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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
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- Y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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".
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- [27] Open API Initiative, "OpenAPI 3.0.0 Specification", <u>https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md</u>.
- [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".
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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
СР	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 the third party.

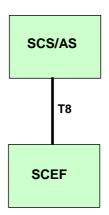


Figure 4.2.1: T8 reference model

4.3 Functional elements

4.3.1 SCEF

The SCEF is a functional element, which provides a 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 service to multiple SCS/AS.

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

The procedures are used to perform event monitoring fucntion via the T8 inteface, which include:

- Monitoring event configuration as specified in subclause 4.4.2.2;
- Monitoring event report as specified in subclause 4.4.2.3;
- Network initiated notification of monitoring event cancellation as specified in subclause 4.4.2.4 ; and
- Network initiated notification 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 a new monitoring event configuration, the SCS/AS shall send an HTTP POST message to the SCEF to 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 or MSISDN or External Group Identifier, the External Identifier or MSISDN indicates the subscription for an individual UE and the External Group Identifier indicates 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 SCS/AS may send an HTTP PUT message to the resource "Individual Monitoring Event Subscription" replacing all properties in the existing configuration.

For one-time monitoring request, the SCS/AS shall include the Maximum Number of Reports with the value be set to 1, and shall 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 the 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 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.

For individual UE configuration request, 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 indicate 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 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 to the resource "Individual Monitoring Event Subscription" which is 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 DNN Failure; and
- API support capability.

Only one-time reporting is supported if the "reachabilityType" attribute sets to "SMS" for the event UE reachability, 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 the request from the SCS/AS, if the configuration request from the SCS/AS is for an individual UE, 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,

- if it is a one-time monitoring request and the monitoring event report is received, the SCEF shall delete the associated configuration, send the HTTP POST response message to the SCS/AS with a "200 OK" status code and including the received monitoring event report.
- otherwise, the SCEF shall,
 - for HTTP POST request, create a resource "Individual Monitoring Event Subscription" addressed by the URI that contains the SCS/AS identifier and an SCEF-created subscription identifier, and send an HTTP POST response to the SCS/AS with a "201 Created" status code, the final suggested configuration parameter(s) (if modified), the indication(s) for the discarded parameter(s) (if discarded), the monitoring event report if received and a location header field containing the URI for the created resource.
 - for HTTP PUT request, update the active resource "Individual Monitoring Event Subscription" addressed by the URI and send an HTTP response to the SCS/AS with a "200 OK" status code, the final suggested configuration parameter(s) (if modified), the indication(s) for the discarded parameter(s) (if discarded) and the monitoring event report if received.
 - for HTTP DELETE request, delete the active resource "Individual Monitoring Event Subscription" addressed by the 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 or delete the resource and shall respond to the SCS/AS with a status code set to "500 Internal Server Error".

4.4.2.2.2.3 Configuration Request for a group of UEs

Upon receipt of the request from the SCS/AS, if the External Group Identifier is included in the configuration request from the SCS/AS, 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 the successful response indicating that group processing is in progress from the HSS before beginning the processing of individual UEs, the SCEF shall,

- for HTTP POST request, create a resource "Individual Monitoring Event Subscription" 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 POST response to the SCS/AS including a location header field containing the URI for the created resource and "201 Created" status code to acknowledge the SCS/AS of the successful group processing request.
- for HTTP PUT request, update the active resource "Individual Monitoring Event Subscription" addressed by the requested URL, and send "200 OK" status code to acknowledge the SCS/AS of the successful group processing request.
- for HTTP DELETE request, delete the active resource "Individual Monitoring Event Subscription" addressed by the requested 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 or delete the resource and shall respond to the SCS/AS with a status code set to "500 Internal Server Error".

Upon receipt of the processing result of the individual UEs from the HSS, the SCEF shall perform 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 POST 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" sets to 1.

Upon receipt of the 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 status code set to 500 Internal Server Error; otherwise the SCEF should send 200 OK status code to acknowledge the SCS/AS with one aggregated report in the requested area by including the total count of number of UEs in the "ueCount" attribute and the External Identifier(s) (if available) or the MSISDN(s) (if available) associated with 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 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 applicable 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 the HTTP POST request from the SCS/AS, if the configuration request from the SCS/AS is for an individual UE, the SCEF shall:

- interact with the PCRF via the Rx inteface by using 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 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 the HTTP POST request from the SCS/AS, if the configuration request from the SCS/AS is for a group of UEs, the SCEF shall:

- interact with all PCRFs in the same PLMN via Nta application of Nt inteface 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 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 the 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 the monitoring event subscription refers to a group-based Monitoring Event configuration, and if no Group Reporting Guard Time was set, then the SCEF shall send an HTTP POST message including the link to the SCEF-created subscription refers to a group-based Monitoring Event Report to the identified destination. If the monitoring event subscription refers to a group-based Monitoring Event Configuration, and if 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 upon reach of the monitoring duration, the SCEF shall send an HTTP POST message to the identified destination including the link to the SCEF-created subscription resource and a list of accumulated Monitoring Event Reports for each UE identified by either External Identifier or MSISDN. The destination URL of the HTTP POST 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 determine the reporting is completed, and then delete the corresponding subscription resource "Individual Monitoring Event Subscription". In addition, the SCEF shall interact with the HSS to delete the event configuration if the event configuration was performed via the HSS but 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 for 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 resource "Individual Monitoring Event Subscription".

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 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.

4.4.3 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 Subscription" 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 500 Internal Server Error.

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 500 Internal Server Error.

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 500 Internal Server Error.

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 UE via the SCEF, the SCS/AS shall send an HTTP POST request to the SCEF for the "Chargeable Party Transactions" resource requesting to become the chargeable party for the session to be set up. The body of the HTTP POST message shall include SCS/AS Identifier, UE IP address, IP Flow description, Sponsor ID, ASP ID, Sponsoring Status, notification destination URI identifying the recipient of notification Within the "notificationDestination" attribute and may include 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 Reference ID in the body of the HTTP POST message.

After receiving the HTTP POST message, if the authorization performed by the SCEF is successful, 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] 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 to the PCRF on the USAGE_REPORT event.

After receiving a successful response from the PCRF, the SCEF shall create a resource "Individual Chargeable Party Transaction", 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 message, including 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 chargeable party transaction. 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 status code set to 500 Internal Server Error.

In order to update the sponsoring status of an established AS session, the SCS/AS shall send an HTTP PATCH message to the SCEF for the "Individual Chargeable Party Transaction" resource requesting to change 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 the response with successful result code from the PCRF, the SCEF shall send an HTTP response to the SCS/AS with a 200 OKstatus 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 status code set to 500 Internal Server Error.

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 to the SCS/AS identified by the notification destination URI received during session setting up. 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 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-resource 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.

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 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 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:
 - 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
 - send a 500 Internal Server Error response without buffering the non-IP data, and include a cause value 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 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 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 status code set to 500 Internal Server Error.

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 status code set to 500 Internal Server Error.

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 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 status code set to 500 Internal Server Error.

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 status code set to 500 Internal Server Error.

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-resources "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 according 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 status code set to 500 Internal Server Error.

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 according 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 status code set to 500 Internal Server Error.

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 Subscription" 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 status code set to 500 Internal Server Error. If not all CP parameters sets are provisioned successfully (i.e. the HSS indicates failure for some or all CP parameter set 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 status code set to 500 Internal Server Error. 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 status code set to 500 Internal Server Error. 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" 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-resource(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 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(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 status code set to 500 Internal Server Error.

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 status code set to "500 Internal Server Error".

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 status code set to 500 Internal Server Error.

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.

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 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 status code set to 500 Internal Server Error.

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 in the existing resource, addressed by the URI received in the response to the request that has created the resource. The UE IP address shall remain unchanged from previously provided values. After receiving such 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 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. Flow Description). After 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 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.

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 successfully 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
sponsorld	string	1	It indicates Sponsor ID.
aspld	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	01	Indicates the length of time in seconds
totalVolume	Volume	01	Total data octets for both downlink and uplink
downlinkVolume	Volume	01	Downlink data octets
uplinkVolume	Volume	01	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.

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

Table 5.2.1.2.3-1: Definition of the TimeWindow data type

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)	1N	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	01	Contains the applicable information corresponding to the event.
flowIds	array(integer)	0N	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	01	Indicates the length of time in seconds
totalVolume	Volume	01	Total data octets for both downlink and uplink
downlinkVolume	Volume	01	Downlink data octets
uplinkVolume	Volume	01	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.

Attribute name	Data type	Cardinality	Description
flowId	integer	1	Indicates the IP flow.
flowDescriptions	array(string)	02	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.

Table 5.2.1.2.8-1: Definition of the FlowInfo data type

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.

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.

Attribute name	Data type	Cardinality	Description	
websocketUri	Link	01	Set by the SCEF to indicate to the SCS/AS the	
			Websocket URI to be used for delivering notifications.	
			(NOTE 1)	
requestWebsocket	boolean	01	Set by the SCS/AS to indicate that the Websocket	
Uri			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.				
	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 resp	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.

Attribute name	Data type	Cardinality	Description
cellIds	array(string)	0N	Indicates a list of Cell Global Identities of the user which identifies the cell the UE is registered.
enodeBlds	array(string)	0N	Indicates a list of eNodeB identities in which the UE is currently located.
routingArealds	array(string)	0N	Identifies a list of Routing Area Identities of the user where the UE is located.
trackingArealds	array(string)	0N	Identifies a list of Tracking Area Identities of the user where the UE is located.
geographicAreas	array(Geogra phicArea)	0N	Identifies a list of geographic area of the user where the UE is located.
civicAddresses	array(CivicAd dress)	0N	Identifies a list of civic addresses of the user where the UE is located.

Table 5.2.1.2.11-1: Definition of the LocationArea data Type

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	01	A URI reference according to IETF RFC 3986 [6] that identifies the problem type.
title	string	01	A short, human-readable summary of the problem type. It should not change from occurrence to occurrence of the problem.
status	integer	01	The HTTP status code for this occurrence of the problem.
detail	string	01	A human-readable explanation specific to this occurrence of the problem.
instance	Uri	01	A URI reference that identifies the specific occurrence of the problem.
cause	string	01	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(InvalidPara m)	0N	Description of invalid parameters, for a request rejected due to invalid parameters.
NOTE 1: See IETF RFC 780 NOTE 2: Additional attributes			idance for each attribute.

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	01	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 Plmnld 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.

Attribute name	Data type	Cardinality	Description
externallds	array(ExternalId)	0N	Each element indicates an external identifier of the UE. (NOTE)
msisdns	array(Msisdn)	0N	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 "externalld" or "msisdn" shall be included for a group member.			

Table 5.2.1.2.15-1: Definition of the ConfigResult data type

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.

Attribute name	Data type	Cardinality	Description
duration	DurationSecRm	01	Indicates the length of time in seconds
totalVolume	VolumeRm	01	Total data octets for both downlink and uplink
downlinkVolume	VolumeRm	01	Downlink data octets
uplinkVolume	VolumeRm	01	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 SCEF.

Attribute name	Data type	Cardinality	Description
geographicAreas	array(GeographicArea)	0N	Identifies a list of geographic area of the user where the UE is located.
civicAddresses	array(CivicAddress)	0N	Identifies a list of civic addresses of the user where the UE is located.
nwAreaInfo	NetworkAreaInfo	01	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.

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].	
	e names defined in OpenAPI Specification [27] do not follow the convention to start with capital nerwise used in this specification.	

Table 5.2.1.3.2-1: Reused OpenAPI data types

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.		
lpv4Addr	String identifying an Ipv4 address formatted in the "dotted decimal" notation as defined in IETF RFC 1166 [28].		
lpv6Addr	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.		
Мсс	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.		
Resourceld	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.		

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

5.2.1.3.3 Enumeration: Event

The enumeration Event represents event reported by the SCEF.

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.

Table 5.2.1.3.3-1: Enumeration Event

5.2.1.3.4 Enumeration: ResultReason

The enumeration ResultReason represents a failure result reason.

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.

Attribute name	Data type	Cardinality	Description
<attribute name=""></attribute>	21	"01", "1", or " <i>MN</i> ",	<only applicable="" if=""></only>

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

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 as assigned the SCS/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, 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 to 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 shall provide this URI in the "websocketUri" attribute in the response as defined in subclause 5.1.2.1.13. Once such a 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
	ProblemDetails	1	400 Bad Request	Incorrect parameters were passed in the request.	GET, POST PUT, PATCH, DELETE
	ProblemDetails	1	401 Unauthorize d	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
Response	ProblemDetails	1	406 Not Acceptable	The content format provided in the "Accept" header is not acceptable by the server.	GET
body	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 Unsupporte d 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.

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 $\langle m \rangle$ as lower boundary, "minItems: $\langle m \rangle$ "; and
 - d. if the cardinality contained an integer value $\langle n \rangle$ as upper boundary, "maxItems: $\langle n \rangle$ ";
 - 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 $\langle m \rangle$ as lower boundary, "min Properties: $\langle m \rangle$ "; and
 - d. if the cardinality contained an integer value $\langle n \rangle$ as upper boundary, "max Properties: $\langle n \rangle$ ";
 - 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)	110	exArrayElements attribute description
exMapElements	map(ExStructure)	1N	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
 - 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	
Тwo	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:

```
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/
```

5.3 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 the monitoring event subscription. 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.

Data type	Reference	Comments
DIDataDeliveryStatus	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
TimeWindow	5.2.1.2.3	Identifies the time interval.

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

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	01	Link to the resource "Individual Monitoring Event Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatur es	01	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	01	Identifies the MTC Service Provider and/or MTC Application. (NOTE 7)	
externalld	ExternalId	01	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	(NOTE 5)
msisdn	Msisdn	01	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	(NOTE 5)
externalGroupId	ExternalGroupId	01	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1) (NOTE 6)	
addExtGroupIds	array(ExternalGr oupId)	0N	Identifies user groups as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1) (NOTE 6)	Number_of_UE s_in_an_area_ notification, Number_of_UE s_in_an_area_ notification_5G
ipv4Addr	lpv4Addr	01	Identifies the Ipv4 address. (NOTE 1)	Location_notific ation, Communication _failure_notific ation
ipv6Addr	lpv6Addr	01	Identifies the Ipv6 address. (NOTE 1)	Location_notific ation, Communication _failure_notific ation
notificationDestination	Link	1	An URI of a notification destination that T8 message shall be delivered to.	
requestTestNotification	boolean	01	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_tes t_event
websockNotifConfig	WebsockNotifCo nfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_we bsocket
monitoringType	MonitoringType	1	Enumeration of monitoring type. Refer to clause 5.3.2.4.3.	
maximumNumberOfRe ports	integer	01	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	01	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].	
repPeriod	DurationSec	01	(NOTE 2) Identifies the periodic time for the event reports. (NOTE 8, NOTE 9)	

groupReportGuardTim	DurationSec	01	Identifies the time for which the SCEF can]
e	DurationSec	01	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	01	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	01	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	01	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	01	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
suggestedNumberOfDI Packets	integer	01	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	01	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
IocationType	LocationType	01	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	01	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)	Location_notific ation, eLCS
minimumReportInterval	DurationSec	01	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify a minimum time interval between Location Reporting notifications.	Location_notific ation, eLCS
maxRptExpireIntvI	DurationSec	01	If "monitoringType" is "LOCATION_REPORTING", this parameter may be included to identify a maximum time interval between Location Reporting notifications.	eLCS

samplingInterval	DurationSec	01	If "monitoringType" is	eLCS
Sampinginervar	DurationOcc	0	"LOCATION_REPORTING", this parameter may be included to identify the	
			maximum time interval between consecutive evaluations by a UE of a	
			trigger event.	
reportingLocEstInd	boolean	01	If "monitoringType" is "LOCATION_REPORTING", this	eLCS
			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.	
linearDistance	LinearDistance	01	If "monitoringType" is "LOCATION_REPORTING", this	eLCS
			parameter may be included to indicate the	
			linear(straight line) distance threshold for motion event reporting.	
locQoS	LocationQoS	01	If "monitoringType" is "LOCATION_REPORTING", this	eLCS
			parameter may be included to indicate the	
			expected location QoS requirement for an	
			immediate MT-LR or deferred MT-LR.	
svcld	ServiceIdentity	01	(NOTE x) If "monitoringType" is	eLCS
	,		"LOCATION_REPORTING", this	
			parameter may be included to indicate the service identity of AF.	
IdrType	LdrType	01	If "monitoringType" is	eLCS
			"LOCATION_REPORTING", this parameter may be included to indicate the	
			event type for a deferred MT-LR.	
velocityRequested	VelocityRequest ed	01	If "monitoringType" is "LOCATION_REPORTING", this	eLCS
	eu		parameter may be included to indicate if	
			the velocity of the target UE is requested or not.	
maxAgeOfLocEst	AgeOfLocationE stimate	01	If "monitoringType" is "LOCATION_REPORTING", this	eLCS
	sumate		parameter may be included to indicate	
			acceptable maximum age of location estimate.	
locTimeWindow	TimeWindow	01	If "monitoringType" is	eLCS
			"LOCATION_REPORTING", this parameter may be included to indicate the	
			starting time and ending time for a	
	Accession	0.1	deferred MT-LR. If "monitoringType" is	Change of IM
associationType	AssociationType	01	"CHANGE_OF_IMSI_IMEI_ASSOCIATIO	Change_of_IM SI_IMEI_associ
			N", this parameter shall be included to	ation_notificatio
			identify whether the change of IMSI-IMEI or IMSI-IMEISV association shall be	n
a basa ba d'a s'	la a l		detected.	
plmnIndication	boolean	01	If "monitoringType" is "ROAMING_STATUS", this parameter	Roaming_statu s_notification
			may be included to indicate the notification of UE's Serving PLMN ID.	e_netheaten
			 "true": The value shall be used to indicate enabling of notification; 	
			 "false": The value shall be used to indicate disabling of notification. 	
			Default: "false".	
		1		

locationArea	LocationArea	01	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_UE s_in_an_area_ notification
locationArea5G	LocationArea5G	01	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.	Number_of_UE s_in_an_area_ notification_5G
dddTraDescriptors	array(DddTraffic Descriptor)	0N	The traffic descriptor(s) of the downlink data source. May be included for event "DOWNLINK_DATA_DELIVERY_STATU S" or "AVAILABILITY_AFTER_DDN_FAILURE".	Downlink_data _delivery_statu s_5G, Availability_afte r_DDN_failure_ notification_en hancement
dddStati	array(DIDataDeli veryStatus)	0N	May be included for event "DOWNLINK_DATA_DELIVERY_STATU S". The subscribed stati (delivered, transmitted, buffered) for the event. If omitted all stati are subscribed.	Downlink_data _delivery_statu s_5G
monitoringEventReport	MonitoringEvent Report	01	Identifies a monitoring event report which is sent from the SCEF to the SCS/AS.	
apiNames	array(string)	0N	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	API_support_c apability_notific ation
			notified for capability change for all APIs the SCEF+NEF supports.	

