclause 4.5.14.1 of 3GPP TS 23.682. If no maximum packet
size was provided to the UE by the SCEF, the SCEF sends a default configured max packet size to
SCS/AS. Unit  bit.
            readOnly: true
          niddDownlinkDataTransfers:
            type: array
            items:
              $ref: '#/components/schemas/NiddDownlinkDataTransfer'
            minItems: 1
            description: The downlink data deliveries that needed to be executed by the SCEF. The
cardinality of the property shall be 0..1 in the request and 0..N in the response (i.e. response may
contain multiple buffered MT NIDD).
          status:
            $ref: '#/components/schemas/NiddStatus'
        required:
          - notificationDestination
        oneOf:
          - required: [externalId]
          - required: [msisdn]
          - required: [externalGroupId]
    NiddDownlinkDataTransfer:
      type: object
      properties:
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        data:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
        reliableDataService:
          type: boolean
          description: Indicates whether the reliable data service (as defined in subclause 4.5.14.3
of 3GPP TS 23.682) acknowledgement is requested (true) or not (false). Default value is false.
        rdsPort:
          $ref: '#/components/schemas/RdsPort'
        maximumLatency:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        priority:
          type: integer
          description: It is used to indicate the priority of the non-IP data packet relative to
other non-IP data packets.
        pdnEstablishmentOption:
          $ref: '#/components/schemas/PdnEstablishmentOptions'
        deliveryStatus:
          $ref: '#/components/schemas/DeliveryStatus'
        requestedRetransmissionTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
      required:
        - data
      oneOf:
        - required: [externalId]
        - required: [msisdn]
        - required: [externalGroupId]
    NiddUplinkDataNotification:
      type: object
      properties:
```

```
        niddConfiguration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        data:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
        reliableDataService:
          type: boolean
          description: Indicates whether the reliable data service acknowledgement is requested
(true) or not (false).
        rdsPort:
          $ref: '#/components/schemas/RdsPort'
      required:
        - niddConfiguration
        - data
      oneOf:
        - required: [externalId]
        - required: [msisdn]
    NiddDownlinkDataDeliveryStatusNotification:
      type: object
      properties:
        niddDownlinkDataTransfer:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        deliveryStatus:
          $ref: '#/components/schemas/DeliveryStatus'
        requestedRetransmissionTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
      required:
        - niddDownlinkDataTransfer
        - deliveryStatus
    NiddConfigurationStatusNotification:
      type: object
      properties:
        niddConfiguration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        status:
          $ref: '#/components/schemas/NiddStatus'
        rdsCapIndication:
          type: boolean
          description: It indicates whether the network capability for the reliable data service is
enabled or not.
        rdsPort:
          $ref: '#/components/schemas/RdsPort'
      required:
        - niddConfiguration
        - status
      oneOf:
        - required: [externalId]
        - required: [msisdn]
    GmdNiddDownlinkDataDeliveryNotification:
      type: object
      properties:
        niddDownlinkDataTransfer:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        gmdResults:
          type: array
          items:
            $ref: '#/components/schemas/GmdResult'
          minItems: 1
          description: Indicates the group message delivery result.
      required:
        - niddDownlinkDataTransfer
        - gmdResults
    RdsPort:
      type: object
      properties:
        portUE:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
        portSCEF:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
      required:
        - portUE
```

```
        - portSCEF
  GmdResult:
    type: object
    properties:
      externalId:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
      msisdn:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
      deliveryStatus:
        $ref: '#/components/schemas/DeliveryStatus'
      requestedRetransmissionTime:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
    required:
      - deliveryStatus
    oneOf:
      - required: [externalId]
      - required: [msisdn]
  NiddDownlinkDataDeliveryFailure:
    type: object
    properties:
      problemDetail:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
      requestedRetransmissionTime:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
    required:
      - problemDetail
  ManagePort:
    type: object
    properties:
      self:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
      appId:
        type: string
        description: Identifies the application.
      manageEntity:
        $ref: '#/components/schemas/ManageEntity'
      skipUeInquiry:
        type: boolean
        description: Indicate whether to skip UE inquiry.
    required:
      - appId
  ManagePortNotification:
    type: object
    properties:
      niddConfiguration:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
      externalId:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
      msisdn:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
      managedPorts:
        type: array
        items:
          $ref: '#/components/schemas/ManagePort'
        minItems: 1
        description: Indicates the reserved RDS port configuration information.
    required:
      - niddConfiguration
    oneOf:
      - required: [externalId]
      - required: [msisdn]
  RdsDownlinkDataDeliveryFailure:
    allOf:
      - $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
      - type: object
        properties:
          requestedRetransmissionTime:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
  PdnEstablishmentOptions:
    anyOf:
    - type: string
      enum:
        - WAIT_FOR_UE
        - INDICATE_ERROR
        - SEND_TRIGGER
    - type: string
      description: >
        This string provides forward-compatibility with future
```

```
                  extensions to the enumeration but is not used to encode
                  content defined in the present version of this API.
            description: >
              Possible values are
              - WAIT_FOR_UE: wait for the UE to establish the PDN connection
              - INDICATE_ERROR: respond with an error cause
              - SEND_TRIGGER: send a device trigger
    PdnEstablishmentOptionsRm:
      anyOf:
        - $ref: '#/components/schemas/PdnEstablishmentOptions'
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/NullValue'
    DeliveryStatus:
      anyOf:
        - type: string
          enum:
            - SUCCESS
            - SUCCESS_NEXT_HOP_ACKNOWLEDGED
            - SUCCESS_NEXT_HOP_UNACKNOWLEDGED
            - SUCCESS_ACKNOWLEDGED
            - SUCCESS_UNACKNOWLEDGED
            - TRIGGERED
            - BUFFERING
            - BUFFERING_TEMPORARILY_NOT_REACHABLE
            - SENDING
            - FAILURE
            - FAILURE_RDS_DISABLED
            - FAILURE_NEXT_HOP
            - FAILURE_TIMEOUT
            - FAILURE_TEMPORARILY_NOT_REACHABLE
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
      description: >
        Possible values are
        - SUCCESS: Success but details not provided
        - SUCCESS_NEXT_HOP_ACKNOWLEDGED: Successful delivery to the next hop with acknowledgment.
        - SUCCESS_NEXT_HOP_UNACKNOWLEDGED: Successful delivery to the next hop without
acknowledgment
        - SUCCESS_ACKNOWLEDGED: Reliable delivery was acknowledged by the UE
        - SUCCESS_UNACKNOWLEDGED: Reliable delivery was not acknowledged by the UE
        - TRIGGERED: The SCEF triggered the device and is buffering the data.
        - BUFFERING: The SCEF is buffering the data due to no PDN connection established.
        - BUFFERING_TEMPORARILY_NOT_REACHABLE: The SCEF has been informed that the UE is temporarily
not reachable but is buffering the data
        - SENDING: The SCEF has forwarded the data, but they may be stored elsewhere
        - FAILURE: Delivery failure but details not provided
        - FAILURE_RDS_DISABLED: RDS was disabled
        - FAILURE_NEXT_HOP: Unsuccessful delivery to the next hop.
        - FAILURE_TIMEOUT: Unsuccessful delivery due to timeout.
        - FAILURE_TEMPORARILY_NOT_REACHABLE: The SCEF has been informed that the UE is temporarily
not reachable without buffering the data.
      readOnly: true
    NiddStatus:
      anyOf:
        - type: string
          enum:
            - ACTIVE
            - TERMINATED_UE_NOT_AUTHORIZED
            - TERMINATED
            - RDS_PORT_UNKNOWN
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
      description: >
        Possible values are
        - ACTIVE: The NIDD configuration is active.
        - TERMINATED_UE_NOT_AUTHORIZED: The NIDD configuration was terminated because the UE´s
authorisation was revoked.
        - TERMINATED: The NIDD configuration was terminated.
        - RDS_PORT_UNKNOWN: The RDS port is unknown.
      readOnly: true
    ManageEntity:
      anyOf:
        - type: string
```

```
            enum:
              - UE
              - AS
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - UE: Representing the UE.
          - AS: Representing the Application Server.
        readOnly: true
    NiddConfigurationPatch:
      type: object
      properties:
        duration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTimeRm'
        reliableDataService:
          type: boolean
          description: Indicates whether the reliable data service (as defined in subclause 4.5.14.3
of 3GPP TS 23.682) acknowledgement is requested (true) or not (false).
          nullable: true
        rdsPorts:
          type: array
          items:
            $ref: '#/components/schemas/RdsPort'
          minItems: 1
          description: Indicates the static port configuration that is used for reliable data
transfer between specific applications using RDS (as defined in subclause 5.2.4 and 5.2.5 of 3GPP TS
24.250).
        pdnEstablishmentOption:
          $ref: '#/components/schemas/PdnEstablishmentOptionsRm'
```

A.7   DeviceTriggering API

```
openapi: 3.0.0
info:
  title: 3gpp-device-triggering
  version: 1.1.0
  description: |
    API for device trigger.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-device-triggering/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/transactions:
    get:
      summary: read all active device triggering transactions for a given SCS/AS.
      tags:
        - Device Triggering API SCS/AS level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
      responses:
        '200':
          description: OK (Successful get all of the active device triggering transactions for the
SCS/AS)
          content:
            application/json:
              schema:
                type: array
```

```
                    items:
                      $ref: '#/components/schemas/DeviceTriggering'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      post:
        summary: Create a long-term transaction for a device triggering.
        tags:
          - DeviceTriggering API Transaction level POST Operation
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of the SCS/AS
            required: true
            schema:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
        requestBody:
          description: Parameters to request a device triggering delivery.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DeviceTriggering'
        callbacks:
          notificationDestination:
            '{request.body#/notificationDestination}':
              post:
                requestBody:  # contents of the callback message
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/DeviceTriggeringDeliveryReportNotification'
                responses:
                  '200':
                    description: OK (successful notification)
                    content:
                     application/json:
                       schema:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/Acknowledgement'
                  '204':
                    description: No Content (successful notification)
                  '307':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                  '308':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                  '400':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                  '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                  '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                  '411':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                  '413':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                  '415':
```

```
                        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                      '429':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                      '500':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                      '503':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                      default:
                        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
              responses:
                '201':
                  description: Created (Successful creation of subscription)
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/DeviceTriggering'
                  headers:
                    Location:
                      description: 'Contains the URI of the newly created resource'
                      required: true
                      schema:
                        type: string
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/transactions/{transactionId}:
    get:
      summary: Read a device triggering transaction resource.
      tags:
        - DeviceTriggering API Transaction level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
           $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
        - name: transactionId
          in: path
          description: Identifier of the transaction resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DeviceTriggering'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
```