NOTE 1:	One of the properties "externalld", "msisdn", "ipv4Addr", "ipv6Addr" or "externalGroupId" shall be included
	for features "Location_notification" and "Communication_failure_notification";. One of the properties
	"externalld", "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 "externalld", "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:	
	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".
NOTE 5:	
	"Number_of_UEs_in_an_area_notification_5G".
NOTE 6:	
	"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
NOTE	- reject the monitoring configuration request.
	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.
INOTE 10	For the eLCS feature, the "accurancy" attribute and "locQoS" attribute are mutually exclusive.

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.

	Link	1	Link to the subscription resource to which	
onfigBooulto			this notification is related.	
•	array(ConfigResu lt)	0N	Each element identifies a notification of grouping configuration result.	
e .	array(Monitoring EventReport)	0N	Each element identifies a monitoring event report.	
cancelInd	Boolean	01	Indicates whether to request to cancel the corresponding monitoring subscription. Set to false or omitted otherwise.	
	AppliedParamete rConfiguration	01	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_p aram_config

Table 5.3.2.2.2-1: Definition of type MonitoringNotification

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	01	If "monitoringType" is "CHANGE_OF_IMSI_IMEI_ASSOC IATION", this parameter shall be included to identify the event of change of IMSI-IMEI or IMSI- IMEISV association is detected.	Change_of_I MSI_IMEI_as sociation_noti fication
	Externalld	01	Refer to 3GPP TS 29.336 [11] Subclause 8.4.22. External identifier	
externalld		-	(NOTE 2)	
idleStatusInfo	IdleStatusInfo	01	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_n otification, Availability_af ter_DDN_fail ure_notificatio n
locationInfo	LocationInfo	01	If "monitoringType" is "LOCATION_REPORTING", this parameter shall be included to indicate the user location related information.	Location_notif ication, eLCS
lossOfConnectReason	integer	01	If "monitoringType" is "LOSS_OF_CONNECTIVITY", this parameter shall be included if available to identify the reason why loss of connectivity is reported.	Loss_of_conn ectivity_notific ation
			Refer to 3GPP TS 29.336 [11] Subclause 8.4.58.	
maxUEAvailabilityTim e	DateTime	01	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.	Ue- reachability_n otification
			Refer to Subclause 5.3.3.22 of 3GPP TS 29.338 [34].	
msisdn	Msisdn	01	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	01	If "monitoringType" is "NUMBER_OF_UES_IN_AN_ARE A", this parameter shall be included to indicate the number of UEs found at the location.	Number_of_U Es_in_an_are a_notification, Number_of_U Es_in_an_are a_notification _5G
plmnld	Plmnld	01	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_stat us_notificatio n
reachabilityType	ReachabilityType	01	If "monitoringType" is "UE_REACHABILITY", this parameter shall be included to identify the reachability of the UE.	Ue- reachability_n otification
			Refer to 3GPP TS 29.336 [11] Subclause 8.4.20.	

roamingStatus	boolean	01	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_stat us_notificatio n
failureCause	FailureCause	01	If "monitoringType" is "COMMUNICATION_FAILURE", this parameter shall be included to indicate the reason of communication failure.	Communicati on_failure_no tification
eventTime	DateTime	01	Identifies when the event is detected or received. Shall be included for each group of UEs.	
pdnConnInfoList	array(PdnConnectionInf ormation)	0N	If "monitoringType" is "PDN_CONNECTIVITY_STATUS", this parameter shall be included to indicate the PDN connection details.	Pdn_connecti vity_status
dddStatus	DIDataDeliveryStatus	01	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_S TATUS", this parameter shall be included to identify the downlink data delivery status detected by the network.	Downlink_dat a_delivery_st atus_5G
dddTrafDescriptor	DddTrafficDescriptor	01	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_S TATUS", this parameter shall be included to identify the downlink data descriptor impacted by the downlink data delivery status change.	Downlink_dat a_delivery_st atus_5G
maxWaitTime	DateTime	01	If "monitoringType" is "DOWNLINK_DATA_DELIVERY_S TATUS", this parameter may be include to identify the time before which the data will be buffered.	Downlink_dat a_delivery_st atus_5G
apiCaps	array(ApiCapabilityInfo)	0N	If "monitoringType" is "API_SUPPORT_CAPABILITY", this parameter shall be included to indicate the availability of all APIs supported by the serving network. If no API is supported by the serving network, an empty apiCaps	API_support_ capability_not ification
		General in a sub-	shall be provided.	
subclause	5.2.7. If no features are indic	cated, the re	clause 5.3.4 are applicable as described in elated property applies for all the features.	
NOTE 2: Identifies t	he user for which the event c	occurred. At	least one of the properties shall be include	ed.

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.

Attribute name	Data type	Cardinality	Description
activeTime	DurationSec	01	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	01	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".
suggestedNumberOfD IPackets	integer	01	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	01	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	01	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".

Table 5.3.2.3.3-1: Definition of type IdleStatusInfo

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.

Attribute name	Data type	Cardinality	Description	
ueCount	integer	1	Identifies the number of UEs.	
externalIds	array(ExternalId)	0N	Each element uniquely identifies a user. (NOTE)	
msisdns	array(Msisdn)	0N	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.

Attribute name	Data type	Cardinality	Description	Applicability
ageOfLocationInfo	DurationMin	01	Indicates the elapsed time since the last network contact of the UE.	
0			Refer to 3GPP TS 29.272 [33].	
cellId	string	01	Indicates the Cell Global Identification of the user which identifies the cell the UE is registered.	
enodeBld	string	01	Indicates the eNodeB in which the UE is currently located.	
routingAreald	string	01	Identifies the Routing Area Identity of the user where the UE is located.	
trackingAreald	string	01	Identifies the Tracking Area Identity of the user where the UE is located.	
plmnld	string	01	Identifies the PLMN Identity of the user where the UE is located.	
twanId	string	01	Identifies the TWAN Identity of the user where the UE is located.	
geographicArea	GeographicAr ea	01	Identifies a geographic area of the user where the UE is located.	
positionMethod	PositioningM ethod	01	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	AccuracyFulfi ImentIndicato r	01	Represents whether the requested accuracy is fulfilled or not. (NOTE)	eLCS
ueVelocity	VelocityEstim ate	01	UE velocity, if requested and available	eLCS
IdrType	LdrType	01	of event that triggers event notification.	eLCS
request, th attribute is - if the " informatio	ne location estima s set to true, and qosFulfilInd" attrib	tion information oute is set to "RE	" attribute is set to false or omitted during the m shall not be included. Otherwise, if the "reportin EQUESTED_ACCURACY_FULFILLED", the loc Class" attribute within the "locQoS" attribute is se	ngLocEstInd" ation estimate
- if the "	qosFulfilInd" attrib		EQUESTED_ACCURACY_NOT_FULFILLED", t Class" attribute within "locQoS" attribute is set t	

Table 5.3.2.3.5-1: Definition of LocationInfo data Type

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.

Attribute name	Data type	Cardinality	Description
			Identifies a non-transparent copy of the BSSGP cause code.
bssgpCause	ssgpCause integer 0		Refer to 3GPP TS 29.128 [12].
			Identify the type of the S1AP-Cause.
causeType	integer	01	Refer to 3GPP TS 29.128 [12].
			Identifies a non-transparent copy of the GMM cause code.
gmmCause	integer	01	Refer to 3GPP TS 29.128 [12].
		01	Identifies a non-transparent copy of the RANAP cause code.
ranapCause	integer		Refer to 3GPP TS 29.128 [12].
			Indicates RAN and/or NAS release cause code information, TWAN release cause code information or untrusted WLAN release cause code information.
ranNasCause	string	01	Refer to 3GPP TS 29.214 [10].
			(NOTE)
		01	Identifies a non-transparent copy of the S1AP cause code.
s1ApCause	integer		Refer to 3GPP TS 29.128 [12].
		01	Identifies a non-transparent copy of the SM cause code.
smCause	integer		Refer to 3GPP TS 29.128 [12].
NOTE: If this prope	erty is provided in	n the "FailureC	ause" type, then other properties shall not be provided.

Table 5.3.2.3.6-1: Definition of type FailureCause

5.3.2.3.7 Type: PdnConnectionInformation

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

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
status	PdnConnectionStatu s	1	Identifies the PDN connection status.	
apn	string	01	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	01	Identifies the 3GPP network function used to communicate with the SCS/AS for non-IP PDN type.	
ipv4Addr	lpv4Addr	01	Identifies the UE Ipv4 address.	
ipv6Addrs	array(lpv6Addr)	0N	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.

Attribute name	Data type	Cardinality	Description	Applicability
externallds	array(ExternalId)	0N	Each element uniquely identifies a user. (NOTE)	
msisdns	array(Msisdn)	0N	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE)	
maximumLatency	DurationSec	01	This parameter may be included to identify the maximum delay acceptable for downlink data transfers, which is applied in the network.	
maximumResponseTi me	DurationSec	01	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.	
maximumDetectionTi me	DurationSec	01	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 of UEs).	mitted, it means the c	hange applies fo	r the whole configuration (i.e. a single UE o	r a group of

Table 5.3.2.3.8-1: Definition of type AppliedParameterConfiguration

5.3.2.3.9 Type: ApiCapabilityInfo

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

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
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Enumeration value	Description	Applicability (NOTE 1)	
LOSS_OF_CONNECTIVI TY	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_REPORTIN G	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	The SCS/AS requests to be notified of communication failure events	Communication_failure_notification	
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	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.	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.

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.

Enumeration value	Description	Applicability (NOTE)	
CURRENT_LOCATION	The SCS/AS requests to be notified for current location	Location_notification, eLCS	
LAST_KNOWN_LOCATI ON	The SCS/AS requests to be notified for last known location	Location_notification, Number_of_UEs_in_an_area_no tification, Number_of_UEs_in_an_area_no tification_5G	
CURRENT_OR_LAST_K NOWN_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.			

Table 5.3.2.4.5-1: Enumeration LocationType

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.

Enumeration value	Description	Applicability (NOTE)		
IMEI	The value shall be used when the change of IMSI-IMEI	Change_of_IMSI_IMEI_associati		
	association shall be detected	on_notification		
IMEISV	The value shall be used when the change of IMSI-	Change_of_IMSI_IMEI_associati		
	IMEISV association shall be detected	on_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.				

Table 5.3.2.4.6-1: Enumeration AssociationType

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.

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.	

Table 5.3.2.4.7-1: Enumeration 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.

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.				

Table 5.3.2.4.8-1: Enumeration PdnConnectionStatus

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.

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.

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.					

5.3.3 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:

Resource name	Resource URI	HTTP method	Meaning
Monitoring Event	3gpp-monitoring-event/v1/{scsAsId}/subscriptions/	GET	Read all subscriptions for a
Subscriptions			given SCS/AS
		POST	Create a new subscription to
			monitoring an event
Individual Monitoring	3gpp-monitoring-	PUT	Modify an existing subscription
Event Subscription	event/v1/{scsAsId}/subscriptions/{subscriptionId}		of monitoring event
		GET	Read a subscription of
			monitoring event
		DELETE	Delete a subscription of
			monitoring event
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

Table 5.3.3.1-1: Resources and methods overview

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	Data type	Cardinality	Remarks	
body	none			
Response	Data type	Cardinality	Response codes	Remarks
	array(MonitoringEventSu bscription)	0N	200 OK	The subscription information 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.				

5.3.3.2.3.2 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			

Deguaat	Data type	Cardinality		Remarks			
Request body	MonitoringEventSubscrip tion	1		to register a subscription to notifications about event with the SCEF.			
	Data type	Cardinality	Response codes	Remarks			
	MonitoringEventSubscrip tion	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.			
Response body	ProblemDetails	01	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	01	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	01	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	01	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 2: T a	 The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply. 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: T	he "cause" attribute within IDLE_STATUS_UNSUPPC						
NOTE 4: T	The "cause" attribute within	the "Problem	Details" data	a structure may be set to			
NOTE 5: T		the "Problem		a structure may be set to "EVENT_UNSUPPORTED" as			

Table 5.3.3.2.3.4-2: Data structures supported by the POST	Γ request/response by the resource
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Table 5.3.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	Р	Cardinality	Description
Location	string	Μ		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 5.3.3.3.1-2: Data structures supported by the GET request/response by the resource

Request	Data type	Cardinality		Remarks		
body	none					
	-		Response			
Response	Data type	Cardinality	codes	Remarks		
body	MonitoringEventSubscrip tion	1	200 OK	The subscription information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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 5.3.3.3.2-2.

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 5.3.3.3.2-2: Data structures supported by the PUT request/response by the resource

Request	Data type	Cardinality		Remarks		
body	MonitoringEventSubscrip tion	1		to update a subscription to notifications about event with the SCEF.		
	Data type	Cardinality	Response codes	Remarks		
Response body	MonitoringEventSubscrip tion	1	200 OK	The subscription was updated successfully.		
body	ProblemDetails	01	403 Forbidden	The subscription resource is not allowed to be updated since the HTTP method is not supported. (NOTE 2, NOTE 3)		
NOTE 2: T NOTE 3: T	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.					

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 5.3.3.3.5-2.

Table 5.3.3.3.5-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

Request	Data type	Cardinality		Remarks		
body	none					
	Data type	Cardinality	Response codes	Remarks		
Response body	none		204 No Content	The subscription was terminated successfully.		
	array(MonitoringEventRe port)	1N	200 OK	The subscription was terminated successfully, the monitoring event report(s) shall be included if received.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.					

5.3.3.4 Monitoring Notification

5.3.3.4.1 Introduction

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

5.3.3.4.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.3.3.4.2-1.

Table 5.3.3.4.2-1: Resource URI variables for resource "Monitoring Event Notification"

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

5.3.3.4.3 Resource methods

5.3.3.4.3.1 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 URI query parameters, request and response data structures, and response codes, as specified in the table 5.3.3.4.3.1-1 and table 5.3.3.4.3.1-2.

Table 5.3.3.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.3.3.4.3.1-2: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks		
body	MonitoringNotification	1	The monitoring notification provided by the SCEF.			
Response	Data type	Cardinality	Response codes	Remarks		
body none 204 No Content The monitoring no				The monitoring notification is received successfully.		
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.						

5.3.3.4.3.2 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.

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 (IMS is changed
5	Roaming_status_notification	The SCS/AS is notified when the UE's roaming statu 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 ir 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. Thi feature requires that the Notification_test_eve featute 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 statu is changed. The feature is not applicable to the pre- 5G.
15	Availability_after_DDN_failure_notification_enha ncement	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 exposur service (e.g. location information preciser than cell level).

Table 5.3.4-1: Features used by MonitoringEvent API

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.

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.

Table 5.3.5.3-1: Application errors

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.

Data type	Reference	Comments	
GeographicArea 3GPP TS 29.572 [42] Id		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.	