```
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '406':
                $ref: 'TS29122_CommonData.yaml#/components/responses/406'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      summary: Replace an existing device triggering transaction resource and the corresponding
device trigger request.
      tags:
        - DeviceTriggering API transaction level PUT Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
           $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
        - name: transactionId
          in: path
          description: Identifier of the transaction resource
          required: true
          schema:
             type: string
      requestBody:
        description: Parameters to update/replace the existing device triggering
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/DeviceTriggering'
      responses:
        '200':
          description: OK (Successful update of the device triggering)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DeviceTriggering'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: Deletes an already existing device triggering transaction.
      tags:
        - DeviceTriggering API Transaction level DELETE Operation
      parameters:
        - name: scsAsId
          in: path
```

```
                description: Identifier of the SCS/AS
                required: true
                schema:
                 $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
              - name: transactionId
                in: path
                description: Identifier of the transaction resource
                required: true
                schema:
                  type: string
          responses:
            '204':
              description: No Content (Successful deletion of the existing subscription)
            '200':
              description: OK (Successful deletion of the existing subscription)
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/DeviceTriggering'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    DeviceTriggering:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        validityPeriod:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        priority:
          $ref: '#/components/schemas/Priority'
        applicationPortId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
        appSrcPortId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
        triggerPayload:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        deliveryResult:
```

```
                  $ref: '#/components/schemas/DeliveryResult'
          required:
            - validityPeriod
            - priority
            - applicationPortId
            - triggerPayload
            - notificationDestination
          oneOf:
            - required: [externalId]
            - required: [msisdn]
    DeviceTriggeringDeliveryReportNotification:
      type: object
      properties:
        transaction:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        result:
          $ref: '#/components/schemas/DeliveryResult'
      required:
        - transaction
        - result
    DeliveryResult:
      anyOf:
      - type: string
        enum:
          - SUCCESS
          - UNKNOWN
          - FAILURE
          - TRIGGERED
          - EXPIRED
          - UNCONFIRMED
          - REPLACED
          - TERMINATE
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - SUCCESS: This value indicates that the device action request was successfully completed.
        - UNKNOWN: This value indicates any unspecified errors.
        - FAILURE: This value indicates that this trigger encountered a delivery error and is deemed
permanently undeliverable.
        - TRIGGERED: This value indicates that device triggering request is accepted by the SCEF.
        - EXPIRED: This value indicates that the validity period expired before the trigger could be
delivered.
        - UNCONFIRMED: This value indicates that the delivery of the device action request is not
confirmed.
        - REPLACED: This value indicates that the device triggering replacement request is accepted
by the SCEF.
        - TERMINATE: This value indicates that the delivery of the device action request is
terminated by the SCS/AS.
      readOnly: true
    Priority:
      anyOf:
      - type: string
        enum:
          - NO_PRIORITY
          - PRIORITY
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - NO_PRIORITY: This value indicates that the device trigger has no priority.
        - PRIORITY: This value indicates that the device trigger has priority.
```

A.8   GMDViaMBMS APIs

A.8.1   GMDviaMBMSbyMB2 API

```
openapi: 3.0.0
info:
  title: GMDviaMBMSbyMB2
```

```
    description: |
      API for Group Message Delivery via MBMS by MB2
      © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
      All rights reserved.
    version: 1.0.1
externalDocs:
    description: 3GPP TS 29.122 V15.4.0 T8 reference point for Northbound APIs
    url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-group-message-delivery-mb2/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/tmgi-allocation:
    get:
      summary: read all TMGI Allocation resource for a given SCS/AS
      tags:
        - TMGI Allocatin Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of TMGI Allocation resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TMGIAllocation'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary:  creates a new TMGI Allocation resource for a given SCS/AS
      tags:
        - TMGI Allocatin Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the TMGI Allocation to be created in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TMGIAllocation'
      responses:
        '201':
          description: successful creation of an TMGI Allocation
          content:
```

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```
              application/json:
                schema:
                  $ref: '#/components/schemas/TMGIAllocation'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/tmgi-allocation/{tmgi}:
    get:
      summary: read a TMGI Allocation resource for a given SCS/AS and a TMGI
      tags:
        - Individual TMGI Allocatin Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of TMGI Allocation resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TMGIAllocation'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary:  Updates an existing TMGI Allocation resource for a given SCS/AS and a TMGI
```

```
      tags:
        - Individual TMGI Allocatin Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the TMGI Allocation to be updated in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TMGIAllocation'
      responses:
        '200':
          description: successful creation of an TMGI Allocation
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TMGIAllocation'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  patch:
    summary:  Updates an existing TMGI Allocation resource for a given SCS/AS and a TMGI
    tags:
      - Individual TMGI Allocatin Operation
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of SCS/AS
        required: true
        schema:
          type: string
      - name: tmgi
        in: path
        description: TMGI
        required: true
        schema:
          type: string
    requestBody:
      description: representation of the TMGI Allocation to be updated in the SCEF
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/TMGIAllocationPatch'
    responses:
      '200':
```

```
              description: successful creation of an TMGI Allocation
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/TMGIAllocation'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary:  deletes an existing TMGI Allocation resource for a given SCS/AS and a TMGI
      tags:
        - Individual TMGI Allocatin Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content, successful deletion of an TMGI Allocation
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/tmgi-allocation/{tmgi}/delivery-via-mbms/:
    get:
      summary: read all group message delivery via MBMS resource for a given SCS/AS and a TMGI
      tags:
        - Delivery via MBMS Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
```

```
              in: path
              description: TMGI
              required: true
              schema:
                type: string
          responses:
            '200':
              description: OK (successful query of Delivery via MBMS resource)
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/GMDViaMBMSByMb2'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary:  Creates a new delivery via MBMS for a given SCS/AS and a TMGI
      tags:
        - Delivery via MBMS Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the GMD via MBMS by MB2 resource to be Created in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/GMDViaMBMSByMb2'
      callbacks:
        gMDByMb2Notification:
          '{$request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/GMDByMb2Notification'
              responses:
                '200':
                  description: OK (The successful acknowledgement of the notification with a body)
                  content:
                    application/json:
                      schema:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/Acknowledgement'
                '204':
                  description: successful notification
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
                    '403':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                    '404':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                    '411':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                    '413':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                    '415':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                    '429':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                    '500':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                    '503':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                    default:
                      $ref: 'TS29122_CommonData.yaml#/components/responses/default'
            responses:
              '201':
                description: successful creation of an GMD via MBMS by MB2 resource
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/GMDViaMBMSByMb2'
                headers:
                  Location:
                    description: 'Contains the URI of the newly created resource'
                    required: true
                    schema:
                      type: string
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/tmgi-allocation/{tmgi}/delivery-via-mbms/{transactionId}:
    get:
      summary: read all group message delivery via MBMS resource for a given SCS/AS and a TMGI
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
```

```
      responses:
        '200':
          description: OK (successful query of an Delivery via MBMS resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByMb2'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary:  Updates a existing delivery via MBMS for a given SCS/AS, a TMGI and transaction Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the GMD via MBMS by MB2 resource to be udpated in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/GMDViaMBMSByMb2'
      responses:
        '200':
          description: successful update of an individual GMD via MBMS by MB2 resource
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByMb2'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
```

```
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary:  Updates a existing delivery via MBMS for a given SCS/AS, a TMGI and transaction Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: tmgi
          in: path
          description: TMGI
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the GMD via MBMS by MB2 resource to be udpated in the SCEF
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/GMDViaMBMSByMb2Patch'
      responses:
        '200':
          description: successful update of an individual GMD via MBMS by MB2 resource
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByMb2'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary:  deletes a delivery via MBMS resource for a given SCS/AS, a TMGI and a transcation
Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
```

```
              schema:
                type: string
          - name: tmgi
            in: path
            description: TMGI
            required: true
            schema:
                type: string
          - name: transactionId
            in: path
            description: Identifier of transaction
            required: true
            schema:
                type: string
        responses:
          '204':
            description: No Content, successful deletion of an resouce of deliery via MBMS
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    TMGIAllocation:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        mbmsLocArea:
          $ref: '#/components/schemas/MbmsLocArea'
        tmgiExpiration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTimeRo'
    GMDViaMBMSByMb2:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        mbmsLocArea:
          $ref: '#/components/schemas/MbmsLocArea'
        messageDeliveryStartTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        groupMessagePayload:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
        scefMessageDeliveryIPv4:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4AddrRo'
```

```yaml
      scefMessageDeliveryIPv6:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6AddrRo'
      scefMessageDeliveryPort:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/PortRo'
    required:
      - notificationDestination
  GMDByMb2Notification:
    type: object
    properties:
      transaction:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
      deliveryTriggerStatus:
        type: boolean
        description: Indicates whether delivery of group message payload corresponding to the TMGI
was successful (TRUE) or not (FALSE)
    required:
      - transaction
      - deliveryTriggerStatus
  TMGIAllocationPatch:
    type: object
    properties:
      externalGroupId:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
      mbmsLocArea:
        $ref: '#/components/schemas/MbmsLocArea'
  GMDViaMBMSByMb2Patch:
    type: object
    properties:
      externalGroupId:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
      mbmsLocArea:
        $ref: '#/components/schemas/MbmsLocArea'
      messageDeliveryStartTime:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
      groupMessagePayload:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
  MbmsLocArea:
    type: object
    properties:
      cellId:
        type: array
        items:
          type: string
        minItems: 1
        description: Indicates a Cell Global Identification of the user which identifies the cell
the UE is registered.
      enodeBId:
        type: array
        items:
          type: string
        minItems: 1
        description: Indicates an eNodeB in which the UE is currently located.
      geographicArea:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        minItems: 1
        description: Identifies a geographic area of the user where the UE is located.
      mbmsServiceAreaId:
        type: array
        items:
          type: string
        minItems: 1
        description: Identifies an MBMS Service Area Identity of the user where the UE is located.
      civicAddress:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
        minItems: 1
        description: Identifies a civic address of the user where the UE is located.
```

A.8.2 GMDviaMBMSbyxMB API

```yaml
openapi: 3.0.0
info:
  title: GMDviaMBMSbyxMB
  description: |
    API for Group Message Delivery via MBMS by xMB
```

```
        © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
        All rights reserved.
    version: 1.1.0
externalDocs:
    description: 3GPP TS 29.122 V16.6.0 T8 reference point for Northbound APIs
    url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
    - {}
    - oAuth2ClientCredentials: []
servers:
    - url: '{apiRoot}/3gpp-group-message-delivery-xmb/v1'
      variables:
        apiRoot:
          default: https://example.com
          description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/services/:
    get:
      summary: read all service resources for a given SCS/AS
      tags:
        - Service Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of service creation resource)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/ServiceCreation'
                minItems: 0
                description: The service resource for the SCS/AS in the request URI is returned.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: creates a new service creation resource for a given SCS/AS
      tags:
        - Service Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the service to be created in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceCreation'
      responses:
        '201':
```

```
              description: successful creation of a service
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/ServiceCreation'
              headers:
                Location:
                  description: 'Contains the URI of the newly created resource'
                  required: true
                  schema:
                    type: string
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/services/{serviceId}:
    get:
      summary: read a service resource for a given SCS/AS and a Service Id
      tags:
        - Individual Service Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of service resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceCreation'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
      delete:
        summary: deletes an existing service resource for a given SCS/AS and a service id
        tags:
          - Individual service Operation
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of SCS/AS
            required: true
            schema:
              type: string
          - name: serviceId
            in: path
            description: Service Id
            required: true
            schema:
              type: string
        responses:
          '204':
            description: No Content, successful deletion of a service resource
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/services/{serviceId}/delivery-via-mbms:
    get:
      summary: read all group message delivery via MBMS resource for a given SCS/AS and a service id
      tags:
        - Delivery via MBMS Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of Delivery via MBMS resource)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/GMDViaMBMSByxMB'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
```

```
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  post:
    summary:  Creates a new delivery via MBMS for a given SCS/AS and a service Id
    tags:
      - Delivery via MBMS Operation
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of SCS/AS
        required: true
        schema:
          type: string
      - name: serviceId
        in: path
        description: Service Id
        required: true
        schema:
          type: string
    requestBody:
      description: representation of the GMD via MBMS by xMB resource to be Created in the SCEF
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/GMDViaMBMSByxMB'
    callbacks:
      gMDByxMBNotification:
        '{$request.body#/notificationDestination}':
          post:
            requestBody:  # contents of the callback message
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/GMDByxMBNotification'
            responses:
              '200':
                description: OK (The successful acknowledgement of the notification with a body)
                content:
                  application/json:
                    schema:
                      $ref: 'TS29122_CommonData.yaml#/components/schemas/Acknowledgement'
              '204':
                description: successful notification
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    responses:
      '201':
        description: successful creation of an GMD via MBMS by xMB resource
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/GMDViaMBMSByxMB'
```

```
              headers:
                Location:
                  description: 'Contains the URI of the newly created resource'
                  required: true
                  schema:
                    type: string
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/services/{serviceId}/delivery-via-mbms/{transactionId}:
    get:
      summary: read all group message delivery via MBMS resource for a given SCS/AS and a service Id
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (successful query of an Delivery via MBMS resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByxMB'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
    put:
      summary:  Updates an existing delivery via MBMS for a given SCS/AS, a service Id and
transaction Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      requestBody:
        description: representation of the GMD via MBMS by xMB resource to be udpated in the SCEF
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/GMDViaMBMSByxMB'
      responses:
        '200':
          description: successful update of an individual GMD via MBMS by xMB resource
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByxMB'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary:  Updates an existing delivery via MBMS for a given SCS/AS, a service Id and
transaction Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
```

```
                schema:
                  type: string
            - name: transactionId
              in: path
              description: Identifier of transaction
              required: true
              schema:
                type: string
        requestBody:
          description: representation of the GMD via MBMS by xMB resource to be udpated in the SCEF
          required: true
          content:
            application/merge-patch+json:
              schema:
                $ref: '#/components/schemas/GMDViaMBMSByxMBPatch'
        responses:
          '200':
            description: successful update of an individual GMD via MBMS by xMB resource
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/GMDViaMBMSByxMB'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary:  deletes a delivery via MBMS resource for a given SCS/AS, a service Id and a
transcation Id.
      tags:
        - Individual Delivery via MBMS resource Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of SCS/AS
          required: true
          schema:
            type: string
        - name: serviceId
          in: path
          description: Service Id
          required: true
          schema:
            type: string
        - name: transactionId
          in: path
          description: Identifier of transaction
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content, successful deletion of an resouce of deliery via MBMS
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    ServiceCreation:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        userServiceId:
          type: string
          description: Identifies the MBMS User Service supplied by the SCEF.
          readOnly: true
        serviceClass:
          type: string
          description: The service class that service belongs to supplied by the SCEF.
          readOnly: true
        serviceLanguages:
          type: array
          items:
            type: string
          minItems: 1
          description: List of language of the service content supplied by the SCEF.
          readOnly: true
        serviceNames:
          type: array
          items:
            type: string
          minItems: 1
          description: List of Service Names supplied by the SCEF.
          readOnly: true
        receiveOnlyMode:
          type: boolean
          description: When set to 'true', the Content Provider indicates that the service is a
Receive Only Mode service. This parameter is supplied by the SCEF.
          readOnly: true
        serviceAnnouncementMode:
          $ref: '#/components/schemas/ServiceAnnouncementMode'
    GMDViaMBMSByxMB:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        mbmsLocArea:
          $ref: '#/components/schemas/MbmsLocArea'
        messageDeliveryStartTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        messageDeliveryStopTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        groupMessagePayload:
```

```
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
            scefMessageDeliveryIPv4:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4AddrRo'
            scefMessageDeliveryIPv6:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6AddrRo'
            scefMessageDeliveryPort:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/PortRo'
        required:
          - notificationDestination
    GMDByxMBNotification:
        type: object
        properties:
            transaction:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
            deliveryTriggerStatus:
                type: boolean
                description: Indicates whether delivery of group message payload was successful(TRUE) or
not (FALSE)
        required:
          - transaction
          - deliveryTriggerStatus
    GMDViaMBMSByxMBPatch:
        type: object
        properties:
            mbmsLocArea:
                $ref: '#/components/schemas/MbmsLocArea'
            messageDeliveryStartTime:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
            messageDeliveryStopTime:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
            groupMessagePayload:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
    MbmsLocArea:
        type: object
        properties:
            cellId:
                type: array
                items:
                    type: string
                minItems: 1
                description: Indicates a Cell Global Identification of the user which identifies the cell
the UE is registered.
            enodeBId:
                type: array
                items:
                    type: string
                minItems: 1
                description: Indicates an eNodeB in which the UE is currently located.
            geographicArea:
                type: array
                items:
                    $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
                minItems: 1
                description: Identifies a geographic area of the user where the UE is located.
            mbmsServiceAreaId:
                type: array
                items:
                    type: string
                minItems: 1
                description: Identifies an MBMS Service Area Identity of the user where the UE is located.
            civicAddress:
                type: array
                items:
                    $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
                minItems: 1
                description: Identifies a civic address of the user where the UE is located.
    ServiceAnnouncementMode:
        anyOf:
        - type: string
          enum:
            - SACH
            - CONTENT_PROVIDER
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
```

```
         Possible values are
         - SACH: BM-SC performs the service announcement for the current service using the SACH
channel.
         - CONTENT_PROVIDER: BM-SC provides the necessary service access information used by the
Content Provider to create the service announcement information.
       readOnly: true
```

A.9 ReportingNetworkStatus API

```
openapi: 3.0.0
info:
  title: 3gpp-network-status-reporting
  version: 1.0.1
  description: |
    API for reporting network status.
    © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V15.4.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-net-stat-report/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/subscriptions:
    parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
    get:
      summary: Read all network status reporting subscription resources for a given SCS/AS.
      responses:
        '200':
          description: The requested information was returned successfully.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/NetworkStatusReportingSubscription'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Create a new network status reporting subscription resource.
      requestBody:
        required: true
        content:
          application/json:
            schema:
```

```
                      $ref: '#/components/schemas/NetworkStatusReportingSubscription'
        callbacks:
          notificationDestination:
            '{request.body#/notificationDestination}':
              post:
                requestBody:  # contents of the callback message
                  required: true
                  content:
                    application/json:
                      schema:
                        $ref: '#/components/schemas/NetworkStatusReportingNotification'
                responses:
                  '204':
                    description: No Content (successful notification)
                  '400':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                  '401':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                  '403':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                  '404':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                  '411':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                  '413':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                  '415':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                  '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        responses:
          '201':
            description: The subscription was created successfully. The URI of the created resource
shall be returned in the "Location" HTTP header.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/NetworkStatusReportingSubscription'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource'
                required: true
                schema:
                  type: string
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/subscriptions/{subscriptionId}:
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS
```

```
              required: true
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ScsAsId'
            - name: subscriptionId
              in: path
              description: Identifier of the subscription resource of type string
              required: true
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ResourceId'
      get:
        summary: Read an active network status reporting subscription resource.
        responses:
          '200':
            description: The requested information was returned successfully.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/NetworkStatusReportingSubscription'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '406':
            $ref: 'TS29122_CommonData.yaml#/components/responses/406'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      put:
        summary: Modify an existing subscription resource to update a subscription.
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NetworkStatusReportingSubscription'
        responses:
          '200':
            description: The subscription was updated successfully.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/NetworkStatusReportingSubscription'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      delete:
        summary: Delete an existing continuous network status reporting subscription resource.
        responses:
          '204':
            description: The subscription was updated successfully.
```

```
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    NetworkStatusReportingSubscription:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        locationArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea'
        timeDuration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        thresholdValues:
          type: array
          items:
            $ref: '#/components/schemas/CongestionValue'
          minItems: 1
          description: Identifies a list of congestion level(s) with exact value that the SCS/AS
requests to be informed of when reached.
        thresholdTypes:
          type: array
          items:
            $ref: '#/components/schemas/CongestionType'
          minItems: 1
          description: Identifies a list of congestion level(s) with abstracted value that the
SCS/AS requests to be informed of when reached.
      required:
        - notificationDestination
        - locationArea
      not:
        required: [thresholdValues, thresholdTypes]
    NetworkStatusReportingNotification:
      type: object
      properties:
        subscription:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        nsiValue:
          $ref: '#/components/schemas/CongestionValue'
        nsiType:
          $ref: '#/components/schemas/CongestionType'
      required:
        - subscription
      not:
        required: [nsiValue, nsiType]
    CongestionValue:
      type: integer
```

```
          minimum: 0
          maximum: 31
          description: Unsigned integer with valid values between 0 and 31. The value 0 indicates that
there is no congestion. The value 1 is the lowest congestion level and value 31 is the highest
congestion level.
      CongestionType:
        anyOf:
        - type: string
          enum:
            - HIGH
            - MEDIUM
            - LOW
        - type: string
          description: >
            This string provides forward-compatibility with future
            extensions to the enumeration but is not used to encode
            content defined in the present version of this API.
        description: >
          Possible values are
          - HIGH: The congestion status is high.
          - MEDIUM: The congestion status is medium.
          - LOW: The congestion status is low.
```