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

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	01	Link to the resource "Individual BDT Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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	01	Identifies the area within which the SCS/AS requests the number of UE.	Bdt
locationArea5G	LocationArea5G	01	Identifies the area within which the AF requests the number of UE.	LocBdt_5G
referenceld	BdtReferenceld	01	Identifies a selected policy of background data transfer.	
transferPolicies	array(TransferPolicy)	0N	Identifies an offered transfer policy.	
selectedPolicy	integer	01	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	01	Identifies a group of users. (NOTE 2)	Group_Id
notificationDestination	Link	01	Contains the URI to receive the BDT notification from the NEF.	BdtNotificatio n_5G
warnNotifEnabled	boolean	01	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.	BdtNotificatio n_5G
trafficDes	TrafficDescriptor	01	Contains the traffic descriptor of the background data. (NOTE 2)	
NOTE 1: Properties m subclause 5.	arked with a feature as d 2.7. If no feature are indic	efined in subclau cated, the related	ise 5.4.4 are applicable as described in property applies for all the features.	
	is only applicable to the			

Table 5.4.2.1.2-1: Definition of type Bdt

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)	
selectedPolicy	integer	1	Identity of the selected background data transfer policy.		
warnNotifEnabled	boolean	01	Indicates whether the BDT warning notification is enabled or not.	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.					

Table 5.4.2.1.3-1: Definition of type BdtPatch

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
bdtRefld	BdtReferenceId	1	This IE indicates transfer policies of background data transfer which the notification corresponds to.	
locationArea5G	LocationArea5G	01	This IE represents a network area where a network performance will go below the criteria set by the operator.	
timeWindow	TimeWindow	01	This IE indicates a time window when a network performance will go below the criteria set by the operator.	
candPolicies	array(TransferPolicy)	0N	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.	
			use 5.4.4 are applicable as described in ad 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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)	
bdtPolicyId	integer	1	Identifier for the transfer policy		
maxUplinkBandwidth	Bandwidth	01	Indicates the maximum aggregated bitrate in the uplink authorized by the PCRF.		
maxDownlinkBandwidt h	Bandwidth	01	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.	subclause 5.2.7. If no feature are indicated, the related property applies for all the features.				

Table 5.4.2.2.2-1: Definition of type TransferPolicy

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:

Resource	Resource URI	HTTP	Meaning
name		method	
BDT	3gpp-bdt/v1/{scsAsId}/subscriptions	GET	Read all active background data transfer
Subscriptio			subscription resources for a given SCS/AS
n		POST	Create a new background data transfer
			subscription resource
Individual	3gpp-	PATCH	Modify a background data transfer
BDT	bdt/v1/{scsAsId}/subscriptions/{subscriptionI		subscription resource to select one of the
Subscriptio	d}		transfer policies offered by the SCEF
n		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
BDT	{notificationDestination}	POST	Notify the BDT warning from the NEF to the
Warning			AF identified by the notification destination
Notification			URI (NOTE)
NOTE: Th	is resource may only be supported in 5G.	1	

Table 5.4.3.1-1: Resources and methods overview

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	array(Bdt)	0N	200 OK	The resource information for the SCS/AS in the request URI are returned.		
NOTE: T						

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	Data type	Cardinality		Remarks
body	Bdt	1	Parameters to register a subscription to request background or transfer related information with the SCEF.	
	Data type	Cardinality	Response codes	Remarks
Response body	Bdt	1	201 Created	The resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: T	he mandatory HTTP error	status codes	for the POS	T 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	Ρ	Cardinality	Description
Location	string	Μ		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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	Bdt	1	200 OK	The resource information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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 5.4.3.3.2-1.

Request Data type 0		Cardinality		Remarks			
body	Bdt	1	The SCS/AS requests to update the BDT policy subscription.				
	Data type	Cardinality	Response codes	Remarks			
Response body	Bdt	1	200 OK	The subscription was modified successfully.			
				The SCEF shall return an updated subscription in the response payload body.			
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.							

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

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 5.4.3.3.3.1.

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

Request	Request bodyData typeCardinalityRemarksBdtPatch1Background data transfer policy selected by the			Remarks		
body			d data transfer policy selected by the SCS/AS.			
	Data type	Cardinality	Response codes	Remarks		
Response body	Bdt	1	200 OK	The resource was modified successfully. The SCEF shall return an updated subscription in the response payload body.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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

Request	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	none		204 No Content	The resource was terminated successfully.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

5.4.3.4 BDT Warning Notification

5.4.3.4.1 Introduction

This resource allows the NEF to notify the AF of the BDT warning notification. This resource may only be supported in 5G.

5.4.3.4.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.5.3.4.2-1.

Table 5.4.3.4.2-1: Resource URI variables for resource "BDT Warning Notification"

Name	Data type	Definition
notificationDestination		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.

5.4.3.4.3 Resource methods

5.4.3.4.3.1 Notification via HTTP 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 request and response data structures, and response codes, as specified in the table 5.4.3.4.3.1-1.

Table 5.4.3.4.3.1-1.: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality	Remarks	
body	ExNotification	1	Representa	tion of the BDT warning notification.
Response	Data type	Cardinality	Response codes Remarks	
body	n/a	1	204 No This case represents a successful notificat warning notification.	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

5.4.3.4.3.2 Notification via Websocket

If supported by both AF and NEF and successfully negotiated, the Notification 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.

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 s	Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".				
Description:	Description: A clear textual description of the feature.				

Table 5.4.4-1: Features used by ResourceManagementOfBdt API

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.

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 A		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.				

Table 5.5.2.1.1-1: ChargeableParty API re-used Data Types

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	01	Link to the resource "Individual Chargeable Party Transaction". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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.	
requestTestNotificatio n	boolean	01	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_t est_event
websockNotifConfig	WebsockNotifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_w ebsocket
ipv4Addr	lpv4Addr	01	Identifies the Ipv4 address.	
ipv6Addr	lpv6Addr	01	Identifies the Ipv6 address. (NOTE 2)	
macAddr	MacAddr48	01	Identifies the MAC address. (NOTE 2)	EthChgParty_ 5G
flowInfo	array(FlowInfo)	0N	Describes the IP flows. (NOTE 2)	
ethFlowInfo	array(EthFlowDescri ption)	0N	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 sponsoring status.	
referenceld	BdtReferenceId	01	The reference ID for a previously selected policy of background data transfer.	
usageThreshold	UsageThreshold	01	Time period and/or traffic volume.	
NOTE 1: Properties m subclause 5. NOTE 2: One of ipv4,	narked with a feature as 2.7. If no feature are in involve or MAC address s	defined in sub dicated, the rel hall be provide	clause 5.5.4 are applicable as described in lated property applies for all the features. ed. If ipv4 or ipv6 address is provided, IP flo ernet flow information shall be provided.	

Table 5.5.2.1.2-1: Definition of type ChargeableParty

5.5.2.1.3 Type: ChargeablePartyPatch

This type represents the configuration of a chargeable party. The structure is used for PATCH request.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
flowInfo	array(FlowInfo)	0N	Describes the application flows.	
ethFlowInfo	array(EthFlowDescri ption)	0N	Describes Ethernet packet flows.	EthChgParty_ 5G
sponsoringEnabled	boolean	01	Indicates sponsoring status.	
referenceld	BdtReferenceId	01	The reference ID for a previously selected policy of background data transfer.	
usageThreshold UsageThresholdRm 01 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.				

Table 5.5.2.1.3-1: Definition of type ChargeablePartyPatch

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:

Resource name	Resource URI	HTTP method	Meaning
Chargeable Party	3gpp-chargeable-party/v1/{scsAsId}/transactions	GET	Read all chargeable party transaction resources for a given SCS/AS
Transaction s		POST	Create a new chargeable party transaction resource
Individual Chargeable	3gpp-chargeable- party/v1/{scsAsId}/transactions/{transactionId}	GET	Read a chargeable party transaction resource
Party Transaction		PATCH	Activate or Deactivate sponsoring by a chargeable party.
		DELETE	Delete an existing chargeable party transaction resource
Event Notification	{notificationDestination}	POST	Notify the bearer level event(s) from the SCEF to the SCS/AS identified by the notification destination URI

Table 5.5.3.1-1: Resources and methods overview

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	Data type	Cardinality	Remarks		Remarks		
body	none						
Response	Data type	Cardinality	Response codes	Remarks			
body	array(ChargeableParty)	0N	200 OK	The chargeable party transactions information 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.							

5.5.3.2.3.2 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.

Poquest	Data type	Cardinality		Remarks
Request body ChargeableParty 1 Parameters to create a chargeable party tran SCEF.		to create a chargeable party transaction with the		
	Data type	Cardinality	Response codes	Remarks
Response body	ChargeableParty	1	201 Created	The transaction was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: T	NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

Table 5.5.3.2.3.4-1: Data structures supported by the POST request/response by the resource

Table 5.5.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	Ρ	Cardinality	Description
Location	string	Μ		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	Data type	Cardinality		Remarks
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	ChargeableParty	1	200 OK	The chargeable party transactions 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.				

5.5.3.3.3.2 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

Poquest	Data type	Cardinality		Remarks
Request body				
	Data type	Cardinality	Response codes	Remarks
Response body	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.

NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.

5.5.3.3.3.4

This HTTP method is not supported for the resource.

POST

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 5.5.3.3.5-1.

Request	Data type	Cardinality		Remarks			
body none							
	Data type	Cardinality	Response codes	Remarks			
Response body	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.			
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.							

Table 5.5.3.3.3.5-1.: Data structures supported by the DELETE request/response by the resource

5.5.3.4 Event Notification

5.5.3.4.1 Introduction

This resource allows the SCEF to notify the SCS/AS of the bearer level event(s).

5.5.3.4.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.5.3.4.2-1.

Table 5.5.3.4.2-1: Resource URI variables for resource "Event Notification"

Name	Data type	Definition
notificationDestination		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.

5.5.3.4.3 Resource methods

5.5.3.4.3.1 Notification via HTTP 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 request and response data structures, and response codes, as specified in the table 5.5.3.4.3.1-1.

Table 5.5.3.4.3.1-1.: Data structures supported by the POST request/response by the resource

Request	Request Data type Cardinality			Remarks
body	NotificationData	1	Representa	tion of the bearer level notification.
Response	Data type	Cardinality	Response codes Remarks	
body	n/a	1		This case represents a successful notification of bearer level event(s).
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

5.5.3.4.3.2 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.

5.5.4 Used Features

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

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.

Data type	Reference	Comments
NullValue	3GPP TS 29.571 [45]	JSON's null value, used as an explicit value of an enumeration.
SupportedFeatures		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	01	Link to the resource "Individual NIDD configuration". This parameter shall be supplied by the SCEF in HTTP responses	
supportedFeatures	SupportedFeatures	01	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	01	Identifies the MTC Service Provider and/or MTC Application. (NOTE 3)	
externalld	ExternalId	01	Each element uniquely identifies a user as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
msisdn	Msisdn	01	(NOTE 2) Each element identifies the MS internal PSTN/ISDN number allocated for a UE.	
externalGroupId	ExternalGroupId	01	(NOTE 2) Identifies a user group as defined in subclause 4.6.3 of 3GPP TS 23.682 [2].	GroupMessa geDelivery
duration	DateTime	01	(NOTE 2) 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	01	The reliable data service (as defined in subclause 4.5.15.3 of 3GPP TS 23.682 [2]) to indicate if a reliable data service acknowledgment is enabled or not.	
rdsPorts	array(RdsPort)	0N	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]).	
pdnEstablishmentOpti on	PdnEstablishment Options	01	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.	
requestTestNotificatio n	boolean	01	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_t est_event
websockNotifConfig	WebsockNotifConfi g	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_w ebsocket

maximumPacketSize	integer	01	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.
niddDownlinkDataTra nsfers	array(NiddDownlink DataTransfer)	0N	The downlink data deliveries that needed to be executed by the SCEF. The cardinality of the property shall be 01 in the request and 0N 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	01	May be supplied by the SCEF
subclause softerwise. NOTE 2: One of the NOTE 3: The SCEF - override - send it	5.2.7. If no features are properties "externalld",	indicated, the "msisdn" or "e MTC provider value and se	ubclause 5.6.4 are applicable as described in related property applies for all the features unless stated externalGroupId" shall be included. identifier and then the SCEF may:

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)
externalld	ExternalId	01	Each element uniquely identifies a user as defined in subclause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
externalGroupId	ExternalGroupId	01	Identifies a user group as defined in subclause 4.6.3 of 3GPP TS 23.682 [2]. (NOTE 2)	GroupMessa geDelivery
msisdn	Msisdn	01	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)	
self	Link	01	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	01	The reliable data service (as defined in subclause 4.5.15.3 of 3GPP TS 23.682 [2]) to indicate if a reliable data service acknowledgment is enabled or not.	
rdsPort	RdsPort	01	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	01	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	01	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.	
pdnEstablishmentOpti on	PdnEstablishmen tOptions	01	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	01	Indicates the MT NIDD delivery status.	
requestedRetransmiss ionTime	DateTime	01	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_REA CHABLE"	

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
niddConfiguration	Link	1	Link to the NIDD configuration resource to which this notification is related.	
externalld	ExternalId	01	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	01	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	01	Indicates whether the reliable data service is enabled.	
rdsPort	RdsPort	01	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]).	
subclause 5	5.2.7. If no featu	ires are indicat	ed in subclause 5.6.4 are applicable as described in ed, the related property applies for all the features. sdn" shall be included.	

5.6.2.1.5 Type: NiddDownlinkDataDeliveryStatusNotification

This type represents the delivery status for a specific NIDD downlink data delivery.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
niddDownlinkDataTra nsfer	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.	
requestedRetransmiss ionTime	DateTime	01	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_REACHAB LE"	
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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
niddConfiguration	Link	1	Link to the NIDD configuration resource to which this notification is related.	
externalld	ExternalId	01	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 2)	
msisdn	Msisdn	01	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	01	It indicates whether the network capability for the reliable data service is enabled or not.	
rdsPort	RdsPort	01	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_veri fication
subclause	5.2.7. If no featu	ire are indicate	ed in subclause 5.6.4 are applicable as described in d, the related property applies for all the features. sdn" shall be included.	

 Table 5.6.2.1.6-1: Definition of type NiddConfigurationStatusNotification

5.6.2.1.7 Type: NiddConfigurationPatch

This type represents an NIDD configuration used in PATCH.

01	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. The reliable data service (as defined in	
01		
	clause 4.5.15.3 of 3GPP TS 23.682 [2]) to indicate if a reliable data service acknowledgment is enabled or not.	
0N	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]).	
nt 01	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.	
	eature as defined	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

Table E C 0 4 7 4. Definition of	turne NiddConfiguration Datab
Table 5.6.2.1.7-1: Definition of	type NiddConfigurationPatch

5.6.2.1.8 Type: GmdNiddDownlinkDataDeliveryNotification

This type represents the delivery status for a specific group NIDD downlink data delivery.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
niddDownlinkDataTra nsfer	Link	1	Link to the NIDD downlink data transfer resource to which this notification is related.	
gmdResults	array(GmdResu It)	1N	Indicates the group message delivery result.	GroupMessa geDelivery
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.				

Table 5.6.2.1.8-1: Definition of type GmdNiddDownlinkDataDeliveryNotification

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	of type ManagePort
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Attribute name	Data type	Cardinality	Description	Applicability
self	Link	01	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	01	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	01	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.

Attribute name	Data type	Cardinality	Description	Applicability
niddConfiguration	Link	1	Link to the NIDD configuration resource to which	
			this notification is related.	
externalld	Externalld	01	Each element uniquely identifies a user as	
			defined in Clause 4.6.2 of 3GPP TS 23.682 [2].	
			(NOTE)	
msisdn	Msisdn	01	Each element identifies the MS internal	
			PSTN/ISDN number allocated for a UE.	
			(NOTE)	
managedPorts	array(Mana	0N	Indicates the reserved RDS port configuration	
-	gePort)		information.	
NOTE: One of the properties "externalld" 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.

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]).

Table 5.6.2.2.2-1: Definition of RdsPort data Type

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.

Attribute name	Data type	Cardinality	Description
externalld	Externalld	01	Each element uniquely identifies a user as defined in sublause 4.6.2 of 3GPP TS 23.682 [2].
			(NOTE)
msisdn	Msisdn	01	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	01	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 "externalld" or "msisdn" shall be included.			

Table 5.6.2.2.3-1: Definition of GmdResult data Type

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	01	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.

Attribute name	Data type	Cardinality	Description
requestedRetransm issionTime	DateTime	01	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.			

Table 5.6.2.2.5-1: Definition of RdsDownlinkDataDeliveryFailure data Type

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.

Enumeration value	umeration value Description		
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.

Enumeration value	Description	Applicability (NOTE)			
SUCCESS	Success but details not provided				
SUCCESS_NEXT_HOP_ACKNOWLE	Successful delivery to the next hop with				
DGED	acknowledgment.				
SUCCESS_NEXT_HOP_UNACKNOW	Successful delivery to the next hop without				
LEDGED	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_	The SCEF has been informed that the UE is				
REACHABLE	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	The SCEF has been informed that the UE is				
CHABLE	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 fea	luies.			

5.6.2.3.5 Enumeration: NiddStatus

The enumeration NiddStatus represents the status of a NIDD configuration.

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].

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.				

Table 5.6.2.3.6-1: Enumeration	PdnEstablishmentOptionsRm
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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	3gpp-nidd/v1/{scsAsId}/configurations	GET	SCS/AS	Read all NIDD configuration resources
conligurations		DOOT	000/40	for a given SCS/AS
		POST	SCS/AS	Create a new NIDD configuration resource.
Individual NIDD	3gpp- nidd/v1/{scsAsId}/configurations/{configurationId}	PATCH	SCS/AS	Modify an existing NIDD configuration resource
configuration		GET	SCS/AS	Read an NIDD configuration resource
		DELETE	SCS/AS	Delete an existing NIDD configuration resource
NIDD downlink data deliveries	3gpp- nidd/v1/{scsAsId}/configurations/{configurationId}/dow nlink-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	3gpp- nidd/v1/{scsAsId}/configurations/{configurationId}/dow nlink-data-deliveries/{downlinkDataDeliveryId}	PUT	SCS/AS	Replace an NIDD downlink data delivery resource.
delivery		DELETE	SCS/AS	Delete an NIDD downlink data delivery resource.
		GET	SCS/AS	Read pending NIDD downlink data delivery resource
NIDD Configuration Update Notification	{notification_uri}	POST	SCEF	Send notifications about the status of an NIDD configuration to the SCS/AS.
NIDD Downlink Data Delivery Status Notification	{notification_uri}	POST	SCEF	Report a specific NIDD downlink data delivery result to the SCS/AS.
NIDD Uplink Data Notification	{notification_uri}	POST	SCEF	Send an uplink non-IP data notification from the SCEF to the SCS/AS.
ManagePort Configuration s	3gpp- nidd/v1/{scsAsId}/configurations/{configurationId}/rds- ports	GET	SCS/AS	Read all RDS ManagePort Configurations.
Individual ManagePort Configuration	3gpp- nidd/v1/{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

ManagePort	{notification_uri}	POST	SCEF	Send notifications about
Notification				the port numbers that are
				reserved.

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	Data type	Cardinality	Remarks		
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	array(NiddConfiguration)	0N	200 OK	The configuration information 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.					

5.6.3.2.3.2 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.

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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

Request	Data type	Cardinality		Remarks		
body	NiddConfiguration	1	Parameters SCEF.	Parameters to create and authorize a NIDD configuration with the SCEF.		
	Data type	Cardinality	Response codes	Remarks		
Response	NiddConfiguration	1	201 Created	The NIDD configuration was created successfully.		
body				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	Ρ	Cardinality	Description
Location	string	Μ		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	Request Data type			Remarks			
body	None						
Response	Data type	Cardinality	Response codes	Remarks			
body	NiddConfiguration	1	200 OK	The configuration information related to the request URI is returned.			
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.						

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	Data type	Cardinality		Remarks		
body	NiddConfigurationPatch	1	Parameters	s to update a NIDD configuration with the SCEF.		
	Data type	Cardinality	Response codes	Remarks		
Response body	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.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality		Remarks
body	none			
	Data type	Cardinality	Response codes	Remarks
	NiddConfiguration	1	200 OK	The NIDD configuration was cancelled successfully.
Response body				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.
NOTE: T	he mandatory HTTP error	status codes	for the DELI	ETE method listed in table 5.2.6-1 also apply.

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	Data type	Cardinality		Remarks	
body	None				
Response	Data type	Cardinality	Response codes	Remarks	
body	array(NiddDownlinkData Transfer)	0N	200 OK	All pending NIDD downlink data deliveries for the SCS/AS and NIDD configuration in the request URI are returned.	
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

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.

Poquest	Data type	Cardinality		Remarks
Request body	NiddDownlinkDataTransf er	1	The parame	eters and non-IP data for the MT delivery.
	Data type	Cardinality	Response codes	Remarks
	NiddDownlinkDataTransf er	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.
Response body	NiddDownlinkDataTransf er	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.
	NiddDownlinkDataDelive ryFailure	01	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: T	he mandatory HTTP error	status codes	for the POS	T method listed in table 5.2.6-1 also apply.

Table 5.6.3.4.3.4-1: Data structures supported by the POST request/response by the resource

Table 5.6.3.4.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	Ρ	Cardinality	Description
Location	string	Μ		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

This resource shall support the resource URI variables defined in table 5.6.3.5.2-1.

Name	Data type	Definition
apiRoot	string	See clause 5.2.4.
scsAsId	string	Identifier of the SCS/AS.
configurationId	string	Identifier of the configuration.
downlinkDataDeliveryl d	string	Identifier of the downlink data delivery.

Table 5.6.3.4.2-1: Resource URI variables for resource "Individual NIDD 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	Data type	Cardinality	Remarks	
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	NiddDownlinkDataTransf er	1	200 OK	Individual NIDD downlink data delivery resource is returned.
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.			

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.

Poquest	Data type	Cardinality		Remarks		
Request body	NiddDownlinkDataTransf er	1	The parame	The parameters and non-IP data for the MT delivery.		
	Data type	Cardinality	Response codes	Remarks		
	NiddDownlinkDataTransf er	1	200 OK	The NIDD downlink data delivery was accepted by the SCEF, the NIDD will be performed later.		
Response body				The SCEF shall return a data structure of type "NiddDownlinkDataTransfer" in the response payload body.		
	ProblemDetails	01	403 Forbidden	The resource is not allowed to be updated since the HTTP PUT method is not supported. (NOTE 2)		
	ProblemDetails	01	404 Not Found	The buffered data is not allowed to be replaced since data delivery has already been delivered. (NOTE 3)		
	ProblemDetails	01	409 Conflict	The buffered data is not allowed to be replaced since data delivery is ongoing sent. (NOTE 4)		
	NiddDownlinkDataDelive ryFailure	01	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.		
				method listed in table 5.2.6-1 also apply. a structure may be set to "OPERATION_PROHIBITED"		

Table 5.6.3.5.3.2-1: Data structures supported by the PUT request/response by the resource

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.

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.

Request	Data type	Cardinality		Remarks		
body	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	01	403 Forbidden	The resource is not allowed to be deleted since the HTTP DELETE method is not supported. (NOTE 2)		
Response body	ProblemDetails	01	404 Not Found	The buffered data is not allowed to be deleted since data delivery has already been delivered. (NOTE 3)		
	ProblemDetails	01	409 Conflict	The buffered data is not allowed to be deleted since data delivery is ongoing sent. (NOTE 4)		
	NiddDownlinkDataDelive ryFailure	01	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.		
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: T d	TE 3: The "cause" attribute within the "ProblemDetails" data structure may be set to "ALREADY_DELIVERED" as defined in subclause 5.6.5.3.					
	The "cause" attribute within the "ProblemDetails" data structure may be set to "SENDING" as defined in subclause 5.6.5.3.					

Table 5.6.3.5.3.5-1.: Data structures supported by the DELETE request/response by the resource

5.6.3.6 NIDD Configuration Update Notification

5.6.3.6.1 Introduction

This resource allows the SCEF to send notifications about the status of an NIDD configuration to the SCS/AS.

5.6.3.6.2 Resource definition

Resource URI: {notification_uri}

This resource shall support the resource URI variables defined in table 5.6.3.6.2-1.

Table 5.6.3.6.2-1: Resource URI variables for resource "NIDD Configuration Update Notification"

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.

5.6.3.6.3 Resource methods

5.6.3.6.3.1 Notification via HTTP 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.6.3.1-1.

Table 5.6.3.6.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality	Remarks	
body	NiddConfigurationStatus Notification	1	The NIDD o	configuration status notification.
	Data type	Cardinality	Response codes	Remarks
Response body	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: T	NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.			

5.6.3.6.4 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.

5.6.3.7 NIDD Downlink Data Delivery Status Notification

5.6.3.7.1 Introduction

This resource 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.

5.6.3.7.2 Resource definition

Resource URI: {notification_uri}

This resource shall support the resource URI variables defined in table 5.6.3.7.2-1.

Table 5.6.3.7.2-1: Resource URI variables for resource "NIDD Downlink Data Delivery Status Notification"

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.

5.6.3.7.3 Resource methods

5.6.3.7.3.1 Notification via HTTP 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 5.6.2.1.5-2 for a group of UEs.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.7.3.1-1.

Table 5.6.3.7.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks
body	NiddDownlinkDataDelive ryStatusNotification	1	The Down link data delivery status notification for a single U	
	Data type	Cardinality	Response codes	Remarks
Response body	Acknowledgement	1	200 OK	The successful acknowledgement of the notification.
	(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.				

Table 5.6.3.7.3.1-2: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks	
body	GmdNiddDownlinkDataD eliveryStatusNotification	1	The Down link data delivery status notification for a group of		
	Data type	Cardinality	Response codes	Remarks	
Response body	Acknowledgement	1	200 OK	The successful acknowledgement of the notification.	
	(None)		204 No Content	The successful acknowledgement of the notification without a body.	
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

5.6.3.7.4 Notification via Websocket

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

5.6.3.8 NIDD Uplink Data Notification

5.6.3.8.1 Introduction

This resource allows the SCEF to send notifications about received NIDD uplink data.

5.6.3.8.2 Resource definition

Resource URI: {notification_uri}

This resource shall support the resource URI variables defined in table 5.6.3.8.2-1.

Name	Data type	Definition
notification_uri		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.

Table 5.6.3.8.2-1: Resource URI variables for resource "NIDD Uplink Data Notification"

5.6.3.8.3 Resource methods

5.6.3.8.3.1 Notification via HTTP 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.8.3.1-1.

Table 5.6.3.8.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks
body	NiddUplinkDataNotificati on	1	The parameters and non-IP data for the NIDD uplink non-IP notification.	
	Data type	Cardinality	Response codes	Remarks
Response body	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.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.				

5.6.3.8.4 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.

5.6.3.9 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.

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])))\$".

Table 5.6.3.9.2-1: Resource URI variables for resource "Individual ManagePort Configuration"

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	Data type	Cardinality		Remarks		
body	None					
Response	Data type	Cardinality	Response codes	Remarks		
body	ManagePort	1	200 OK	The configuration 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.						

5.6.3.9.3.2 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.

	Data type	Cardinality		Remarks			
Request body	ManagePort	1		The ManagePort configuration to be created which represents the information used for reserving the port configuration for an application.			
	Data type	Cardinality	Response codes	Remarks			
	ManagePort	1	201 Created	This indicates the reservation of port configuration for specified application is successful.			
Response	None		202 Accepted	This indicates the request for reservation of port configuration for specified application is accepted and under processing.			
body	ProblemDetails	01	403 Forbidden	The cause value shall be set to "PORT_NOT_FREE" in the "cause" attribute of the "ProblemDetails" structure.			
	RdsDownlinkDataDeliver yFailure	01	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.			
NOTE 1: T	NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.						

Table 5.6.3.9.3.2-1: Data structures supported by the PUT request/response by the resource

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.

	Data type	Cardinality		Remarks
		ePort configuration to be cancelled which represents tion used for releasing the port configuration for an		
	Data type	Cardinality	Response codes	Remarks
	None		204 No Content	The ManagePort configuration was cancelled successfully and the port configuration was released.
Response body	None		202 Accepted	This indicates the request for cancellation of port configuration for specified application is accepted and under processing.
	ProblemDetails	01	404 Not Found	The cause value shall be set to "PORT_NOT_ASSO_WITH_APP" in the "cause" attribute of the "ProblemDetails" structure.
	RdsDownlinkDataDeliver yFailure	01	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.
NOTE: T	he mandatory HTTP error	status codes	for the DELI	ETE method listed in table 5.2.6-1 also apply.

Table 5.6.3.9.3.5-1.: Data structures supported by the DELETE request/response by the resource

5.6.3.10 ManagePort Notification

5.6.3.10.1 Introduction

This resource allows the SCEF to send notifications about the port numbers that are reserved..

5.6.3.10.2 Resource definition

Resource URI: {notification_uri}

This resource shall support the resource URI variables defined in table 5.6.3.10.2-1.

Table 5.6.3.Z.2-1: Resource URI variables for resource "ManagePort Notification"

Name	Data type	Definition
notification_uri		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.

5.6.3.10.3 Resource methods

5.6.3.10.3.1 Notification via HTTP 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.6.3.10.3.1-1.

Request	Data type	Cardinality		Remarks		
body	ManagePortNotification	1		eters that represents the information about port at are reserved for use with an application.		
	Data type	Cardinality	Response codes	Remarks		
Response body	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.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.					

Table 5.6.3.10.3.1-1: Data structures supported by the POST request/response by the resource

5.6.3.10.4 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.

5.6.3.11 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	Data type	Cardinality		Remarks		
body	None					
Response	Data type	Cardinality	Response codes	Remarks		
body	array(ManagePort)	0N		All RDS dynamic port configuration information related to the request URI are returned.		
NOTE: T						

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.

5.6.4 Used Features

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

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:	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.					

Table 5.6.4-1: Features used by NIDD API

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.

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	Rds_port_verif
		numbers in the MT NIDD, such port	ication
		numbers does not match with the	
		configured port numbers.	
OPERATION_PROHIBITED	403 Forbidden	Indicates the operation is prohibitted.	
PORT_NOT_FREE	403 Forbidden	Port is not free as it is already	Rds_dynamic
		associated with an application	_port
ALREADY_DELIVERED	404 Not Found	The SCEF has already delivered the	
		buffered data.	
PORT_NOT_ASSOC_WITH_AP	404 Not Found	Port is free and is not associated with	Rds_dynamic
Р		any application.	_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	500 Internal Server Error	The SCEF has aborted the delivery	
BLE		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.	

Table 5.6.5.3-1: Application errors

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	Link to the resource "Individual Device Triggering Transaction". This parameter shall be supplied by the SCEF in HTTP responses.	
externalld	ExternalId	01	Uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2].	
msisdn	Msisdn	01	(NOTE 2) Identifies the MS internal PSTN/ISDN number allocated for a UE.	
supportedFeatures	SupportedFeatures	01	(NOTE 2) 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	01	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.	
requestTestNotificatio n	boolean	01	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	WebsockNotifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	
deliveryResult	DeliveryResult	01	The delivery result shall be included in the HTTP responses that indicate the delivery status of the device triggering.	
			clause 5.7.4 are applicable as described in lated property applies for all the features.	
	roperties "externalId" or			

Table 5.7.2.1.2-1:	Definition of type	DeviceTriggering
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5.7.2.1.3 Type: DeviceTriggeringDeliveryReportNotification

This type represents device triggering delivery report notification.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
transaction	Link		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.				

 Table 5.7.2.1.4-1: Definition of type DeviceTriggeringDeliveryReportNotification

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 5.7.2.2.1: 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

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.	
UNCONFIRM ED	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.	
	erties marked with a feature as defined in subclause 5.7.4 are applicable as des ause 5.2.7. If no features are indicated, the related property applies for all the fe	

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: Enumera	tion Priority
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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:

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
Device Triggering Transactions	3gpp-device-triggering/v1/{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	3gpp-device- triggering/v1/{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
		DELET E	SCS/AS	Delete an existing device triggering transaction resource and cancel the device triggering
Device Triggering Delivery Report Notification	{notification_uri}	POST	SCEF	Report a device triggering delivery report to SCS/AS.

Table 5.7.3.1-1: Resources and methods overview

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	array(DeviceTriggering)	0N	200 OK	The device triggering transactions information 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.						

5.7.3.2.3.2 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

Request Data type Cardinality		Remarks			
body	DeviceTriggering	1	Parameters to request a device triggering delivery.		
	Data type	Cardinality	Response codes	Remarks	
Response body	DeviceTriggering	1	201 Created	The long term transaction for the device triggering was created successfully.	
				The SCEF shall return a data structure of type "DeviceTriggering" 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 5.7.3.2.3.4-2: Headers supported by the 201 Response Code on this resource

Name	Data type	Ρ	Cardinality	Description
Location	string	Μ		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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	DeviceTriggering	1		The device triggering transaction 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.						

5.7.3.3.3.2 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.

Request	Data type	Cardinality		Remarks
body DeviceTriggering 1 Parameters to replace a		to replace a device triggering with the SCEF.		
	Data type	Cardinality	Response codes	Remarks
Response body	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.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

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	Data type	Cardinality		Remarks		
body	none					
	Data type	Cardinality	Response codes	Remarks		
Response body	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.		
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.						

5.7.3.4 Device Triggering Delivery Report Notification

5.7.3.4.1 Introduction

This resource allows the SCEF to send notifications about device triggering delivery report events to the SCS/AS.

5.7.3.4.2 Resource definition

Resource URI: {notification_uri}

This resource shall support the resource URI variables defined in table 5.7.3.4.2-1.