A.10   CpProvisioning API

```
openapi: 3.0.0
info:
  title: 3gpp-cp-parameter-provisioning
  version: 1.1.1
  description: |
    API for provisioning communication pattern parameters.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-cp-parameter-provisioning/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/subscriptions:
    get:
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. The subscription information related to the request URI is returned.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/CpInfo'
                minItems: 0
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
```

```
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '406':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/406'
              '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      post:
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
            required: true
            schema:
              type: string
        requestBody:
          description: create new subscriptions for a given SCS/AS and the provisioning CP parameter
sets.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/CpInfo'
        responses:
          '201':
            description: Created. The subscription was created successfully. The SCEF shall return the
created subscription in the response payload body.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/CpInfo'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource'
                required: true
                schema:
                  type: string
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            description: The CP parameters for all sets were not created successfully. CpReport may be
included with detailed information.
            content:
              application/json:
                schema:
                  type: array
                  items:
                    $ref: '#/components/schemas/CpReport'
                  minItems: 1
              application/problem+json:
                schema:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/subscriptions/{subscriptionId}:
    get:
      parameters:
```

```
          - name: scsAsId
            in: path
            description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
            required: true
            schema:
              type: string
          - name: subscriptionId
            in: path
            description: Subscription ID
            required: true
            schema:
              type: string
        responses:
          '200':
            description: OK. The subscription information related to the request URI is returned.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/CpInfo'
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '406':
            $ref: 'TS29122_CommonData.yaml#/components/responses/406'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      requestBody:
        description: Modify a CP parameter provisioning subscription resource.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/CpInfo'
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Subscription ID
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. The subscription was modified successfully. The SCEF shall return an
updated subscription in the response payload body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/CpInfo'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
```

```
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  description: The CP parameters for all sets were not updated successfully. CpReport may be
included with detailed information.
                  content:
                    application/json:
                      schema:
                        type: array
                        items:
                          $ref: '#/components/schemas/CpReport'
                        minItems: 1
                    application/problem+json:
                      schema:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      delete:
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
            required: true
            schema:
              type: string
          - name: subscriptionId
            in: path
            description: Subscription ID
            required: true
            schema:
              type: string
        responses:
          '204':
            description: No Content. The subscription was deleted successfully. The payload body shall
be empty.
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/subscriptions/{subscriptionId}/cpSets/{setId}:
    get:
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
          required: true
```

```
                  schema:
                    type: string
              - name: subscriptionId
                in: path
                description: Subscription ID
                required: true
                schema:
                  type: string
              - name: setId
                in: path
                description: Identifier of the CP parameter set
                required: true
                schema:
                  type: string
          responses:
            '200':
              description: OK. The subscription information related to the request URI is returned.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/CpParameterSet'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
        put:
          requestBody:
            description: Change information for a CP parameter set.
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/CpParameterSet'
          parameters:
            - name: scsAsId
              in: path
              description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
              required: true
              schema:
                type: string
            - name: subscriptionId
              in: path
              description: Subscription ID
              required: true
              schema:
                type: string
            - name: setId
              in: path
              description: Identifier of the CP parameter set
              required: true
              schema:
                type: string
          responses:
            '200':
              description: OK. The CP parameter set resource was modified successfully. The SCEF shall
return an updated CP parameter set resource in the response payload body.
              content:
                application/json:
                  schema:
```

```
                      $ref: '#/components/schemas/CpParameterSet'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '409':
              description: The CP parameters for the CP set were not updated successfully.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/CpReport'
                application/problem+json:
                  schema:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              description: The CP parameters for the CP set were not updated successfully.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/CpReport'
                application/problem+json:
                  schema:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Subscription ID
          required: true
          schema:
            type: string
        - name: setId
          in: path
          description: Identifier of the CP parameter set
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. The subscription was deleted successfully. The payload body shall
be empty.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    CpInfo:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        mtcProviderId:
          type: string
          description: Identifies the MTC Service Provider and/or MTC Application.
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        cpParameterSets:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/CpParameterSet'
          minProperties: 1
          description: Identifies a set of CP parameter information that may be part of this CpInfo
structure.
        cpReports:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/CpReport'
          minProperties: 1
          description: Supplied by the SCEF and contains the CP set identifiers for which CP
parameter(s) are not added or modified successfully. The failure reason is also included. Each
element provides the related information for one or more CP set identifier(s) and is identified in
the map via the failure identifier as key.
          readOnly: true
      required:
        - cpParameterSets
      oneOf:
        - required: [externalId]
        - required: [msisdn]
        - required: [externalGroupId]
    CpParameterSet:
      type: object
      properties:
        setId:
          type: string
          description: SCS/AS-chosen correlator provided by the SCS/AS in the request to create a
resource fo CP parameter set(s).
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        validityTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        periodicCommunicationIndicator:
          $ref: '#/components/schemas/CommunicationIndicator'
        communicationDurationTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        periodicTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        scheduledCommunicationTime:
          $ref: '#/components/schemas/ScheduledCommunicationTime'
        scheduledCommunicationType:
```

```
                  $ref: '#/components/schemas/ScheduledCommunicationType'
              stationaryIndication:
                  $ref: '#/components/schemas/StationaryIndication'
              batteryInds:
                  type: array
                  items:
                      $ref: '#/components/schemas/BatteryIndication'
                  minItems: 1
              trafficProfile:
                  $ref: '#/components/schemas/TrafficProfile'
              expectedUmts:
                  type: array
                  items:
                      $ref: '#/components/schemas/UmtLocationArea5G'
                  minItems: 1
                  description: Identifies the UE's expected geographical movement. The attribute is only
applicable in 5G.
              expectedUmtDays:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/DayOfWeek'
          required:
              - setId
      ScheduledCommunicationTime:
          type: object
          properties:
              daysOfWeek:
                  type: array
                  items:
                      $ref: 'TS29122_CommonData.yaml#/components/schemas/DayOfWeek'
                  minItems: 1
                  maxItems: 6
                  description: Identifies the day(s) of the week. If absent, it indicates every day of the
week.
              timeOfDayStart:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeOfDay'
              timeOfDayEnd:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeOfDay'
      CpReport:
          type: object
          properties:
              setIds:
                  type: array
                  items:
                      type: string
                  minItems: 1
                  description: Identifies the CP set identifier(s) which CP parameter(s) are not added or
modified successfully
              failureCode:
                  $ref: '#/components/schemas/CpFailureCode'
          required:
              - failureCode
      UmtLocationArea5G:
          allOf:
              - $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
              - type: object
                properties:
                    umtTime:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeOfDay'
                    umtDuration:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
      CommunicationIndicator:
          anyOf:
          - type: string
            enum:
                - PERIODICALLY
                - ON_DEMAND
          - type: string
            description: >
              This string provides forward-compatibility with future
              extensions to the enumeration but is not used to encode
              content defined in the present version of this API.
          description: >
              Possible values are
              - PERIODICALLY: Identifies the UE communicates periodically
              - ON_DEMAND: Identifies the UE communicates on demand
      StationaryIndication:
          anyOf:
          - type: string
            enum:
```

```
                        - STATIONARY
                        - MOBILE
                    - type: string
                      description: >
                        This string provides forward-compatibility with future
                        extensions to the enumeration but is not used to encode
                        content defined in the present version of this API.
                  description: >
                    Possible values are
                    - STATIONARY: Identifies the UE is stationary
                    - MOBILE: Identifies the UE is mobile
          CpFailureCode:
            anyOf:
            - type: string
              enum:
                - MALFUNCTION
                - SET_ID_DUPLICATED
                - OTHER_REASON
            - type: string
              description: >
                This string provides forward-compatibility with future
                extensions to the enumeration but is not used to encode
                content defined in the present version of this API.
            description: >
              Possible values are
              - MALFUNCTION: This value indicates that something functions wrongly in CP parameter
provisioning or the CP parameter provisioning does not function at all.
              - SET_ID_DUPLICATED: The received CP set identifier(s) are already provisioned.
              - OTHER_REASON: Other reason unspecified.
          BatteryIndication:
            anyOf:
            - type: string
              enum:
                - BATTERY_RECHARGE
                - BATTERY_REPLACE
                - BATTERY_NO_RECHARGE
                - BATTERY_NO_REPLACE
                - NO_BATTERY
            - type: string
              description: >
                This string provides forward-compatibility with future
                extensions to the enumeration but is not used to encode
                content defined in the present version of this API.
            description: >
              Possible values are
              - BATTERY_RECHARGE: UE powered with rechargeable battery.
              - BATTERY_REPLACE: UE powered with replaceable battery.
              - BATTERY_NO_RECHARGE: UE powered with no rechargeable battery.
              - BATTERY_NO_REPLACE: UE powered with no replaceable battery.
              - NO_BATTERY: UE not battery powered.
          TrafficProfile:
            anyOf:
            - type: string
              enum:
                - SINGLE_TRANS_UL
                - SINGLE_TRANS_DL
                - DUAL_TRANS_UL_FIRST
                - DUAL_TRANS_DL_FIRST
                - MULTI_TRANS
            - type: string
              description: >
                This string provides forward-compatibility with future
                extensions to the enumeration but is not used to encode
                content defined in the present version of this API.
            description: >
              Possible values are
              - SINGLE_TRANS_UL: Uplink single packet transmission.
              - SINGLE_TRANS_DL: Downlink single packet transmission.
              - DUAL_TRANS_UL_FIRST: Dual packet transmission, firstly uplink packet transmission with
subsequent downlink packet transmission.
              - DUAL_TRANS_DL_FIRST: Dual packet transmission, firstly downlink packet transmission with
subsequent uplink packet transmission.
              - MULTI_TRANS: Multiple packet transmission.
          ScheduledCommunicationType:
            anyOf:
            - type: string
              enum:
                - DOWNLINK
```

```
                    - UPLINK
                    - BIDIRECTIONAL
            - type: string
              description: >
                This string provides forward-compatibility with future
                extensions to the enumeration but is not used to encode
                content defined in the present version of this API.
          description: >
            Possible values are
            - DOWNLINK: Downlink only.
            - UPLINK: Uplink only.
            - BIDIRECTIONAL: Bi-directional.
```