Table 5.7.3.4.2-1: Resource URI variables for resource "Device Triggering Delivery Report Notification"

Name	Data type	Definition
notification_uri	Link	A URI indicating the notification destination URI where T8 notification requests shall be delivered. This URI can be provided within the "notificationDestination" attribute in the DeviceTriggering type.

5.7.3.4.3 Resource methods

5.7.3.4.3.1 Notification via HTTP 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.7.3.4.3.1-1.

Table 5.7.3.4.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks		
body	DeviceTriggeringDelivery ReportNotification	1	The Device	Triggering delivery report.		
	Data type	Cardinality	Response codes	Remarks		
Response body	Acknowledgement	1	200 OK	The successful acknowledgement of the notification.		
locay	(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.						

5.7.3.4.3.2 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.

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.					

Table 5.7.4-1: Features used by DeviceTriggering API

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	Link to the resource "Individual TMGI Allocation". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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	01	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.	
tmgiExpiration	DateTimeRo	01	Identifies the absolute time at which the TMGI is considered to expire.	
			subclause 5.8.4 are applicable as described in e related property applies for all the features.	

Table 5.8.2.1.1.2-1:	Definition	of type	TMGIAllocation
	Donnition	0	

5.8.2.1.1.3 Type: GMDViaMBMSByMb2

This type represents the group message delivery via MBMS by MB2.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	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	
requestTestNotificatio n	boolean	01	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_t est_event
websockNotifConfig	WebsockNotifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_w ebsocket
externalGroupId	ExternalGroupId	01	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.	
messageDeliveryStart Time	DateTime	01	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
groupMessagePayloa d	Bytes	01	Indicates the payload the SCS/AS intends to deliver to the UEs.	
scefMessageDeliveryl Pv4	Ipv4AddrRo	01	Indicates the Ipv4 address where the SCEF wants to receive the data.	
scefMessageDeliveryl Pv6	lpv6AddrRo	01	Indicates the Ipv6 address where the SCEF wants to receive the data.	
scefMessageDelivery Port	PortRo	01	Indicates the port number where the SCEF wants to receive the data.	
			lause 5.8.4 are applicable as described in ated property applies for all the features.	

Table 5.8.2.1.1.3-1: Definition of type GMDViaMBMSByMb2

5.8.2.1.1.4 Type: GMDByMb2Notification

This type represents the group message delivery notification.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
transaction	Link	1	Link to the transaction resource to which this notification is related.	
deliveryTriggerStatus	boolean		Indicates whether delivery of group message payload corresponding to the TMGI was successful (TRUE) or not (FALSE).	
			e 5.8.4 are applicable as described in 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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)	
externalGroupId	ExternalGroupId	01	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].		
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.		
-					

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	01	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2].	
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.	
messageDeliveryStart Time	DateTime	01	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
groupMessagePayloa d	Bytes	01	Indicates the payload the SCS/AS intends to deliver to the UEs.	
			subclause 5.8.4 are applicable as described in 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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
cellId	array(string)	0N	Indicates a Cell Global Identification of the user which identifies the cell the UE is registered.	
enodeBld	array(string)	0N	Indicates an eNodeB in which the UE is currently located.	
geographicArea	array(Geographic Area)	0N	Identifies a geographic area of the user where the UE is located.	
mbmsServiceAreal d	array(string)	0N	Identifies an MBMS Service Area Identity of the user where the UE is located.	
civicAddress	array(CivicAddre ss)	0N	Identifies a civic address of the user where the UE is located.	
			d in subclause 5.8.2.3 are applicable as described d, the related property applies for all the features.	in

Table 5.8.2.1.1.7-1: Definition of the MbmsLocArea data type

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:

Resource	Resource URI	HTTP	HTTP	Meaning
name	Resource on	method	initiator	Wearing
TMGI Allocation	3gpp-group-message-delivery-	GET	SCS/AS	Read all active TMGI resources
	mb2/v1/{scsAsId}			for a given SCS/AS
	/tmgi-allocation	POST	SCS/AS	Create a new TMGI resource for a given SCS/AS
Individual TMGI Allocation	3gpp-group-message-delivery- mb2/v1/{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	3gpp-group-message-delivery- mb2/v1/{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	3gpp-group-message-delivery- mb2/v1/{scsAsId}	PUT	SCS/AS	Replace a group message delivery resource
MB2	/tmgi-allocation/{tmgi}/delivery-via-mbms/ {transactionId}	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.
GMD via MBMS by MB2 Notification	{notificationDestination}	POST	SCEF	Report a specific group message delivery result to the SCS/AS for a given transaction Id selected by the SCEF.

Table 5.8.2.2.1-1:	Resources and	methods	overview
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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 5.8.2.2.2-1.

Table 5.8.2.2.2-1: 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 5.8.2.2.3.1-1: Data structures supported by the GET request/response by the resource

Request	Data type	Cardinality		Remarks
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	array(TMGIAllocation)	0N	200 OK	The TMGI allocation for the SCS/AS in the request URI are returned.
NOTE: T				

5.8.2.2.3.2 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.

5.8.2.2.3.4 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.

Request	Data type	Cardinality		Remarks		
body	TMGIAllocation	1	Parameters	to create a TMGI allocation resource		
	Data type	Cardinality	Response codes	Remarks		
Response body	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: T	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	Ρ	Cardinality	Description
Location	string	Μ		Contains the URI of the newly created resource, according to the structure: {apiRoot}/3gpp-group-message-delivery-mb2/v1/{scsAsId}/tmgi-allocation/{tmgi}

5.8.2.2.3.5 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.

Request Data type Cardinality Remark		Remarks		
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	TMGIAllocation	1	200 OK	A TMGI allocation for the SCS/AS in the request URI is returned.
NOTE: T	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	Data type	Cardinality		Remarks
body	TMGIAllocation	1	Parameters	to replace a TMGI resource
Response	Data type	Cardinality	Response codes	Remarks
body	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 Data type Cardinality		Remarks			
body	TMGIAllocationPatch	1	Parameters	to modify a TMGI resource	
Response	Data type	Cardinality	Response codes	Remarks	
body	TMGIAllocation	1	200 OK	The modification of a TMGI allocation was created successfully.	
NOTE: T	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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	none		204 No Content	The TMGI allocation resource was removed successfully.		
NOTE: T	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	Data type	Cardinality		Remarks			
body	none						
Response	Data type	Cardinality	Response codes	Remarks			
body	array(GMDViaMBMSBy Mb2)	0N	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.

Request	Data type	Cardinality		Remarks		
body	GMDViaMBMSByMb2	1		Parameters to create and authorize a group message delivery via MBMS with the SCEF.		
	Data type	Cardinality	Response codes	Remarks		
	GMDViaMBMSByMb2	1	201 Created	The creation of a group message delivery was created successfully.		
Response body				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	Ρ	Cardinality	Description
Location	string	Μ		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.

Request	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	GMDViaMBMSbyMb2	01	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.

Request	Data type	Cardinality		Remarks		
		to replace group message delivery resource with the				
	Data type	Cardinality	Response codes	Remarks		
Response body	GMDViaMBMSByMb2	1	200 OK	The group message delivery was modified successfully.		
<i>Locy</i>				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.						

Table 5.8.2.2.5.3.2-1: Data structures supported by the PUT request/response by the resource

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	Data type	Cardinality		Remarks		
body	GMDViaMBMSByMb2Pa tch	1	Parameters SCEF.	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.		
<i>Locy</i>				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	Data type	Cardinality		Remarks		
body	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 Resource: GMD via MBMS by MB2 Notification

5.8.2.2.6.1 Introduction

This resource allows the SCEF report the delivery trigger status to the SCS/AS to indicate whether group message delivery was triggered successful.

5.8.2.2.6.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.8.2.2.6.2-1.

Name	Data type	Definition
notificationDestination		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.

5.8.2.2.6.3 Resource methods

5.8.2.2.6.3.1 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.8.2.2.6.3.1-1.

Table 5.8.2.2.6.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks				
body	GMDByMb2Notification	1	The delivery status notification.					
	Data type	Cardinality	Response codes	Remarks				
Response body	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.								

5.8.2.2.6.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the Group Message Delivery via MBMS Notification 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.

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.					

Table 5.8.2.3-1: Features used by GMDviaMBMSbyMB2 API

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 dentifies the geographical information of the user(s). dentifies the civic address information of the user(s)		
GeographicArea 3GPP TS 29.572 [42]		dentifies the geographical information of the user(s).		
CivicAddress	3GPP TS 29.572 [42]	Identifies the civic address information of the user(s).		
SupportedFeatures		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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	Link to the resource "Individual xMB Service". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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	01	Identifies a user group as defined in subclause 4.6.2 of 3GPP TS 23.682 [2] supplied by the SCS/AS.	
userServiceId	string	01	Identifies the MBMS User Service supplied by the SCEF.	
serviceClass	string	01	The service class that service belongs to supplied by the SCEF.	
serviceLanguages	array(string)	0N	List of language of the service content supplied by the SCEF.	
serviceNames	array(string)	0N	List of Service Names supplied by the SCEF	
receiveOnlyMode	boolean	01	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	01	Enumeration of Service Announcement Mode supplied by the SCEF.	
			ubclause 5.8.4 are applicable as described in 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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	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	
requestTestNotificatio n	boolean	01	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_t est_event
websockNotifConfig			Notification_w ebsocket	
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.	
messageDeliveryStart Time	DateTime	01	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.	
messageDeliveryStop Time	DateTime	01	Identifies the absolute time at which the SCS/As is expected to stop distributing the data. If absent, configuration time will be used.	
groupMessagePayloa d	Bytes	01	Indicates the payload the SCS/AS intends to deliver to the UEs.	
scefMessageDeliveryl Pv4	lpv4AddrRo	01	Indicates the Ipv4 address where the SCEF wants to receive the data.	
scefMessageDeliveryl Pv6	lpv6AddrRo	01	Indicates the Ipv6 address where the SCEF wants to receive the data.	
scefMessageDelivery	PortRo	01	Indicates the port number where the SCEF wants to receive the	

Table 5.8.3.1.1.3-1: Definition of type GMDViaMBMSByxMB

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	2.7. If no feature are indica	ted, 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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)	
mbmsLocArea	MbmsLocArea	01	Restricts the distribution of the group message.		
messageDeliveryStart Time	DateTime	01	Identifies the absolute time at which the SCS/As starts to distribute the data. If absent, it indicates the message shall be sent immediately.		
messageDeliveryStop Time	DateTime	01	Identifies the absolute time at which the SCS/As is expected to stop distributing the data. If absent, the configuration value will be used.		
groupMessagePayloa d	Bytes	01	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.					

Table 5.8.3.1.1.5-1: Definition of the GMDViaMBMSByxMBPatch data type

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
cellId	array(string)	0N	Indicates a Cell Global Identification of the user which identifies the cell the UE is registered.	
enodeBld	array(string)	0N	Indicates an eNodeB in which the UE is currently located.	
geographicArea	array(Geographic Area)	0N	Identifies a geographic area of the user where the UE is located.	
mbmsServiceAreal d	array(string)	0N	Identifies an MBMS Service Area Identity of the user where the UE is located.	
civicAddress	array(CivicAddre ss)	0N	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.				

Table 5.8.3.1.1.6-1: Definition of the MbmsLocArea data type

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.		
	erties marked with a feature as defined in subclause 5.7.4 are applicable as des ause 5.2.7. If no features are indicated, the related property applies for all the fe		

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:

Resource name	Resource URI	HTTP method	HTTP initiator	Meaning
xMB Services	3gpp-group-message-delivery- xmb/v1/{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	3gpp-group-message-delivery- xmb/v1/{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	3gpp-group-message-delivery- xmb/v1/{scsAsId} /services/{serviceId}/delivery-via-	GET	SCS/AS	Read all group message delivery resources for a given SCS/AS and Service Id.
	mbms	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	3gpp-group-message-delivery- xmb/v1/{scsAsId}	PUT	SCS/AS	Replace a group message delivery resource
хMB	/services/{serviceId}/delivery-via- mbms/{transactionId}	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.
GMD via MBMS by xMB Notification	{notificationDestination}	POST	SCEF	Report a specific group message delivery result to the SCS/AS for a given Transaction Id selected by the SCEF.

Table 5.8.3.2.1-1: I	Resources and	methods	overview
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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	Data type	Cardinality		Remarks		
body	none.					
Deemenee	Data type	Cardinality	Response codes	Remarks		
Response body	array(ServiceCreation)	0N	200 OK	The service resource for the SCS/AS in the request URI is returned.		
NOTE: T	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

Demuset	Data type	Cardinality		Remarks	
Request body	ServiceCreation	1	Parameters to create and authorize a service with the SCEF.		
	Data type	Cardinality	Response codes	Remarks	
Response body	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: T	he mandatory HTTP error	status codes	for the POS	T 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	Ρ	Cardinality	Description
Location	string	Μ		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.			
serviceld	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	Data type	Cardinality	Remarks			
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	ServiceCreation	01	200 OK	The service resource for the SCS/AS and Service Id in the request URI is returned.		
NOTE: T						

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	Request Data type			Remarks	
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	none		204 No Content	The group message delivery subscription was cancelled successfully.	
NOTE: T	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	Data type	Cardinality		Remarks		
body	None					
Response	Data type	Cardinality	Response codes	Remarks		
body	array(GMDViaMBMSByx MB)	0N		The list of "GMDViaMBMSByxMB" data for the SCS/AS and the service identifier are returned.		
NOTE: T						

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	Data type	Cardinality		Remarks	
		to create and authorize a group message delivery via the SCEF.			
	Data type	Cardinality	Response codes	Remarks	
	GMDViaMBMSByxMB	1	201 Created	The creation of a group message delivery was created successfully.	
Response body				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: T	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	Ρ	Cardinality	Description
Location	string	М		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.	
serviceldld	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.

Request Data type Cardinality		Remarks		
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	GMDViaMBMSByxMB	01		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.

Request	Data type	Cardinality		Remarks		
body	GMDViaMBMSByxMB	1	Parameters SCEF.	to replace group message delivery resource with the		
	Data type	Cardinality	Response codes	Remarks		
Response body	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	Data type	Cardinality		Remarks		
body	GMDViaMBMSByxMB Patch	, , , , , , , , , , , , , , , , , , , ,		to partially update a group message delivery with the		
	Data type	Cardinality	Response codes	Remarks		
Response body	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.

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

Table 5.8.3.2.5.3.5-1.: Data structures supported by the DELETE request/response by the resource

5.8.3.2.6 Resource: GMD via MBMS by xMB Notification

5.8.3.2.6.1 Introduction

This resource allows the SCEF report the delivery trigger status to the SCS/AS to indicate whether group message delivery was triggered successful.

5.8.3.2.6.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.8.3.2.6.2-1.

Table 5.8.3.2.6.2-1: Resource URI variables for resource "Group Message Delivery via MBMS Notification"

Name	Data type	Definition
notificationDestination		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.

5.8.3.2.6.3 Resource methods

5.8.3.2.6.3.1 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.

The possible response messages from the SCS/AS, depending on whether the POST request is successful or unsuccessful, are shown in Table 5.8.3.2.6.3.1-1.

Table 5.8.3.2.6.3.1-1: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks
body GMDByxMBNotification 1 The delivery status notification.		y status notification.		
	Data type	Cardinality	Response codes	Remarks
Response body	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.				

5.8.3.2.6.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the Group Message Delivery via MBMS Notification 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 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.				

5.9 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.

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)	
self	Link	01	Link to the resource "Individual Network Status Reporting subscription". This parameter shall be supplied by the SCEF in HTTP responses.		
supportedFeatures	SupportedFeatures	01	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		
requestTestNotificatio n	boolean	01	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_t est_event	
websockNotifConfig	WebsockNotifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_w ebsocket	
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	DateTme	01	Identifies the time for which a continuous reporting is requested. Shall not be provided for one time reporting case.		
thresholdValues	array(CongestionValue)	0N	Identifies a list of congestion level(s) with exact value that the SCS/AS requests to be informed of when reached.		
thresholdTypes	array(CongestionType)	0N	(NOTE 2) Identifies a list of congestion level(s) with abstracted value that the SCS/AS requests to be informed of when reached.		
NOTE 1. Droportion or			(NOTE 2)		
subclause 5.	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: thresholdValue and thresholdType 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	01	Network Status Indicator based on exact value for congestion status received from RCAF(s). (NOTE 2)			
nsiType	CongestionType	01	Network Status Indicator based on abstracted value for congestion status. (NOTE 2)			
NOTE 1: Properties ma	arked with a feature a	as defined in s	ubclause 5.9.4 are applicable as described in			
subclause 5.	2.7. If no features are	indicated, the	e related property applies for all the features.			
NOTE 2: nsiValue and	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.

Enumer	ration value	Description Applicabili (NOTE)			
HIGH		The congestion status is high.			
MEDIUM		The congestion status is medium.			
LOW		The congestion status is low.			
		ked with a feature as defined in subclause 5.9.4 are applicable as described in 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:

Resource name	Resource URI	HTTP method	Meaning
Network Status Reporting Subscription	3gpp-net-stat-report/v1/{scsAsId}/subscriptions	GET	Read all network status reporting subscription resources for a given SCS/AS.
S		POST	Create a new network status reporting subscription resource.
Individual Network Status	3gpp-net-stat- report/v1/{scsAsId}/subscriptions/{subscriptionId}	GET	Read a network status reporting subscription resource.
Reporting subscription		PUT	Modify an existing continuous network status reporting subscription resource.
		DELETE	Delete an existing continuous network status reporting subscription resource.
Network Status Reporting Notification	{notificationDestination}	POST	Report a detected network status for a subscription from the SCEF to the SCS/AS

Table 5.9.3.1-1: Resources and methods overview

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	Data type	Cardinality		Remarks	
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
	array(NetworkStatusRep ortingSubscription)	0N	200 OK	The information about the network status reporting subscriptions related to the request URI is returned.	
NOTE: T					

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	Data type	Cardinality		Remarks	
body	NetworkStatusReporting Subscription	1		Parameters to register a subscription to request notifications about network status information report with the SCEF.	
	Data type	Cardinality	Response codes	Remarks	
	NetworkStatusReporting	1	201	The subscription was created successfully.	
Response body	•		Created	The URI of the created resource shall be returned in the "Location" HTTP header.	
	ProblemDetails	01	403 Forbidden	The subscription resource is not allowed to be created due to exceeded quota limit. (NOTE 2)	
NOTE 2: T	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	Ρ	Cardinality	Description
Location	string	Μ		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 Data type Cardinality Re		Remarks			
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	NetworkStatusReporting Subscription	1	200 OK	The subscription information related to the request URI is returned.	
NOTE: T					

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

Data type Cardinality Remarks		Remarks			
body	NetworkStatusReporting Subscription		Parameters to register a subscription to request notifications network status information report with the SCEF.		
Response	Data type	Cardinality	Response codes	Remarks	
body	NetworkStatusReporting Subscription	1	200 OK	The subscription was updated successfully.	
NOTE: T	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.

5.9.3.3.5 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	Data type	Cardinality		Remarks	
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	none		204 No Content	The subscription was terminated successfully.	
NOTE: T	NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

5.9.3.4 Network Status Reporting Notification

5.9.3.4.1 Introduction

This resource allows the SCEF to send notifications about the detected network status to the SCS/AS.

5.9.3.4.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.9.3.4.2-1.

Table 5.9.3.4.2-1: Resource URI variables for resource "Network Status Reporting Notification"

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the SCS/AS during creation of the network
		status reporting subscription.

5.9.3.4.3 Resource methods

5.9.3.4.3.1 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 URI query parameters, request and response data structures, and response codes, as specified in the table 5.9.3.4.3.1-1 and table 5.9.3.4.3.1-2.

Table 5.9.3.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.9.3.4.3.1-2: Data structures supported by the POST request/response by the resource

Request Data type Cardinality Remark		Remarks		
body	NetworkStatusReporting Notification	1	The network status reporting notification provided by the SCEF	
Response	Data type	Cardinality	Response codes Remarks	
body	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.				

5.9.3.4.3.2 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 featute is also supported.
2	Notification_test_event	The testing of notifications connections is supported according to subclause 5.2.5.3.
	A short name that can be n: A clear textual descrip	e used to refer to the bit and to the feature, e.g. "Notification". otion 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.

Data type	Reference	Comments
NetworkAreaInfo	3GPP TS 29.554 [50]	Identifies a network area information.
SupportedFeatures		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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 2)
self	Link	01	Link to the resource "Individual CP Provisioning Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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	01	Identifies the MTC Service Provider and/or MTC Application. (NOTE 3)	
externalld	ExternalId	01	Each element uniquely identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
msisdn	Msisdn	01	Each element identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	
externalGroupId	ExternalGroupId	01	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
cpParameterSets	map(CpParameterSet)	1N	Identifies a set of CP parameter information that may be part of this CpInfo structure.	
cpReports	map(CpReport)	0N	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 2: Properties subclause 3 NOTE 3: The SCEF - override - send it	marked with a feature as de 5.2.7. If no feature are indic	efined in subclau ated, the related provider identi ue and send it to		n

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.

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	01		
validityTime	DateTime	01	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.	
periodicCommunicationIn dicator	Communication Indicator	01	Identifies whether UE communicates periodically or on demand.	
communicationDurationTi me	DurationSec	01	Identifies duration time of periodic communication	
periodicTime	DurationSec	01	Identifies interval time of periodic communication	
scheduledCommunication Time	ScheduledCom municationTime	01	Identifies time zone and day of the week when the UE is available for communication.	
scheduledCommunication Type	ScheduledCom municationType	01	Indicates the Scheduled Communication Type. May only be present if the "scheduledCommunicationTime" attribute is provided.	ScheduledCo mmType_5G
stationaryIndication	StationaryIndic ation	01	Identifies whether the UE is stationary or mobile.	
batteryInds	array(BatteryIn dication)	0N	Indicates the power consumption type(s) of the UE. (NOTE 3)	
trafficProfile expectedUmts	TrafficProfile array(UmtLocati onArea5G)	01 0N	Identifies the type of data transmission. Identifies the UE's expected geographical movement. The attribute is only applicable in 5G. (NOTE 2)	ExpectedUM T_5G ExpectedUmt Time_5G
expectedUmtDays	array(DayOfWe ek)	06	Identifies the day(s) of the week. If absent, it indicates every day of the week.	ExpectedUmt Time_5G
subclause 5.2.7. NOTE 2: The first instance the location. NOTE 3: If "BATTERY_RE simultaneously, v provided simultan battery shall not	If no features are of the attribute re ECHARGE" is prov vice versa; If "BAT neously, vice vers be provided simuli	indicated, the presents the s vided, "BATTE TERY_REPL/ a; If "NO_BAT taneously, vice	bclause 5.10.4 are applicable as described i related property applies for all the features. start of the location, and the last one represer RY_NO_RECHARGE" shall not be provided ACE" is provided, "BATTERY_NO_REPLACE TERY" is provided, any value indicating UE p	nts the stop of " shall not be

Table 5.10.2.2.2-1: Definition of	f type CpParameterSet
	i type opi arameteroot

Type: ScheduledCommunicationTime

This data type represents an offered scheduled communication time.

5.10.2.2.3

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
daysOfWeek	array(DayOfWeek)	06	Identifies the day(s) of the week. If absent, it indicates every day of the week.	
timeOfDayStart	TimeOfDay	01	Identifies the start time of the day.	
timeOfDayEnd	TimeOfDay	01	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.				

Table 5.10.2.2.3-1: Definition of type ScheduledCommunicationTime

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
setIds	array(string)		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.			١	

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 da	ta Type
------------------------------------------------------------	---------

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
umtTime	TimeOfDay	01	This IE identifies the time of the day when the UE arrives the location.	ExpectedUmt Time_5G
umtDuration	DurationSec	01	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

Enumeration value	Description	Applicability (NOTE)				
PERIODICALLY	Identifies the UE communicates periodically					
ON_DEMAND	DEMAND Identifies the UE communicates on demand					

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					
	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.

Enumeration value	Description	Applicability (NOTE)		
BATTERY_RECHARGE	UE powered with rechargeable battery.			
BATTERY_REPLACE	UE powered with replaceable battery.			
BATTERY_NO_RECHARGE	Y_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.				

Table 5.10.2.3.6-1: Enumeration BatteryIndication

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 Applicabili (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.				
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:

Resource name	Resource URI	HTTP method	Meaning
CP provisioning Subscriptions	3gpp-cp-parameter- provisioning/v1/{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	3gpp-cp-parameter- provisioning/v1/{scsAsId}/subscriptions/{su bscriptionId}	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	3gpp-cp-parameter- provisioning/v1/{scsAsId}/subscriptions/{su bscriptionId}/cpSets/{setId}	PUT	Update CP at individual CP set(s) level associated a CP parameter set Id.
	(NOTE)	GET	Read CP at individual CP set(s) level associated a CP parameter set Id.
		DELETE	Delete CP at individual CP set(s) level associated a CP parameter set Id.
NOTE: This setId SCS/AS.	as a resource identifier is not necessarily iden	tical as the CP para	ameter set Id received from the

Table 5.10.3.1-1: Resources and methods overview

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	array(CpInfo)	0N	200 OK	The subscription information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality	Remarks			
body	CpInfo	1	Change information in CP parameter set.			
	Data type	Cardinality	Response codes	Remarks		
	CpInfo	1	201	The subscription was created successfully.		
Response body				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)	1N	500 Internal Server Error	The CP parameters for all CP sets were not created successfully. CpReport is included with detailed information.		
NOTE: T	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	Ρ	Cardinality	Description
Location	string	Μ		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 5.10.3.3.1-2: Data structures supported by the GET request/response by the resource

Request	Data type	Cardinality	Remarks			
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	CpInfo	1	200 OK	The subscription information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality	Remarks			
body	CpInfo	1	Change info	Change information in CP parameter set(s).		
	Data type	Cardinality	Response codes Remarks			
	CpInfo	1	200 OK	The subscription was modified successfully.		
Response body				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)	1N	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 PUT method listed in table 5.2.6-1 also apply.						

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	none		204 No The subscription was deleted successfully. To Content payload body shall be empty.			
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.						

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-parameterprovisioning/v1/{scsAsId}/subscriptions/{subscriptionId}/cpSets/{setId}

This resource shall support the resource URI variables defined in table 5.10.3.3.2-1.

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

Table 5.10.3.3.2-1: Resource URI variables for resource "Individual CP Set Provisioning"

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	CpParameterSet	1	200 OK	The subscription information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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.

Request	Data type	Cardinality		Remarks		
body	CpParameterSet	1	Change info	Change information in CP parameter set.		
	Data type	Cardinality	Response codes	Remarks		
	CpParameterSet	1	200 OK	The CP parameter set resource was modified successfully.		
Deenenee				The SCEF shall return an updated CP parameter set resource in the response payload body.		
Response 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.		
NOTE: T	he mandatory HTTP error	status codes	for the PUT	method listed in table 5.2.6-1 also apply.		

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.

T F (0 0 (0 F (D ()			
Table 5.10.3.4.3.5-1.: Data stru	ictures supported by t	he DELETE reque	st/response by the resource

Request	Data type	Cardinality	Remarks		
body	none				
Response	Data type	Cardinality	Response codes Remarks		
body none 204 No Content Payload body shall be empty.		The subscription was deleted successfully. The payload body shall be empty.			
NOTE: T	NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

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.

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.				

Table 5.10.4-1: Features used by CpProvisioning API

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.

Data type	Reference	Comments
SupportedFeatures		Used to negotiate the applicability of the optional features defined in table 5.11.4-1.
Dnai	3GPP TS 29.571 [45]	DNAI

Table 5.11.2.1.1-1: PfdManagement API re-used Data Types

5.11.2.1.2 Type: PfdManagement

This type represents a PFD management resource for a PFD management request.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	Link to the resource "Individual PFD Management Transaction". This parameter shall be supplied by the SCEF in	
supportedFeatures	Image: wide of the sector of the se			
pfdDatas	map(PfdDat a)	1N	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(PfdRe port)	0N	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.	
notificationDestinat ion	Link	01	A URI indicating the notification destination for T8 notifications.	PfdMgmtNotif ication
requestTestNotific ation	boolean	01	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_t est_event
websockNotifConfi g	WebsockNo tifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_ websocket
			efined in subclause 5.11.4 are applicable as described i cated, the related property applies for all the features.	n

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
externalAppId	string	1	Each element uniquely external application identifier (NOTE 2)	
self	Link	01	Link to the resource "Individual Application PFD Management". This parameter shall be supplied by the SCEF in HTTP responses.	
pfds	map(Pfd)	1N	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	01	Indicates that the list of PFDs in this request should be deployed within the time interval indicated by the Allowed Delay	
cachingTime	DurationSecRo	01	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.	
subclause NOTE 2: An externa NOTE x: When mult	5.2.7. If no features are alAppId can only belong	indicated, the relation to one "individual features on the second	use 5.11.4 are applicable as described i ted property applies for all the features. PFD Management Transaction" resource identifier, the application is detected whe ched.	

Table 5.11.2.1.3-1: Definition of type PfdData

5.11.2.1.4 Type: Pfd

This data type represents a PFD for an external Application Identifier.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
pfdld	string	1	Identifies a PFD of an application identifier.	
flowDescriptions	array(string)	0N	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)	0N	Indicates a URL or a regular expression which is used to match the significant parts of the URL. (NOTE 2)	
domainNames	array(string)	0N	Indicates an FQDN or a regular expression as a domain name matching criteria.	
dnProtocol	DomainNameProtocol	01	(NOTE 2) 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
 IOTE 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. IOTE 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. 				a PFD

Table 5.11.2.1.4-1: Definition of type Pfd

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
externalAppIds	array(string)	1N	Identifies the external application identifier(s) which PFD(s) are not added or modified successfully	
failureCode	FailureCode	1	Identifies the failure reason	
cachingTime	DurationSec	01	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	01	Identifies a location area of the user plane(s) which are unable to enforce the PFD(s).	

Table 5.11.2.1.5-1: Definition of type PfdReport

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
locationArea	LocationArea	01	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	01	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.	FailureLocati on_5G
dnais	array(DNAI)	0N	Identifies a list of DNAI supported by the user plane functions which are unable to enforce the provisioned PFD(s) successfully.	FailureLocati on_5G

 Table 5.11.2.1.6-1: Definition of the UserPlaneLocationArea data Type

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.

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.				

Table 5.11.2.2.3-1: Enumeration FailureCode

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.	
	ed with a feature as defined in subclause 5.10.4 are applica If no features are indicated, the related property applies for	

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:

Resource name	Resource URI	HTTP method	Meaning
PFD Management	3gpp-pfd-management/v1/{scsAsId}/transactions/	GET	Read all PFDs for a given SCS/AS
Transactions		POST	Create PFDs for a given SCS/AS and one or more external Application Identifier(s)
Individual PFD Management Transaction	3gpp-pfd- management/v1/{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	3gpp-pfd- management/v1/{scsAsId}/transactions/{transactionId}/appli	PUT	Update PFDs at individual application level
PFD Management	cations/{appId} (NOTE)	PATCH	Update PFDs at individual application level
		GET	Read PFDs at individual application level
		DELETE	Delete PFDs at individual application level
PFD Management Notification	{notificationDestination}	POST	Send asynchronous PFD management result.
	appId as the resource identifier is not necessarily identical as the SCS/AS.	the external	application identifier received

Table 5.11.3.1-1: Resources and methods overview

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	Data type	Cardinality	Remarks		
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	array(PfdManagement)	0N		All transactions including the PFDs for the SCS/AS in the request URI are returned.	
NOTE: T					

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.

Request	Data type	Cardinality		Remarks
body	PfdManagement	1		
	Data type	Cardinality	Response codes	Remarks
Response body	PfdManagement	1	201 Created	The PFDs resource was created successfully. PfdReport may be included to provide detailed failure information for some applications.
	array(PfdReport)	1N	500 Internal Server Error	The PFDs for all applications were not created successfully. PfdReport is included with detailed information.
NOTE: T	he mandatory HTTP error status co	des for the PC	OST method liste	ed 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	Ρ	Cardinality	Description
Location	string	Μ		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.

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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	Data type	Cardinality	Remarks		
body	none				
Response	Data type	Cardinality	Response codes	Remarks	
body	none			All PFDs were removed successfully. The SCEF shall not return a response payload.	
NOTE: T	NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

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.

Request	Data type	Cardinality Remarks		Remarks		
body	none					
	Data type	Cardinality	Response codes	Remarks		
Response body	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.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality		Remarks		
body	PfdManagement	1	update of P	pdate of PFD(s) for an existing transaction Id.		
	Data type	Cardinality	Response codes	Remarks		
Response body	PfdManagement	1	200 OK	The PFDs were updated successfully. PfdReport may be included to provide detailed failure information for some applications.		
Jou,	array(PfdReport)	1N	500 Internal Server Error	The PFDs for all applications were not updated successfully. PfdReport is included with detailed information.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	None		204 No Content	The PFDs for an existing transaction Id were removed successfully.		
NOTE: T						

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	Data type	Cardinality		Remarks		
body	None					
Response	Data type	Cardinality	Response codes	Remarks		
	PfdData	1	200 OK	The PFDs at individual application level 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.						

5.11.3.4.3.2 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	Data type	Cardinality		Remarks
body	PfdData	1	Update of F	PFD(s) for an existing external application identifier.
	Data type	Cardinality	Response codes	Remarks
	PfdData	1 200 OK	The PFDs for an existing external application identifier were updated successfully.	
Response	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.
body		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.
NOTE: T	he mandatory HTTP error	status codes	for the PUT	method listed in table 5.2.6-1 also apply.

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 5.11.3.3.3.3-1.