A.11   PfdManagement API

```
openapi: 3.0.0
info:
  title: 3gpp-pfd-management
  version: 1.1.1
  description: |
    API for PFD management.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-pfd-management/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/transactions:
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: OK. All transactions related to the request URI are returned.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/PfdManagement'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    post:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PfdManagement'
        description: Create a new transaction for PFD management.
      responses:
        '201':
          description: Created. The transaction was created successfully. The SCEF shall return the
created transaction in the response payload body. PfdReport may be included to provide detailed
failure information for some applications.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdManagement'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          description: The PFDs for all applications were not created successfully. PfdReport is
included with detailed information.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/PfdReport'
                minItems: 1
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      callbacks:
        notificationDestination:
          '{request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      type: array
                      items:
                        $ref: '#/components/schemas/PfdReport'
                      minItems: 1
              responses:
                '204':
                  description: No Content (successful notification)
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
```

```
                      $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                    '401':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                    '403':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                    '404':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                    '411':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                    '413':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                    '415':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                    '429':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                    '500':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                    '503':
                      $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                      $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/transactions/{transactionId}:
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
        required: true
        schema:
          type: string
      - name: transactionId
        in: path
        description: Transaction ID
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: OK. The transaction information related to the request URI is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdManagement'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    put:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PfdManagement'
        description: Change information in PFD management transaction.
      responses:
        '200':
          description: OK. The transaction was modified successfully. The SCEF shall return an
updated transaction in the response payload body.
```

```
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/PfdManagement'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              description: The PFDs for all applications were not updated successfully. PfdReport is
included with detailed information.
              content:
                application/json:
                  schema:
                    type: array
                    items:
                      $ref: '#/components/schemas/PfdReport'
                    minItems: 1
                application/problem+json:
                  schema:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      responses:
        '204':
          description: No Content. The transaction was deleted successfully. The payload body shall
be empty.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /{scsAsId}/transactions/{transactionId}/applications/{appId}:
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
        required: true
        schema:
          type: string
      - name: transactionId
        in: path
        description: Transaction ID
```

```
                required: true
                schema:
                  type: string
          - name: appId
            in: path
            description: Identifier of the application
            required: true
            schema:
              type: string
      get:
        responses:
          '200':
            description: OK. The application information related to the request URI is returned.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/PfdData'
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '406':
            $ref: 'TS29122_CommonData.yaml#/components/responses/406'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      put:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdData'
          description: Change information in application.
        responses:
          '200':
            description: OK. The application resource was modified successfully. The SCEF shall return
an updated application resource in the response payload body.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/PfdData'
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            description: The PFDs for the application were not updated successfully.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/PfdReport'
              application/problem+json:
                schema:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '409':
            description: The PFDs for the application were not updated successfully.
            content:
              application/json:
```

```
              schema:
                $ref: '#/components/schemas/PfdReport'
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          description: The PFDs for the application were not updated successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdReport'
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    patch:
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/PfdData'
        description: Change information in PFD management transaction.
      responses:
        '200':
          description: OK. The transaction was modified successfully. The SCEF shall return an
updated transaction in the response payload body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          description: The PFDs for the application were not updated successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdReport'
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '409':
          description: The PFDs for the application were not updated successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdReport'
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
```

```
        '500':
          description: The PFDs for the application were not updated successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PfdReport'
            application/problem+json:
              schema:
                $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      responses:
        '204':
          description: No Content. The application was deleted successfully. The payload body shall
be empty.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    PfdManagement:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        pfdDatas:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/PfdData'
          minProperties: 1
          description: Each element uniquely identifies the PFDs for an external application
identifier. Each element is identified in the map via an external application identifier as key. The
response shall include successfully provisioned PFD data of application(s).
        pfdReports:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/PfdReport'
          minProperties: 1
          description: Supplied by the SCEF and contains the external application identifiers for
which PFD(s) are not added or modified successfully. The failure reason is also included. Each
element provides the related information for one or more external application identifier(s) and is
identified in the map via the failure identifier as key.
          readOnly: true
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
```

```
          websockNotifConfig:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        required:
          - pfdDatas
    PfdData:
      type: object
      properties:
        externalAppId:
          type: string
          description: Each element uniquely external application identifier
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        pfds:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/Pfd'
          description: Contains the PFDs of the external application identifier. Each PFD is
identified in the map via a key containing the PFD identifier.
        allowedDelay:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSecRm'
        cachingTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSecRo'
      required:
        - externalAppId
        - pfds
    Pfd:
      type: object
      properties:
        pfdId:
          type: string
          description: Identifies a PDF of an application identifier.
        flowDescriptions:
          type: array
          items:
            type: string
          minItems: 1
          description: Represents a 3-tuple with protocol, server ip and server port for UL/DL
application traffic. The content of the string has the same encoding as the IPFilterRule AVP value
as defined in IETF RFC 6733.
        urls:
          type: array
          items:
            type: string
          minItems: 1
          description: Indicates a URL or a regular expression which is used to match the
significant parts of the URL.
        domainNames:
          type: array
          items:
            type: string
          minItems: 1
          description: Indicates an FQDN or a regular expression as a domain name matching criteria.
        dnProtocol:
          $ref: '#/components/schemas/DomainNameProtocol'
      required:
        - pfdId
    PfdReport:
      type: object
      properties:
        externalAppIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies the external application identifier(s) which PFD(s) are not added
or modified successfully
        failureCode:
          $ref: '#/components/schemas/FailureCode'
        cachingTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        locationArea:
          $ref: '#/components/schemas/UserPlaneLocationArea'
      required:
        - externalAppIds
        - failureCode
    UserPlaneLocationArea:
      type: object
      properties:
```

```
        locationArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea'
        locationArea5G:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        dnais:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
          minItems: 0
          description: Identifies a list of DNAI which the user plane functions support.
    FailureCode:
      anyOf:
      - type: string
        enum:
          - MALFUNCTION
          - RESOURCE_LIMITATION
          - SHORT_DELAY
          - APP_ID_DUPLICATED
          - PARTIAL_FAILURE
          - OTHER_REASON
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - MALFUNCTION: This value indicates that something functions wrongly in PFD provisioning or
the PFD provisioning does not function at all.
        - RESOURCE_LIMITATION: This value indicates there is resource limitation for PFD storage.
        - SHORT_DELAY: This value indicates that the allowed delay is too short and PFD(s) are not
stored.
        - APP_ID_DUPLICATED: The received external application identifier(s) are already
provisioned.
        - PARTIAL_FAILURE: The PFD(s) are not provisioned to all PCEFs/TDFs/SMFs.
        - OTHER_REASON: Other reason unspecified.
    DomainNameProtocol:
      anyOf:
      - type: string
        enum:
          - DNS_QNAME
          - TLS_SNI
          - TLS_SAN
          - TSL_SCN
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - DNS_QNAME: Identifies the DNS protocol and the question name in DNS query.
        - TLS_SNI: Identifies the Server Name Indication in TLS ClientHello message.
        - TLS_SAN: Identifies the Subject Alternative Name in TLS ServerCertificate message.
        - TLS_SCN: Identifies the Subject Common Name in TLS ServerCertificate message.
```

A.12 ECRControl API

```
openapi: 3.0.0
info:
  title: 3gpp-ecr-control
  version: 1.1.1
  description: |
    API for enhanced converage restriction control.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-ecr-control/v1'
    variables:
      apiRoot:
```

```
          default: https://example.com
          description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /query:
    post:
      summary: Query the status of enhanced converage restriction for a UE.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ECRControl'
      responses:
        '200':
          description: The requested information was returned successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ECRData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /configure:
    post:
      summary: Configure the enhanced converage restriction for a UE.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ECRControl'
      responses:
        '200':
          description: The Enhanced Coverage Restriction setting was configured successfully..
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ECRData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
```

```
                  '415':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                  '429':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                  default:
                    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    ECRControl:
      type: object
      properties:
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        mtcProviderId:
          type: string
          description: Identifies the MTC Service Provider and/or MTC Application.
        scsAsId:
          type: string
          description: Identifier of the SCS/AS.
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        ecrDataWbs:
          type: array
          items:
            $ref: '#/components/schemas/PlmnEcRestrictionDataWb'
          minItems: 0
        restrictedPlmnIds:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
          minItems: 0
          description: Indicates a complete list (and possibly empty) of serving PLMNs where
Enhanced Coverage shall be restricted. This attribute shall not be present for the query custom
operation.
        allowedPlmnIds:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
          minItems: 0
          description: Indicates a complete list (and possibly empty) of serving PLMNs where
Enhanced Coverage shall be allowed. This attribute shall not be present for the query custom
operation.
      required:
        - supportedFeatures
      oneOf:
        - required: [externalId]
        - required: [msisdn]
      not:
        required: [restrictedPlmnIds, allowedPlmnIds]
    ECRData:
      type: object
      properties:
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        visitedPlmnId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
        ecrDataWbs:
          type: array
          items:
            $ref: '#/components/schemas/PlmnEcRestrictionDataWb'
          minItems: 0
        restrictedPlmnIds:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
```

```
            minItems: 0
            description: Indicates a complete list (and possibly empty) of serving PLMNs where
Enhanced Coverage shall be restricted.
          allowedPlmnIds:
            type: array
            items:
              $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
            minItems: 0
            description: Indicates a complete list (and possibly empty) of serving PLMNs where
Enhanced Coverage shall be allowed.
        required:
          - supportedFeatures
        not:
          required: [restrictedPlmnIds, allowedPlmnIds]
    PlmnEcRestrictionDataWb:
        type: object
        properties:
          plmnId:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/PlmnId'
          plmnEcrDataWb:
            $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/EcRestrictionDataWb'
        required:
          - plmnId
```

A.13 NpConfiguration API

```
openapi: 3.0.0
info:
  title: 3gpp-network-parameter-configuration
  version: 1.1.2
  description: |
    API for network parameter configuration.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-network-parameter-configuration/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause of 3GPP TS 29.122.
paths:
  /{scsAsId}/configurations:
    get:
      summary: read all of the active configurations for the SCS/AS
      tags:
        - NpConfiguration API SCS/AS level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get all of the active NpConfigurations for the SCS/AS)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/NpConfiguration'
                minItems: 0
                description: Network Parameter configurations
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
```

```
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '406':
                $ref: 'TS29122_CommonData.yaml#/components/responses/406'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new configuration resource for network parameter configuration
      tags:
        - NpConfiguration API Configuration level POST Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
      requestBody:
        description: new configuration creation
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NpConfiguration'
      callbacks:
        notificationDestination:
          '{request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/ConfigurationNotification'
              responses:
                '204':
                  description: No Content (successful notification)
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      responses:
        '201':
          description: Created (Successful creation of configuration)
          content:
```

```
                application/json:
                  schema:
                    $ref: '#/components/schemas/NpConfiguration'
              headers:
                Location:
                  description: 'Contains the URI of the newly created resource'
                  required: true
                  schema:
                    type: string
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/configurations/{configurationId}:
    get:
      summary: read an active configuration for the SCS/AS and the configuration Id
      tags:
        - NpConfiguration API Configuration level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active configuration)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NpConfiguration'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing configuration resource
      tags:
        - NpConfiguration API Configuration level PUT Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing configuration
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NpConfiguration'
      responses:
        '200':
          description: OK (Successful deletion of the existing configuration)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NpConfiguration'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Updates/replaces an existing configuration resource
      tags:
        - NpConfiguration API Configuration level PATCH Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      requestBody:
```

```
                required: true
                content:
                  application/merge-patch+json:
                    schema:
                      $ref: '#/components/schemas/NpConfigurationPatch'
          responses:
            '200':
              description: OK. The configuration was modified successfully.
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/NpConfiguration'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

      delete:
        summary: Deletes an already existing configuration
        tags:
          - NpConfiguration API Configuration level DELETE Operation
        parameters:
          - name: scsAsId
            in: path
            description: Identifier of the SCS/AS
            required: true
            schema:
              type: string
          - name: configurationId
            in: path
            description: Identifier of the configuration resource
            required: true
            schema:
              type: string
        responses:
          '204':
            description: No Content (Successful deletion of the existing configuration)
          '200':
            description: OK. (Successful deletion of the existing configuration)
            content:
              application/json:
                schema:
                  type: array
                  items:
                    $ref: 'TS29122_CommonData.yaml#/components/schemas/ConfigResult'
                  minItems: 1
                  description: The configuration was terminated successfully, the configuration
failure information for group members shall be included if received.
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    NpConfiguration:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        mtcProviderId:
          type: string
          description: Identifies the MTC Service Provider and/or MTC Application.
        externalId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalId'
        msisdn:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Msisdn'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        maximumLatency:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        maximumResponseTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        suggestedNumberOfDlPackets:
          type: integer
          minimum: 0
          description: This parameter may be included to identify the number of packets that the
serving gateway shall buffer in case that the UE is not reachable.
        groupReportingGuardTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        validityTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
      oneOf:
        - required: [externalId]
        - required: [msisdn]
        - required: [externalGroupId]
    NpConfigurationPatch:
      type: object
      properties:
        maximumLatency:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSecRm'
        maximumResponseTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSecRm'
        suggestedNumberOfDlPackets:
          type: integer
          minimum: 0
          description: This parameter may be included to identify the number of packets that the
serving gateway shall buffer in case that the UE is not reachable.
          nullable: true
        groupReportGuardTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSecRm'
        validityTime:
```

```
              $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTimeRm'
    ConfigurationNotification:
      type: object
      properties:
        configuration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        configResults:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/ConfigResult'
          minItems: 1
          description: The grouping configuration result notification provided by the SCEF.
        appliedParam:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/AppliedParameterConfiguration'
      required:
        - configuration
```