Request	Data type	Cardinality	1	Remarks
body	PfdData	1	Update of F	PFD(s) for an existing external application identifier.
	Data type	Cardinality	Response codes	Remarks
	PfdData	1	200 OK	The PFDs for an existing external application identifier were updated successfully.
Response	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.
body	body PfdReport 1	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.
NOTE: T	he mandatory HTTP error	status codes	for the PAT	CH method listed in table 5.2.6-1 also apply.

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	Data type	Cardinality		Remarks		
body	none					
Response	Data type	Cardinality	Response codes	Remarks		
body	none		204 No Content	The PFDs were removed successfully.		
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.						

5.11.3.5 PFD Management Notification

5.11.3.5.1 Introduction

This resource allows the SCEF to send notification about PFD management result to the SCS/AS, if the PFD provisioning fails within the allowed delay.

5.11.3.5.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.11.3.5.2-1.

Table 5.11.3.5.2-1: Resource URI variables for resource "PFD Management Notification"

Name	Data type	Definition
notificationDestination		Callback reference provided by the SCS/AS during creation of the PFD management transaction.

5.11.3.5.3 Resource methods

5.11.3.5.3.1 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 URI query parameters, request and response data structures, and response codes, as specified in the table 5.11.3.5.3.1-1 and table 5.11.3.5.3.1-2.

Table 5.11.3.5.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.11.3.5.3.1-2: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks		
body	PfdReport	1N	The PFD m	anagement notification provided by the SCEF.		
Response	Data type	Cardinality	Response y codes Remarks			
body	none		204 No Content	The PFD management notification is received successfully.		
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.						

5.11.3.5.3.2 Notification via Websocket

If supported by both SCS/AS and SCEF and successfully negotiated, the PfdManagementNotification 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.

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.			
	A short name that can be n: A clear textual descrip	used to refer to the bit and to the feature, e.g. "Notification". tion of the feature.	

Table 5.11.4-1: Features used by PfdManagement API

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.

Data type	Reference	Comments
EcRestrictionDataWb	3GPP TS 29.503 [63]	
SupportedFeatures		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.

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.		
externalId	Externalld	01	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2].		
msisdn	Msisdn	01	(NOTE 2) Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 2)		
ecrDataWbs	array(PlmnEcRestrict ionDataWb)	0N	Identifies whether enhanced coverage mode are restricted or not. This attribute shall not be present for the query custom operation.	ECR_WB_5 G	
restrictedPlmnlds	array(Plmnld)	0N	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(Plmnld)	0N	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)		
subclause 5.2.7. If r NOTE 2: One of th		the related pr	subclause 5.4.4 are applicable as described in operty applies for all the features. shall be included.		

Table 5.12.2.1.2-1: Definition of type ECRControl

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
supportedFeatures	SupportedFeatur es	1	Used to negotiate the supported optional features of the API as described in subclause 5.2.7.	
visitedPlmnId	Plmnld	01	Indicates the current visited PLMN.	
ecrDataWbs	array(PlmnEcRes trictionDataWb)	0N	Identifies whether enhanced coverage mode are restricted or not.	ECR_WB_5G
restrictedPlmnIds	array(Plmnld)	0N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be restricted. (NOTE 2)	
allowedPlmnIds	array(Plmnld)	0N	Indicates a complete list (and possibly empty) of serving PLMNs where Enhanced Coverage shall be allowed. (NOTE 2)	
	2.7. If no feature are	indicated, the re	bclause 5.4.4 are applicable as described in elated property applies for all the features. e mutually exclusive.	

Table 5.12.2.1.3-1: Definition of type ECRData

5.12.2.1.4 Type: PlmnEcRestrictionDataWb

Table 5.12.2.1.4-1: Definition of type PImnEcRestrictionDataWb

Attribute name	Data type	Cardinality	Description	Applicability
plmnld	Plmnld	1	Indicates the PLMN where enhanced	
			coverage mode shall be restricted or not.	
plmnEcrDataWb	EcRestrictionData	01	Identifies whether enhanced coverage	
	Wb		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.

Operation name	Custom operation URI	Mapped HTTP method	Description
query	{apiRoot}/3gpp-ecr-control/v1/query		Query the status of enhanced converage restriction for a UE
	{apiRoot}/3gpp-ecr- control/v1/configure		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

Poquest	Data type	Cardinality		Remarks	
Request body ECRControl 1		1	Parameters to query the current status of Enhanced Coverage Restriction.		
	Data type	Cardinality	Response codes	Remarks	
Response body	ECRData	1	200 OK	The requested information was returned successfully.	
body	ProblemDetails	01	403 Forbidden	The requested information was rejected due to exceeded quota limit. (NOTE 2)	
NOTE 2: T	he mandatory HTTP error status co he "cause" attribute within the "Prot efined in subclause 5.12.5.3.				

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			

Poquost	Data type	Cardinality		Remarks
		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
body	ProblemDetails	01	403 Forbidden	The requested information was rejected 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 5.12.5.3. 				

Table 5.12.3.3.2-2: Data structures supported by the POST request/response on this operation

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.

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 2)
self	Link	01	Link to the resource "Individual NP Configuration". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures SupportedF eatures		01	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	01	Identifies the MTC Service Provider and/or MTC Application. (NOTE 4)	
externalld	Externalld	01	Identifies a user as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
msisdn	Msisdn	01	Identifies the MS internal PSTN/ISDN number allocated for a UE. (NOTE 1)	
externalGroupId	ExternalGro upId	01	Identifies a user group as defined in Clause 4.6.2 of 3GPP TS 23.682 [2]. (NOTE 1)	
maximumLatency	DurationSec	01	This parameter may be included to identify the maximum delay acceptable for downlink data transfers.	
maximumRespons eTimeDurationSec01This parameter may be included to identify the of time for which the UE stays reachable to a SCS/AS to reliably deliver the required down		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.		
suggestedNumber OfDIPackets	integer	01	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.	
groupReportingGu ardTime	DurationSec	01	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].	
notificationDestinat ion	Link	01	A URI indicating the notification destination where T8 notification requests shall be delivered. The attribute shall be provided if the attribute "externalGroupId" is provided.	
requestTestNotific ation	boolean	01	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_t est_event
websockNotifConfi g	WebsockNo tifConfig	01	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	01	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 2: Properties subclause NOTE 3: If this attr NOTE 4: The SCE	s marked with 5.2.7. If no fe ibute is omitted F should checl	a feature as de ature are indic d, no expiry for < received MT(", "msisdn" or "externalGroupId" shall be included. efined in subclause 5.13.4 are applicable as described i cated, the related property applies for all the features. r network parameter configuration applies. C provider identifier and then the SCEF may: lue and send it to HSS;	n
- send i	t directly to the	e HSS; or	guration request.	

Table 5.13.2.1.2-1: Definition of type NpConfiguration

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
Rm maximum delay ac		This parameter may be included to identify the maximum delay acceptable for downlink data transfers.		
maximumRespons DurationSec eTime Rm		01	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.	
suggestedNumber OfDIPackets	integer	01	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.	
groupReportGuard Time	DurationSec Rm	01	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	DateTimeR m	01	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.				

Table 5.13.2.1.3-1: Definition of type NpConfigurationPatch

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)	0N	Each element identifies a notification of grouping configuration result.		
appliedParam	iguration	01	Indicates the applied parameter configuration in the network. The "maximumDetectionTime" attribute in AppliedParameterConfiguration data type is not applicable for Network Parameter configuration.		
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:

Resource name	Resource URI	HTTP method	Meaning
NP Configurations	3gpp-network-parameter-configuration /v1/{scsAsId}/configurations/	GET	Read all NP configurations for a given SCS/AS
		POST	Create a new np configuration
Individual NP Configuration	3gpp-network-parameter-configuration /v1/{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
Configuration Notification	{notificationDestination}	POST	Report a grouping configuration result from the SCEF to the SCS/AS

Table 5.13.3.1-1: Resources and methods overview

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	"NF	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.

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	Data type	Cardinality		Remarks
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	array(NpConfiguration)	0N	200 OK	The NP configuration information related to the request URI is returned.
NOTE: T	he mandatory HTTP error	status codes	for the GET	method listed in table 5.2.6-1 also apply.

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

Poquest	Data type	Cardinality		Remarks
Request body	NpConfiguration	1		create a new configuration to configure eters with the SCEF.
	Data type	Cardinality	Response codes	Remarks
	NpConfiguration	1	201 Created	The configuration was created successfully.
Response body				The URI of the created resource shall be returned in the "Location" HTTP header.
	ProblemDetails	01	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 2:		blemDetails" d as defined in s	ata structure ma ubclause 5.13.5	

Table 5.13.3.2.3.4-3: Headers supported by the 201 Response Code on this resource

Name	Data type	Ρ	Cardinality	Description
Location	string	Μ		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 5.13.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Cardinality	Remarks

Table 5.13.3.3.1-2: Data structures supported by the GET request/response by the resource

Request	Data type	Cardinality	rdinality Remarks	
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	NpConfiguration	1	200 OK	The configuration information related to the request URI is returned.
NOTE: T	he mandatory HTTP error	status codes	for the GET	method listed in table 5.2.6-1 also apply.

5.13.3.3.2 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 5.13.3.3.2-2.

Table 5.13.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.3.2-2: Data structures supported by the PUT request/response by the resource

Request	Data type	Cardinality		Remarks
body	NpConfiguration	1	Update of n	network parameter(s) for an existing Configuration.
	Data type	Cardinality	Response codes	Remarks
	NpConfiguration	1	200 OK	The resource was updated successfully.
Response body				The SCEF shall return an updated Configuration information in the response.
body	ProblemDetails	01	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 2: T "I a	he "cause" attribute within PARAMETER_OUT_OF_R	the "Problem ANGE" as de	Details" data efined in sub	method listed in table 5.2.6-1 also apply. a structure may be set to clause 5.13.5.3. In such case, the "invalidParams" data structure to indicate which parameters are out of

5.13.3.3.3 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 5.13.3.3.3.1 and table 5.13.3.3.3-2.

Table 5.13.3.3.3.1: URI query parameters supported by the PATCH method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Request	Data type	Cardinality		Remarks			
body	NpConfigurationPatch	1	Partial upda	Partial update an existing network parameter configuration.			
	Data type	Cardinality	Response codes	Remarks			
	NpConfiguration	1	200 OK	The configuration was updated successfully.			
Response body				The SCEF shall return an updated configuration information in the response.			
	ProblemDetails	01	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 2:	· · · · · · · · · · · · · · · · · · ·						

5.13.3.3.4 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 5.13.3.3.5-2.

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	Data type	Cardinality		Remarks		
body	none					
	Data type	Cardinality	Response codes	Remarks		
	none		204 No	The configuration was terminated successfully.		
Response body		Content	The response body shall be empty.			
body	array(ConfigResult)	1N	200 OK	The configuration was terminated successfully, the configuration failure information for group members shall be included if received.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.					

5.13.3.4 Configuration Notification

5.13.3.4.1 Introduction

This resource allows the SCEF to send notifications about grouping configuration result to the SCS/AS.

5.13.3.4.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.13.3.4.2-1.

Table 5.13.3.4.2-1: Resource URI variables for resource "Configuration Notification"

Name	Data type	Definition
notificationDestination Link		Callback reference provided by the SCS/AS during creation of the NP
		configuration subscription.

5.13.3.4.3 Resource methods

5.13.3.4.3.1 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 URI query parameters, request and response data structures, and response codes, as specified in the table 5.13.3.4.3.1-1 and table 5.13.3.4.3.1-2.

Table 5.13.3.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Cardinality	Remarks
none specified			

Table 5.13.3.4.3.1-2: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks	
body	ConfiguationNotification	1	The groupir SCEF.	ng configuration result notification provided by the	
Response	Data type	Cardinality	Response codes	Remarks	
body	none		204 No Content	The notification is received successfully.	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.					

5.13.3.4.3.2 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.

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.
	A short name that can be us a: A clear textual descriptio	ed to refer to the bit and to the feature, e.g. "Notification". n of the feature.

Table 5.13.4-1: Features used by NpConfiguration API

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.

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE 1)
self	Link	01	Link to the resource "Individual AS Session with Required QoS Subscription". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedFeatures	01	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.	
notificationDestinat ion	Link	1	Contains the URL to receive the notification bearer level event(s) from the SCEF.	
flowInfo	array(FlowInfo)	0N	Describe the IP data flow which requires QoS. (NOTE 2)	
ethFlowInfo	array(EthFlowDescri ption)	0N	Identifies Ethernet packet flows. (NOTE 2)	EthAsSessio nQoS_5G
qosReference	string	01	Identifies a pre-defined QoS information	
altQoSReferences	array(string)	0N	Identifies an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority.	AlternativeQo S_5G
uelpv4Addr	lpv4Addr	01	The Ipv4 address of the UE. (NOTE 2)	
ipDomain	string	01	The IPv4 address domain identifier. The attribute may only be provided if the uelpv4Addr attribute is present.	
uelpv6Addr	lpv6Addr	01	The Ipv6 address of the UE. (NOTE 2)	
macAddr	MacAddr48	01	Identifies the MAC address. (NOTE 2)	EthAsSessio nQoS_5G
usageThreshold	UsageThreshold	01	Time period and/or traffic volume in which the QoS is to be applied.	
sponsorInfo	SponsorInformation	01	Indicates a sponsor information	
qosMonInfo	QosMonitoringInform ation	01	Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed.	QoSMonitori ng_5G
requestTestNotific ation	boolean	01	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_t est_event
websockNotifConfi g	WebsockNotifConfig	01	Configuration parameters to set up notification delivery over Websocket protocol as defined in subclause 5.2.5.4.	Notification_ websocket
subclause NOTE 2: One of "u	e 5.2.7. If no features a ielpv4Addr", "uelpv6Ad	re indicated, th dr" or "macAde	subclause 5.14.4 are applicable as described ne related property applies for all the features. dr" shall be included. If ipv4 or ipv6 address is ress is provided, Ethernet flow information shall	provided, IP

 Table 5.14.2.1.2-1: Definition of type AsSessionWithQoSSubscription

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
flowInfo	array(FlowInfo)	0N	Describe the data flow which requires QoS.	
ethFlowInfo	array(EthFlowDescri ption)	0N	Describes Ethernet packet flows.	EthAsSessio nQoS_5G
qosReference	string	01	Pre-defined QoS reference	
altQoSReferences	array(string)	0N	Identifiers an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority.	AlternativeQo S_5G
usageThreshold	UsageThresholdRm	01	Time period and/or traffic volume in which the QoS is to be applied.	
qosMonInfo	QosMonitoringInform ationRm	01	Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed.	QoSMonitori ng_5G
			subclause 5.14.4 are applicable as described in the related property applies for all the features.	n

 Table 5.14.2.1.3-1: Definition of type AsSessionWithQoSSubscriptionPatch

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		Link to the transaction resource to which this notification is related.
eventReports	array(UserPlaneEvent Report)	1N	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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
event	UserPlaneEvent	1 Indicates the event reported by the SCEF.		
accumulatedUsage	AccumulatedUsag e	01 Contains the applicable information corresponding to the event.		
flowIds	array(integer)	0N	Identifies the flows that were sent during event subscription	
appliedQosRef	string	01	The currently applied QoS reference. Applicable for event QOS_NOT_GUARANTEED.	AlternativeQoS _5G
qosMonReports array(QosMonitori 0N ngReport)		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

Attribute name	Data type	Cardinality	Description	Applicability
reqQosMonParam s	array(RequestedQos MonitoringParameter)	1N	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(ReportingFreq uency)	1N	Indicates the frequency for the reporting, such as event triggered, periodic, when the PDU Session is released, and/or any combination.	
repThreshDI	Uinteger	01	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.	
repThreshUI	Uinteger	01	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	01	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	01	Indicates the minimum waiting time between subsequent reports. Only applicable when the "repFreqs" attribute includes "EVENT_TRIGGERED".	
repPeriod	DurationSec	01	Indicates the time interval between successive reporting. It shall be present when the AF requests to report the delay periodically.	

Table 5.14.2.1.6-1: Definition of type QosMonitoringInformation

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".

Attribute name	Data type	Cardinality	Description	Applicability
reqQosMonParam s	array(RequestedQos MonitoringParameter)	0N	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(ReportingFreq uency)	0N	Indicates the frequency for the reporting, such as event triggered, periodic, when the PDU Session is released, and/or any combination.	
repThreshDI	UintegerRm	01	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.	
repThreshUI	UintegerRm	01	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	01	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	01	Indicates the minimum waiting time between subsequent reports. Only applicable when the "repFreqs" attribute includes "EVENT_TRIGGERED".	
repPeriod	DurationSecRm	01	Indicates the time interval between successive reporting. It shall be present when the AF requests to report the delay periodically.	