A.14 AsSessionWithQoS API

```
openapi: 3.0.0
info:
  title: 3gpp-as-session-with-qos
  version: 1.1.4
  description: |
    API for setting us an AS session with required QoS.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.14.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-as-session-with-qos/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/subscriptions:
    get:
      summary: read all of the active subscriptions for the SCS/AS
      tags:
        - AsSessionWithQoS API SCS/AS level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/AsSessionWithQoSSubscription'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
```

```
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  post:
    summary: Creates a new subscription resource
    tags:
      - AsSessionWithQoS API Subscription level POST Operation
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS
        required: true
        schema:
          type: string
    requestBody:
      description: Request to create a new subscription resource
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AsSessionWithQoSSubscription'
    callbacks:
      notificationDestination:
        '{request.body#/notificationDestination}':
          post:
            requestBody:  # contents of the callback message
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/UserPlaneNotificationData'
            responses:
              '204':
                description: No Content (successful notification)
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    responses:
      '201':
        description: Created (Successful creation of subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AsSessionWithQoSSubscription'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
```

```
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{scsAsId}/subscriptions/{subscriptionId}:
    get:
      summary: read an active subscriptions for the SCS/AS and the subscription Id
      tags:
        - AsSessionWithQoS API Subscription level GET Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AsSessionWithQoSSubscription'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing subscription resource
      tags:
        - AsSessionWithQoS API subscription level PUT Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
```

```
                required: true
                schema:
                  type: string
              - name: subscriptionId
                in: path
                description: Identifier of the subscription resource
                required: true
                schema:
                  type: string
          requestBody:
            description: Parameters to update/replace the existing subscription
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/AsSessionWithQoSSubscription'
          responses:
            '200':
              description: OK (Successful update of the subscription)
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/AsSessionWithQoSSubscription'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Updates/replaces an existing subscription resource
      tags:
        - AsSessionWithQoS API subscription level PATCH Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/AsSessionWithQoSSubscriptionPatch'
      responses:
        '200':
          description: OK. The subscription was modified successfully.
          content:
            application/json:
```

```
                schema:
                  $ref: '#/components/schemas/AsSessionWithQoSSubscription'
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29122_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29122_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29122_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing subscription
      tags:
        - AsSessionWithQoS API Subscription level DELETE Operation
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '200':
          description: OK (Successful deletion of the existing subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UserPlaneNotificationData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
```

```
            type: oauth2
            flows:
              clientCredentials:
                tokenUrl: '{tokenUrl}'
                scopes: {}
  schemas:
    AsSessionWithQoSSubscription:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        flowInfo:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
          minItems: 1
          description: Describe the data flow which requires QoS.
        ethFlowInfo:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
          minItems: 1
          description: Identifies Ethernet packet flows.
        qosReference:
          type: string
          description: Identifies a pre-defined QoS information
        altQoSReferences:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies an ordered list of pre-defined QoS information. The lower the
index of the array for a given entry, the higher the priority.
        disUeNotif:
          description: Indicates whether the QoS flow parameters signalling to the UE when the SMF
is notified by the NG-RAN of changes in the fulfilled QoS situation is disabled (true) or not
(false). Default value is false. The fulfilled situation is either the QoS profile or an Alternative
QoS Profile.
          type: boolean
        ueIpv4Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        ipDomain:
          type: string
        ueIpv6Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
        macAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        usageThreshold:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThreshold'
        sponsorInfo:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/SponsorInformation'
        qosMonInfo:
          $ref: '#/components/schemas/QosMonitoringInformation'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the SCEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
      required:
        - notificationDestination
    AsSessionWithQoSSubscriptionPatch:
      type: object
      properties:
        flowInfo:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
          minItems: 1
          description: Describe the data flow which requires QoS.
        ethFlowInfo:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
```

```
                 minItems: 1
                 description: Identifies Ethernet packet flows.
             qosReference:
               type: string
               description: Pre-defined QoS reference
             altQoSReferences:
               type: array
               items:
                 type: string
               minItems: 1
               description: Identifies an ordered list of pre-defined QoS information. The lower the
index of the array for a given entry, the higher the priority.
             disUeNotif:
               type: boolean
               description: Indicates whether the QoS flow parameters signalling to the UE when the SMF
is notified by the NG-RAN of changes in the fulfilled QoS situation is disabled (true) or not
(false). The fulfilled situation is either the QoS profile or an Alternative QoS Profile.
             usageThreshold:
               $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThresholdRm'
             qosMonInfo:
               $ref: '#/components/schemas/QosMonitoringInformationRm'
       QosMonitoringInformation:
         type: object
         properties:
           reqQosMonParams:
             type: array
             items:
               $ref:
'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/RequestedQosMonitoringParameter'
             minItems: 1
           repFreqs:
             type: array
             items:
               $ref: 'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/ReportingFrequency'
             minItems: 1
           repThreshDl:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
           repThreshUl:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
           repThreshRp:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
           waitTime:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
           repPeriod:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
         required:
           - reqQosMonParams
           - repFreqs
       QosMonitoringInformationRm:
         type: object
         properties:
           reqQosMonParams:
             type: array
             items:
               $ref:
'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/RequestedQosMonitoringParameter'
             minItems: 1
           repFreqs:
             type: array
             items:
               $ref: 'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/ReportingFrequency'
             minItems: 1
           repThreshDl:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/UintegerRm'
           repThreshUl:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/UintegerRm'
           repThreshRp:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/UintegerRm'
           waitTime:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSecRm'
           repPeriod:
             $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSecRm'
       QosMonitoringReport:
         type: object
         properties:
           ulDelays:
             type: array
             items:
```

```yaml
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        minItems: 1
      dlDelays:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        minItems: 1
      rtDelays:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        minItems: 1
    UserPlaneNotificationData:
      type: object
      properties:
        transaction:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        eventReports:
          type: array
          items:
            $ref: '#/components/schemas/UserPlaneEventReport'
          minItems: 1
          description: Contains the reported event and applicable information
      required:
        - transaction
        - eventReports
    UserPlaneEventReport:
      type: object
      properties:
        event:
          $ref: '#/components/schemas/UserPlaneEvent'
        accumulatedUsage:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/AccumulatedUsage'
        flowIds:
          type: array
          items:
            type: integer
          minItems: 1
          description: Identifies the IP flows that were sent during event subscription
        appliedQosRef:
          type: string
          description: The currently applied QoS reference. Applicable for event QOS_NOT_GUARANTEED
or SUCCESSFUL_RESOURCES_ALLOCATION.
        qosMonReports:
          type: array
          items:
            $ref: '#/components/schemas/QosMonitoringReport'
          minItems: 1
          description: Contains the QoS Monitoring Reporting information
      required:
        - event
    UserPlaneEvent:
      anyOf:
      - type: string
        enum:
          - SESSION_TERMINATION
          - LOSS_OF_BEARER
          - RECOVERY_OF_BEARER
          - RELEASE_OF_BEARER
          - USAGE_REPORT
          - FAILED_RESOURCES_ALLOCATION
          - QOS_GUARANTEED
          - QOS_NOT_GUARANTEED
          - QOS_MONITORING
          - SUCCESSFUL_RESOURCES_ALLOCATION
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - SESSION_TERMINATION: Indicates that Rx session is terminated.
        - LOSS_OF_BEARER : Indicates a loss of a bearer.
        - RECOVERY_OF_BEARER: Indicates a recovery of a bearer.
        - RELEASE_OF_BEARER: Indicates a release of a bearer.
        - USAGE_REPORT: Indicates the usage report event.
        - FAILED_RESOURCES_ALLOCATION: Indicates the resource allocation is failed.
```

```
        - QOS_GUARANTEED: The QoS targets of one or more SDFs are guaranteed again.
        - QOS_NOT_GUARANTEED: The QoS targets of one or more SDFs are not being guaranteed.
        - QOS_MONITORING: Indicates a QoS monitoring event.
        - SUCCESSFUL_RESOURCES_ALLOCATION: Indicates the resource allocation is successful.
```

A.15 MsisdnLessMoSms API

```
openapi: 3.0.0
info:
  title: 3gpp-msisdn-less-mo-sms
  version: 1.1.0
  description: |
    API for MSISDN-less Mobile Originated SMS.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /:
    post:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MsisdnLessMoSmsNotification'
      responses:
        '200':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MsisdnLessMoSmsNotificationReply'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
```

```
              tokenUrl: '{tokenUrl}'
              scopes: {}
  schemas:
    MsisdnLessMoSmsNotification:
      type: object
      properties:
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        sms:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Bytes'
        externalId:
          type: string
          description: External identifier has the form username@realm.
        applicationPort:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
      required:
        - supportedFeatures
        - sms
        - externalId
        - applicationPort
    MsisdnLessMoSmsNotificationReply:
      type: object
      properties:
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - supportedFeatures
```

A.16 RacsParameterProvisioning API

```
openapi: 3.0.0
info:
  title: 3gpp-racs-parameter-provisioning
  version: 1.0.1
  description: |
    API for provisioning UE radio capability parameters.
    © 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.9.0 T8 reference point for Northbound APIs
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.122/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-racs-pp/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{scsAsId}/provisionings:
    parameters:
      - name: scsAsId
        in: path
        description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
        required: true
        schema:
          type: string
    get:
      responses:
        '200':
          description: OK. The provisioning information related to the request URI is returned.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/RacsProvisioningData'
                minItems: 0
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
```

```
              $ref: 'TS29122_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29122_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29122_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29122_CommonData.yaml#/components/responses/404'
            '406':
              $ref: 'TS29122_CommonData.yaml#/components/responses/406'
            '429':
              $ref: 'TS29122_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29122_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29122_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      post:
        requestBody:
          description: create new provisionings for a given SCS/AS.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RacsProvisioningData'
        responses:
          '201':
            description: Created. The provisioning was created successfully.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/RacsProvisioningData'
            headers:
              Location:
                description: 'Contains the URI of the newly created resource'
                required: true
                schema:
                  type: string
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            description: The RACS data for all RACS IDs were not provisioned successfully.
            content:
              application/json:
                schema:
                  type: array
                  items:
                    $ref: '#/components/schemas/RacsFailureReport'
                  minItems: 1
              application/problem+json:
                schema:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    /{scsAsId}/provisionings/{provisioningId}:
      parameters:
        - name: scsAsId
          in: path
          description: Identifier of the SCS/AS as defined in subclause subclause 5.2.4 of 3GPP TS
29.122.
          required: true
          schema:
```

```
            type: string
        - name: provisioningId
          in: path
          description: Provisioning ID
          required: true
          schema:
            type: string
    get:
      responses:
        '200':
          description: OK. The provisioning information related to the request URI is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RacsProvisioningData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    patch:
      requestBody:
        description: update an existing parameter provisioning.
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/RacsProvisioningDataPatch'
      responses:
        '200':
          description: OK. The provisioning data was updated successfully. The SCEF shall return an
updated provisioning information in the response.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RacsProvisioningData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          description: The RACS data for all RACS IDs were not provisioned successfully.
          content:
            application/json:
              schema:
```

```
                          type: array
                          items:
                            $ref: '#/components/schemas/RacsFailureReport'
                          minItems: 1
                    application/problem+json:
                      schema:
                        $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      put:
        requestBody:
          description: update an existing parameter provisioning.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/RacsProvisioningData'
        responses:
          '200':
            description: OK. The provisioning data was updated successfully. The SCEF shall return an
updated provisioning information in the response.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/RacsProvisioningData'
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            description: The RACS data for all RACS IDs were not provisioned successfully.
            content:
              application/json:
                schema:
                  type: array
                  items:
                    $ref: '#/components/schemas/RacsFailureReport'
                  minItems: 1
              application/problem+json:
                schema:
                  $ref: 'TS29122_CommonData.yaml#/components/schemas/ProblemDetails'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      delete:
        responses:
          '204':
            description: No Content. The provisioning was terminated successfully. The payload body
shall be empty.
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    RacsProvisioningData:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        racsConfigs:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/RacsConfiguration'
          minProperties: 1
          description: Identifies the configuration related to manufacturer specific UE radio
capability. Each element uniquely identifies an RACS configuration for an RACS ID and is identified
in the map via the RACS ID as key. The response shall include successfully provisioned RACS data.
        racsReports:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/RacsFailureReport'
          minProperties: 1
          description: Supplied by the SCEF. Contains the RACS IDs for which the RACS data are not
provisioned successfully.
          readOnly: true
      required:
        - racsConfigs
    RacsFailureReport:
      type: object
      properties:
        racsIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies the RACS ID(s) for which the RACS data are not provisioned
successfully.
        failureCode:
          $ref: '#/components/schemas/RacsFailureCode'
      required:
        - racsIds
        - failureCode
    RacsConfiguration:
      type: object
      properties:
        racsId:
          type: string
          description: The UE radio capability ID provided by the SCS/AS to identify the UE radio
capability data. See 3GPP TS 23.003 for the encoding.
        racsParamEps:
          type: string
          description: The UE radio capability data in EPS.
        racsParam5Gs:
          type: string
          description: The UE radio capability data in 5GS.
        imeiTacs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/TypeAllocationCode'
          minItems: 1
          description: Related UE model's IMEI-TAC values.
```

```
          anyOf:
            - required: [racsParamEps]
            - required: [racsParam5Gs]
          required:
            - racsId
            - imeiTacs
    RacsProvisioningDataPatch:
      type: object
      properties:
        racsConfigs:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/RacsConfigurationRm'
          minProperties: 1
          description: Identifies the configuration related to manufactuer specific UE radio
capability. Each element uniquely identifies an RACS configuration for an RACS ID and is identified
in the map via the RACS ID as key.
    RacsConfigurationRm:
      type: object
      properties:
        racsParamEps:
          type: string
          description: The UE radio capability data in EPS.
          nullable: true
        racsParam5Gs:
          type: string
          description: The UE radio capability data in 5GS.
          nullable: true
        imeiTacs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/TypeAllocationCode'
          minItems: 1
          description: Related UE model's IMEI-TAC values.
      nullable: true
    RacsFailureCode:
      anyOf:
      - type: string
        enum:
          - MALFUNCTION
          - RESOURCE_LIMITATION
          - RACS_ID_DUPLICATED
          - OTHER_REASON
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - MALFUNCTION: This value indicates that something functions wrongly in RACS provisioning or
the RACS provisioning does not function at all.
        - RESOURCE_LIMITATION: This value indicates there is resource limitation for RACS data
storage.
        - RACS_ID_DUPLICATED: The received RACS identifier(s) are already provisioned.
        - OTHER_REASON: Other reason unspecified.
```

Annex B (informative):
Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-04	CT3#89					TS skeleton of T8 reference point stage 3. Inclusion of C3-172217, C3-172242, C3-172249 and editorial change from Rapporteur.	0.0.0
2017-05	CT3#90					Inclusion of C3-173256, C3-173257, C3-173306, C3-173318, C3-173323, C3-173329 and editorial change from Rapporteur.	0.1.0
2017-09	CT3#91					Inclusion of C3-174368, C3-174279, C3-174079, C3-174352, C3-174328, C3-174329, C3-174374, C3-174375, C3-174243, C3-174333, C3-174334, C3-174376, C3-174281, C3-174377, C3-174356, C3-174280, C3-174358, C3-174359, C3-174379, C3-174337, C3-174361, C3-174294, C3-174362, C3-174385, C3-174299 and editorial change from Rapporteur.	0.2.0
2017-10	CT3#92					Inclusion of C3-175068, C3-175365, C3-175370, C3-175301, C3-175227, C3-175228, C3-175359, C3-175230, C3-175231, C3-175337, C3-175247, C3-175290, C3-175360 and editorial changes from Rapporteur.	0.3.0
2017-12	CT3#93					Inclusion of C3-176329, C3-176218, C3-176356, C3-176375, C3-176357, C3-176334, C3-176378, C3-176067, C3-176335, C3-176073, C3-176337, C3-176380, C3-176390, C3-176362, C3-176339, C3-176340, C3-176233, C3-176089, C3-176267, C3-176383, C3-176365, C3-176366, C3-176272, C3-176273, C3-176274, C3-176391, C3-176368, C3-176369, C3-176385, C3-176279 and editorial changes from Rapporteur.	0.4.0
2018-01	CT3#94					Inclusion of C3-180349, C3-180329, C3-180222, C3-180078, C3-180285, C3-180081, C3-180330, C3-180331, C3-180084, C3-180332, C3-180333, C3-180290, C3-180291, C3-180089, C3-180234, C3-180334, C3-180294, C3-180237, C3-180295, C3-180296, C3-180297, C3-180337, C3-180357, C3-180136, C3-180298 and editorial changes from Rapporteur.	0.5.0
2018-02	CT3#95					Inclusion of C3-181271, C3-181324, C3-181340, C3-181273, C3-181333, C3-181334, C3-181276, C3-181325 and editorial changes from Rapporteur.	0.6.0
2018-03	CT#79	CP-181053				TS sent to plenary for information	1.0.0
2018-04	CT3#96					Inclusion of C3-182464, C3-182017, C3-182444, C3-182019, C3-182486, C3-182487, C3-182344, C3-182074, C3-182373, C3-182446, C3-182291, C3-182292, C3-182488, C3-182508, C3-182345, C3-182094, C3-182295, C3-182346, C3-182096, C3-182347, C3-182348, C3-182026, C3-182349, C3-182098, C3-182350, C3-182099, C3-182100, C3-182209, C3-182101, C3-182102, C3-182455, C3-182506, C3-182353, C3-182491, C3-182355, C3-182447, C3-182507, C3-182359, C3-182106, C3-182107, C3-182108, C3-182492, C3-182109, C3-182110, C3-182480, C3-182362, C3-182448, C3-182449, C3-182450, C3-182425, C3-182365, C3-182112, C3-182113, C3-182035, C3-182367, C3-182115, C3-182368, C3-182493, C3-182494, C3-182509, C3-182372 and editorial changes from Rapporteur.	1.1.0
2018-05	CT3#97					Inclusion of C3-183028, C3-183029, C3-183030, C3-183474, C3-183051, C3-183475, C3-183476, C3-183054, C3-183055, C3-183056, C3-183478, C3-183479, C3-183336, C3-183337, C3-183832, C3-183340, C3-183609, C3-183611, C3-183612, C3-183833, C3-183614, C3-183834, C3-183883, C3-183616, C3-183343, C3-183088, C3-183617, C3-183618, C3-183741, C3-183625, C3-183626, C3-183122, C3-183123, C3-183124, C3-183635, C3-183792, C3-183634, C3-183619, C3-183786, C3-183082, C3-183083, C3-183084, C3-183622, C3-183835, C3-183624, C3-183627, C3-183075, C3-183737, C3-183836, C3-183419, C3-183630, C3-183066, C3-183347, C3-183861, C3-183788, C3-183862, C3-183789, C3-183637, C3-183837, C3-183863, C3-183639, C3-183864, C3-183067, C3-183068, C3-183069, C3-183641, C3-183059, C3-183071, C3-183606, C3-183779 and editorial changes from Rapporteur.	1.2.0
2018-06	CT#80	CP-181038				TS sent to plenary for approval	2.0.0
2018-06	CT#80	CP-181038				TS approved by plenary	15.0.0
2018-09	CT#81	CP-182022	0001	2	F	MonitoringEvent API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0002	2	F	ChargeableParty API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0003	2	F	GMDviaMBMSbyMB2 API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0004	2	F	GMDviaMBMSbyxMB API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0005	2	F	ReportingNetworkStatus API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0006	2	F	ECRControl API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0007	2	F	NpConfiguration API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0008	2	F	AsSessionWithQoS API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182022	0009		F	Update the Error Handling	15.1.0
2018-09	CT#81	CP-182022	0010	2	F	CpProvisioning OpenAPI schema	15.1.0

2018-09	CT#81	CP-182022	0011	2	F	Remove the monitoring configuration for a group	15.1.0
2018-09	CT#81	CP-182022	0012	1	F	Resource description in Procedure subclauses	15.1.0
2018-09	CT#81	CP-182022	0013	1	F	Monitoring event API Update	15.1.0
2018-09	CT#81	CP-182022	0014	2	F	BDT API Update	15.1.0
2018-09	CT#81	CP-182022	0015		F	Network Parameter Configuration API Update	15.1.0
2018-09	CT#81	CP-182022	0016	1	F	Complete the common openAPI definition	15.1.0
2018-09	CT#81	CP-182022	0017	2	F	Complete the openAPI definition for BDT API	15.1.0
2018-09	CT#81	CP-182022	0018		F	NIDD API cleanup	15.1.0
2018-09	CT#81	CP-182022	0019	2	F	Complete the openAPI definition for NIDD API	15.1.0
2018-09	CT#81	CP-182022	0020	1	F	One-time monitoring	15.1.0
2018-09	CT#81	CP-182178	0021	3	F	PATCH data type in ChargeableParty API	15.1.0
2018-09	CT#81	CP-182022	0022	1	F	Procedure correction of PFD management error handling	15.1.0
2018-09	CT#81	CP-182022	0023	2	F	Complete the openAPI definition for PFD API	15.1.0
2018-09	CT#81	CP-182022	0024	1	F	Essential Corrections on TS 29.122	15.1.0
2018-09	CT#81	CP-182022	0025	2	F	Allignment of error codes with TS 29.500	15.1.0
2018-09	CT#81	CP-182022	0026	2	F	OpenAPI updates for Device Triggering	15.1.0
2018-09	CT#81	CP-182022	0027	1	F	OpenAPI updates for MSISDN-less Mobile Originated SMS	15.1.0
2018-09	CT#81	CP-182022	0028	2	F	Monitoring event report	15.1.0
2018-09	CT#81	CP-182022	0030		F	Add cause in ProblemDetails data type	15.1.0
2018-09	CT#81	CP-182022	0031	1	F	Remove format keyword for 3GPP defined data type	15.1.0
2018-09	CT#81	CP-182022	0032		F	Correct supported features	15.1.0
2018-09	CT#81	CP-182022	0033		F	Correct ConfigResult data type for Monitoring API	15.1.0
2018-09	CT#81	CP-182022	0034		F	Correct reachability type in monitoring API	15.1.0
2018-09	CT#81	CP-182022	0035		F	Add HSS interaction for NIDD configuration	15.1.0
2018-09	CT#81	CP-182022	0036		F	Correct NiddConfigurationPatch data type	15.1.0
2018-09	CT#81	CP-182179	0037	2	F	Removable attribute definition for NIDD configuration	15.1.0
2018-09	CT#81	CP-182180	0038	2	F	Correct MT NIDD procedure	15.1.0
2018-09	CT#81	CP-182022	0039	1	F	Correct group NIDD procedure	15.1.0
2018-09	CT#81	CP-182022	0040		F	Device Trigger cleanup	15.1.0
2018-09	CT#81	CP-182022	0041		F	Removable attribute definition for PFD management	15.1.0
2018-09	CT#81	CP-182181	0042	2	F	Correct PFD error code	15.1.0
2018-09	CT#81	CP-182022	0043		F	Removable attribute definition for NP configuration	15.1.0
2018-09	CT#81	CP-182022	0044		F	Correct ConfigResult data type for NP Provisioning API	15.1.0
2018-09	CT#81	CP-182022	0045		F	Removable attribute definition for AS required QoS	15.1.0
2018-09	CT#81	CP-182022	0047		F	Version numbering update	15.1.0
2018-09	CT#81	CP-182022	0048	1	F	Removal of external docs field	15.1.0
2018-09	CT#81	CP-182203	0049		F	paths property in A.2	15.1.0
2018-12	CT#82	CP-183116	0050		F	File naming for Common data type	15.2.0
2018-12	CT#82	CP-183116	0051		F	UE corrections	15.2.0
2018-12	CT#82	CP-183116	0052	2	F	ExternalDocs field	15.2.0
2018-12	CT#82	CP-183116	0053	7	F	Enhancement of LocationArea	15.2.0
2018-12	CT#82	CP-183116	0054		F	Data type for Individual TMGI Allocation PATCH operation	15.2.0
2018-12	CT#82	CP-183127	0055	2	F	Correction on Accuracy level	15.2.0
2018-12	CT#82	CP-183116	0056	2	F	Correction on type ConfigResult	15.2.0
2018-12	CT#82	CP-183128	0057	5	F	Monitoring Event Report	15.2.0
2018-12	CT#82	CP-183116	0059		F	Correct server definition	15.2.0
2018-12	CT#82	CP-183116	0060		F	Correct data type for roamingStatus	15.2.0
2018-12	CT#82	CP-183116	0061		F	Correct external identifier and msisdn	15.2.0
2018-12	CT#82	CP-183116	0062		F	Correct common data definition	15.2.0
2018-12	CT#82	CP-183116	0063	3	F	Additional data type clarification in openAPI	15.2.0
2018-12	CT#82	CP-183116	0064		F	Correct Chargeable Party	15.2.0
2018-12	CT#82	CP-183116	0065	2	F	Correct GMD via MB2	15.2.0
2018-12	CT#82	CP-183116	0066	3	F	Correct GMD via xMB	15.2.0
2018-12	CT#82	CP-183116	0067	5	F	Correct MT NIDD	15.2.0
2018-12	CT#82	CP-183116	0068		F	Correct monitoring API	15.2.0
2018-12	CT#82	CP-183116	0069		F	Correct CP provisioning	15.2.0
2018-12	CT#82	CP-183116	0070		F	Correct Device trigger	15.2.0
2018-12	CT#82	CP-183116	0071		F	Correct PFD management	15.2.0
2018-12	CT#82	CP-183116	0072		F	Correct report network status	15.2.0
2018-12	CT#82	CP-183116	0073		F	Correct NP provisioning	15.2.0
2018-12	CT#82	CP-183116	0074		F	Correct MO SMS	15.2.0
2018-12	CT#82	CP-183116	0075		F	Correct AS session with QoS	15.2.0
2018-12	CT#82	CP-183116	0076	3	F	Error handling	15.2.0
2018-12	CT#82	CP-183116	0077	1	F	Content type	15.2.0
2018-12	CT#82	CP-183116	0078	2	F	Supporting Ethernet UE in Chargeable Party and AF session with QoS	15.2.0
2018-12	CT#82	CP-183116	0079	2	F	Security adaptation for T8 APIs with CAPIF	15.2.0
2018-12	CT#82	CP-183116	0080	1	F	Remove empty array or map for applicable attributes	15.2.0
2018-12	CT#82	CP-183116	0081	3	F	Presence conditions in yaml file	15.2.0
2018-12	CT#82	CP-183116	0082		F	Remove format keyword for TimeOfDay data type	15.2.0
2018-12	CT#82	CP-183116	0083	2	F	Additional external group ID for number of UE in an area	15.2.0

2018-12	CT#82	CP-183116	0084		F	Correct eDRX cycle length	15.2.0
2018-12	CT#82	CP-183116	0086		F	Correct PLMN ID in monitoring API	15.2.0
2018-12	CT#82	CP-183116	0088		F	Missing ECRData in ECR configuration response	15.2.0
2018-12	CT#82	CP-183116	0089		F	Correct GMD via MBMS	15.2.0
2018-12	CT#82	CP-183116	0090		F	Missing UE ID in GMD acknowledgement	15.2.0
2018-12	CT#82	CP-183116	0091	1	F	RDS indication in MT NIDD acknowledgement	15.2.0
2018-12	CT#82	CP-183116	0092	1	F	Correct pfdDatas cardinality in PFD management	15.2.0
2018-12	CT#82	CP-183116	0093	1	F	Correct NP configuration yaml definition	15.2.0
2018-12	CT#82	CP-183116	0094	6	F	Different results in CP parameter sets provisioning	15.2.0
2018-12	CT#82	CP-183116	0095		F	Correct server URI in Device Trigger	15.2.0
2018-12	CT#82	CP-183116	0096		F	Implementation of Binary data	15.2.0
2018-12	CT#82	CP-183116	0097		F	Missed GET for resource GMD via MBMS by xMB	15.2.0
2018-12	CT#82	CP-183116	0098	1	F	Notification URI Consistency_ChargableParty	15.2.0
2018-12	CT#82	CP-183116	0099	1	F	Notification URI for GMDviaMBMSbyMB2 API	15.2.0
2018-12	CT#82	CP-183116	0100	1	F	Notification URI for GMDviaMBMSbyxMB API	15.2.0
2018-12	CT#82	CP-183116	0101		F	Resource usage and Notification URI for NIDD API	15.2.0
2018-12	CT#82	CP-183116	0102	2	F	Security field	15.2.0
2018-12	CT#82	CP-183116	0103	1	F	Status code support for AsSessionWithQoS API	15.2.0
2018-12	CT#82	CP-183116	0104	1	F	Status code support for ChargeableParty API	15.2.0
2018-12	CT#82	CP-183116	0105	2	F	Status code support for CpProvisioning API	15.2.0
2018-12	CT#82	CP-183116	0106	1	F	Status code support for DeviceTriggering API	15.2.0
2018-12	CT#82	CP-183116	0107	1	F	Status code support for ECRControl API	15.2.0
2018-12	CT#82	CP-183116	0108	1	F	Status code support for GMDviaMBMSbyMB2 API	15.2.0
2018-12	CT#82	CP-183116	0109	2	F	Status code support for GMDviaMBMSbyxMB API	15.2.0
2018-12	CT#82	CP-183116	0110	3	F	Status code support for MonitoringEvent API	15.2.0
2018-12	CT#82	CP-183116	0111	1	F	Status code support for MsisdnLessMoSms API	15.2.0
2018-12	CT#82	CP-183116	0112	2	F	Status code support for NIDD API	15.2.0
2018-12	CT#82	CP-183116	0113	1	F	Status code support for NpConfiguration API	15.2.0
2018-12	CT#82	CP-183116	0114	1	F	Status code support for PfdManagement API	15.2.0
2018-12	CT#82	CP-183116	0115	1	F	Status code support for ReportingNetworkStatus API	15.2.0
2018-12	CT#82	CP-183116	0116	1	F	Status code support for ResourceManagementOfBdt API	15.2.0
2018-12	CT#82	CP-183116	0117	1	F	Location header	15.2.0
2018-12	CT#82	CP-183116	0118	2	F	API Version Update	15.2.0
2018-12	CT#82	CP-183116	0119	1	F	Link of the created resources for AsSessionWithQoS API	15.2.0
2018-12	CT#82	CP-183116	0120	1	F	Link of the created resources for ChargeableParty API	15.2.0
2018-12	CT#82	CP-183116	0121	1	F	Link of the created resources for CpProvisioning API	15.2.0
2018-12	CT#82	CP-183116	0122	1	F	Link of the created resourcesfor DeviceTriggering API	15.2.0
2018-12	CT#82	CP-183116	0123	1	F	Link of the created resources for GMDviaMBMSbyMB2 API	15.2.0
2018-12	CT#82	CP-183116	0124	1	F	Link of the created resources for GMDviaMBMSbyxMB API	15.2.0
2018-12	CT#82	CP-183116	0125	1	F	Link of the created resources for MonitoringEvent API	15.2.0
2018-12	CT#82	CP-183116	0126	1	F	Link of the created resources for NIDD API	15.2.0
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