Table 5.14.2.1.7-1: Definition of type QosMonitoringInformationRm

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)	0N	Uplink packet delay in units of milliseconds. (NOTE)		
dlDelays	array(Uinteger)	0N	Downlink packet delay in units of milliseconds. (NOTE)		
		Round trip delay in units of milliseconds. (NOTE)			
NOTE: In this re	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 5.14.2.2.1: 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.		
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:

Resource name	Resource URI	HTTP method	Meaning
AS Session with Required QoS Subscriptions	3gpp-as-session-with-qos/v1/{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	3gpp-as-session-with- qos/v1/{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.
Event Notification	{notificationUri}	POST	Notify the bearer level event(s) from the SCEF to the SCS/AS

Table 5.14.3.1-1: Resources and methods overview

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	Data type	Cardinality	Remarks		
body	none				
			Response		
Response	Data type	Cardinality	codes	Remarks	
body array(AsSessionWithQo 0N SSubscription)		200 OK	The subscription information related to the request URI is returned.		
NOTE: T	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.				

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

Request	Data type	Cardinality		Remarks
	AsSessionWithQoSSubscription	1		create a subscription for an AS session to 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: T	he mandatory HTTP error status co	des for the PC	OST method liste	ed 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	Ρ	Cardinality	Description
Location	string	Μ		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	Data type	Cardinality		Remarks
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	AsSessionWithQoSSubs cription	1	200 OK	The subscription information related to the resource URI is returned.
NOTE: T	he mandatory HTTP error	status codes	for the GET	method listed in table 5.2.6-1 also apply.

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	Data type	Cardinality		Remarks	
body	AsSessionWithQoSSubs cription	1	Set up AS s	Set up AS session with required QoS.	
	Data type	Cardinality	Response codes	Remarks	
Response body	AsSessionWithQoSSubs cription	1	200 OK	The subscription was modified successfully.	
				The SCEF shall return an updated subscription in the response payload body.	
NOTE: T	he mandatory HTTP error	status codes	for the PUT	method listed in table 5.2.6-1 also apply.	

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

Request	Data type	Cardinality		Remarks	
body	AsSessionWithQoSSubs criptionPatch	1	Partial upda	Partial update of an AS session with required QoS.	
	Data type	Cardinality	Response codes	Remarks	
Response body	AsSessionWithQoSSubs cription	1	200 OK	The subscription was modified successfully. The SCEF shall return an updated subscription in the	
NOTE: T	he mandatory HTTP error	status codes	for the PAT	response payload body. CH method listed in table 5.2.6-1 also apply.	

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

Request	Data type	Cardinality		Remarks
body	none			
	Data type	Cardinality	Response codes	Remarks
	none		204 No	The subscription was terminated successfully.
Response body			Content	The response body shall be empty.
	UserPlaneNotifcationDat a	1	200 OK	The subscription was terminated successfully. The user plane notification data shall be included in the response.
NOTE: T	he mandatory HTTP error	status codes	for the DELI	ETE method listed in table 5.2.6-1 also apply.

Table 5.14.3.3.3.5-2: Data structures supported by the DELETE request/response by the resource

5.14.3.4 Event Notification

5.14.3.4.1 Introduction

This resource allows the SCEF to notify the SCS/AS of the bearer level event(s).

5.14.3.4.2 Resource definition

Resource URI: {notificationUrl}

This resource shall support the resource URI variables defined in table 5.14.3.4.2-1.

Table 5.14.3.4.2-1: Resource URI variables for resource "Event Notification"

Name	Data type	Definition
notificationUri		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.

5.14.3.4.3 Resource methods

5.14.3.4.3.1 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 request and response data structures, and response codes, as specified in the table 5.14.3.4.3.1-1.

Table 5.14.3.4.3.1-1.: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks		
body	UserPlaneNotificationDat a	1	Representation of the bearer level notification.			
Response	Data type	Cardinality	Response codes	Remarks		
body	none	1	200 OK	This case represents a successful notification of bearer level event(s).		
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.						

5.14.3.4.3.2 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.

5.14.4 Used Features

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

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					
Feature: A	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.

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
supportedFeature	SupportedFe	1	Used to negotiate the supported optional features	
S	atures		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.				

Table 5.15.2.1.2-1: Definition of type MsisdnLessMoSmsNotification

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)
supportedFeature	SupportedFe		Used to negotiate the supported optional features	
S	atures		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}		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

This resource allows the SCEF to deliver a received MSIDN-less MO SMS to the SCS/AS.

5.15.3.2.2 Resource definition

Resource URI: {notificationDestination}

This resource shall support the resource URI variables defined in table 5.15.3.2.2-1.

Table 5.15.3.2.2-1: Resource URI variables for resource "MSISDN-less MO SMS Notification"

Name	Data type	Definition
notificationDestination		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 Resource 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 5.15.3.3.3.1-2: Data structures supported by the POST request/response by the resource

Request	Data type	Cardinality		Remarks		
	MsisdnLessMoSmsNotifi cation	1	The MSISDN-less MO SMS.			
Response Data type Cardinality Response		Response codes	Remarks			
body	MsisdnLessMoSmsNotifi cationReply		200 OK	The MSISDN-less MO SMS is received successfully.		
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 also apply.						

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
self	Link	01	Link to the resource "Individual RACS parameter provisioning". This parameter shall be supplied by the SCEF in HTTP responses.	
supportedFeatures	SupportedF eatures	01	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(Racs Configuratio n)	1N	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(RacsF ailureReport)	0N	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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
racsIds	array(string)	1N	Identifies the RACS ID(s) for which the RACS data are not provisioned successfully.	
failureCode RacsFailure 1 It indicates the failure reason.				
			efined in subclause 5.16.4 are applicable as described i licated, the related property applies for all the features.	n

Table 5.16.2.1.3-1: Definition of type RacsFailureReport

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)
racsld	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	01	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)	
racsParam5Gs string		01	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)	
		Related UE model's IMEI-TAC values		
subclaus NOTE 2: At least of	e 5.2.7. If no fe one of racsPara	atures are ind	efined in subclause 5.16.4 are applicable as described i icated, the related property applies for all the features. Param5Gs shall be provided. vidual RACS Parameter Provisioning" resource.	n

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.

Attribute name	Data type	Cardinality	Description	Applicability (NOTE)
racsConfigs	map(RacsC onfiguration Rm)		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.

Attribute name	Data type	Cardinality	Description	Applicability
racsParamEps	string	01	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	01	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(TypeAllocatio nCode)	0N	Related UE model's IMEI-TAC values.	

Table 5.16.2.1.6-1: Definition of type RacsConfigurationRm

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.

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.	

Table 5.16.2.2.3-1: Enumeration RacsFailureCode

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:

Resource name	Resource URI	HTTP method	Meaning
RACS Parameter Provisionings	{apiRoot}/3gpp-racs-pp/v1/{scsAsId}/provisionings/	GET	Read all RACS parameter provisionings for a given AF
		POST	Create a new RACS parameter provisioning
Individual RACS Parameter Provisioning	{apiRoot}/3gpp-racs- pp/v1/{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

 Table 5.16.3.1-1: Resources and methods overview

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	Data type	Cardinality	Remarks
body	none		

Response	Data type	Cardinality	Response codes	Remarks		
body	array(RacsProvisioningData)	0N		The provisioning information related to the request URI is returned.		
NOTE:	NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 also apply.					

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	Data type	Cardinality		Remarks
body	RacsProvisioningData	1	Parameters to	create a new provisioning.
	Data type	Cardinality	Response codes	Remarks
Desnense	RacsProvisioningData	1	201 Created	The provisioning was created successfully.
Response body				The URI of the created resource shall be returned in the "Location" HTTP header.
	array(RacsFailureReport)	1N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
NOTE: T	he mandatory HTTP error status co	odes for the P	DST method list	ed 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	Ρ	Cardinality	Description
Location	string	М		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	Data type	Cardinality		Remarks
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	RacsProvisioningData	1	200 OK	The provisioning information related to the request URI is returned.
NOTE: T	he mandatory HTTP error	status codes	for the GET	method listed in table 5.2.6-1 also apply.

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	Data type	Cardinality		Remarks
body	RacsProvisioningDataPatch	1	Partial upda	ate an existing parameter provisioning.
	Data type	Cardinality	Response codes	Remarks
	RacsProvisioningData	1	200 OK	The provisioning data was updated successfully.
Response body				The SCEF shall return an updated provisioning information in the response.
	array(RacsFailureReport)	1N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
NOTE:	The mandatory HTTP error st	atus codes fo	or the PATCI	H method listed in table 5.2.6-1 also apply.

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 5.16.3.3.3-2.

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	Data type	Cardinality	Remarks	
body	RacsProvisioningData	1	Replace an	existing parameter provisioning.
	Data type	Cardinality	Response codes	Remarks
	RacsProvisioningData	1	200 OK	The provisioning data was replaced successfully.
Response body				The SCEF shall return an updated provisioning information in the response.
	array(RacsFailureReport)	1N	500 Internal Server Error	The RACS data for all RACS IDs were not provisioned successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 also apply.				

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

Request	Data type	Cardinality	Remarks	
body	none			
Response	Data type	Cardinality	Response codes	Remarks
body	none		Content	The provisioning was terminated successfully.
				The response body shall be empty.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 also apply.				

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 hosted in ETSI Forge, 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: 1.1.0
  description:
    Data types applicable to several APIs.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
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/
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 $\tt 3GPP\ TS\ 29.214$ 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' minTtems: 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. Bvtes: type: string description: String with format "byte" as defined in OpenAPI Specification, i.e, base64encoded 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 MSTSDN. 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: '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:

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```
$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: 1.1.1
  description:
   API for Monitoring Event.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.7.0 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 '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.vaml#/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) '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.vaml#/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' ·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'

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'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' '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. '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.vaml#/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'

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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' locOos: \$ref: 'TS29572 Nlmf Location.yaml#/components/schemas/LocationOos' svcId: \$ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/ServiceIdentity' ldrTvpe: \$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' associationType: \$ref: '#/components/schemas/AssociationType' plmnIndication: type: boolean description: If "monitoringType" is "ROAMING_STATUS", this parameter may be included to the notification of UE's Serving PLMN ID. - "true" The value shall be used to indicate indicate the notification of UE's Serving PLMN ID. enabling of notification; - "false" The value shall be used to indicate disabling of notification. "false". Default 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' 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

twanId:

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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.

type: string description: Identifies the TWAN Identity of the user where the UE is located. geographicArea: \$ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea' positionMethod: \$ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethod' gosFulfilInd: \$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]. qmmCause 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 SIAP 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 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

- 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:
  anvOf:
  - 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.

A.4 ResourceManagementOfBdt API

```
openapi: 3.0.0
info:
  title: 3gpp-bdt
  version: 1.1.0
  description:
    API for BDT resouce management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
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-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.
        '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) '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' 14291: \$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' '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.vaml#/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' '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+ison: 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' 2041: description: The Individual BDT Policy resource is modified with a selected policy. '400'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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.vaml#/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. '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: Sref: 'TS29122 CommonData.vaml#/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. readOnlv: 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 or not. trafficDes: \$ref: '#/components/schemas/TrafficDescriptor' required: volumePerUE - numberOfUEs - desiredTimeWindow BdtPatch: type: object properties: selectedPolicv: type: integer description: Identity of the selected background data transfer policy. warnNotifEnabled: type: boolean description: Indicates whether the BDT warning notification is enabled or not. 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:
       bdt.RefId:
         $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: 1.1.1
  description:
   API for Chargeable Party management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.7.0 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. '400'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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: '200': description: OK (The successful acknowledgement of the notification with a body) '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.vaml#/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' '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' '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 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'

'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: Sref: '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' 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 sponsoring status. 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 sponsoring status.
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: 1.1.0
 description:
   API for non IP data delivery.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
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-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.
        '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:
```

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```
$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.vaml#/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.vaml#/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'
                ·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' '400'**:** \$ref: 'TS29122 CommonData.vaml#/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: 2001: 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. '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' 15031: \$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. '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.vaml#/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. '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: 2001: description: NIDD downlink data delivery is successful. content: application/json: schema: \$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 '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.vaml#/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' 15001: description: The NIDD downlink data delivery request was not successful. content: application/json: schema: \$ref: '#/components/schemas/NiddDownlinkDataDeliveryFailure' 15031: \$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' '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.vaml#/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' '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.vaml#/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. '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. '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.vaml#/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' ·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. '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: The reliable data service (as defined in subclause 4.5.15.3 of 3GPP TS 23.682) to indicate if a reliable data service acknowledgment is enabled or not. 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: Sref: '#/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: The reliable data service (as defined in subclause 4.5.15.3 of 3GPP TS 23.682) to indicate if a reliable data service acknowledgment is enabled or not. 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 is enabled. 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: Sref: 'TS29122 CommonData.vaml#/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] ${\tt GmdNiddDownlinkDataDeliveryNotification:}$ 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:
 all0f:
    - $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: anvOf: - 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: The reliable data service (as defined in subclause 4.5.15.3 of 3GPP TS 23.682) to indicate if a reliable data service acknowledgment is enabled or not. 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: 1.0.2 description: API for device trigger. © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All rights reserved. externalDocs: description: 3GPP TS 29.122 V16.4.0 T8 reference point for Northbound APIs url: 'http://www.3qpp.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' '400': \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401': \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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) '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' '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. taqs: - 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' '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.vaml#/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' ·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'

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'429': \$ref: 'TS29122_CommonData.yaml#/components/responses/429' 15001: \$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.vaml#/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 \ensuremath{\mathsf{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.vaml#/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: 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.vaml#/components/responses/401' '403': \$ref: 'TS29122_CommonData.yaml#/components/responses/403' '404': \$ref: 'TS29122 CommonData.vaml#/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 \ensuremath{\mathsf{SCS}}\xspace/\ensuremath{\mathsf{AS}}\xspace 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'
      4031:
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      4291:
        $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.vaml#/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.vaml#/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'

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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.vaml#/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

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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/ison: 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.vaml#/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 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' 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

```
openapi: 3.0.0
info:
  title: GMDviaMBMSbyxMB
  description: |
    API for Group Message Delivery via MBMS by {\sf 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.vaml#/components/responses/400' '401'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/401' '403': \$ref: 'TS29122 CommonData.vaml#/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':

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\$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.vaml#/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 taqs: - 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.vaml#/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' 15001: \$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:

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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: 2001: 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' 4031: \$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.vaml#/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.
          readOnlv: 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.
         readOnlv: 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:
```

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```
$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: 2001: 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.vaml#/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.vaml#/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.vaml#/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.vaml#/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.vaml#/components/responses/401' 4031: \$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: 1.1.0
   description: |
```

```
API for provisioning communication pattern parameters.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
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-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
        '400':
          $ref: 'TS29122 CommonData.vaml#/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' '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' '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. '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' · 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.vaml#/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' '400': \$ref: 'TS29122 CommonData.vaml#/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. '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.vaml#/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 StationarvIndication: anvOf: - 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:
      anvOf:
      - 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: 1.1.0
  description:
    API for PFD management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
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-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'
        '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' 15031: \$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.vaml#/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/ison: 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) '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' '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' '400'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401': \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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.vaml#/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. '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' '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.vaml#/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' '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'

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'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' '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.
        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 ONAME - 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: 1.1.0
  description:
    API for enhanced converage restriction control.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
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-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' '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' '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.vaml#/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'

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:

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```
title: 3gpp-network-parameter-configuration
  version: 1.1.1
  description: |
    API for network parameter configuration.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.7.0 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/vl'
    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
        '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:
```

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\$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) '400': \$ref: 'TS29122 CommonData.vaml#/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' 4031: \$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

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' '400'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401': \$ref: 'TS29122_CommonData.yaml#/components/responses/401' '403'**:** \$ref: 'TS29122 CommonData.vaml#/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: 2001: description: OK (Successful deletion of the existing configuration) content: application/json: schema: \$ref: '#/components/schemas/NpConfiguration' ·400': \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401': \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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' '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. '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.vaml#/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.

ETSI

```
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.vaml#/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: 1.1.1
  description:
   API for setting us an AS session with required QoS.
   © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
externalDocs:
  description: 3GPP TS 29.122 V16.7.0 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' '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.vaml#/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) '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.vaml#/components/responses/411' 4131: \$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' '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' ·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.vaml#/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' '400': \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/401' '403'**:** \$ref: 'TS29122 CommonData.vaml#/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' '400': \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401'**:** \$ref: 'TS29122_CommonData.yaml#/components/responses/401' 4031: \$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 altOoSReferences: 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. 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: Sref: '#/components/schemas/OosMonitoringInformation' 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 AsSessionWithOoSSubscriptionPatch: 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 altOoSReferences:

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. usageThreshold: \$ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThresholdRm' qosMonInfo: \$ref: '#/components/schemas/QosMonitoringInformationRm' QosMonitoringInformation: type: object properties: reqQosMonParams: type: array items: Sref: '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 - reqFreqs QosMonitoringInformationRm: type: object properties: reqQosMonParams: type: array items: <pref:</pre> '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: ulDelavs: type: array items: \$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. 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 - OOS NOT GUARANTEED - QOS_MONITORING - 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.

A.15 MsisdnLessMoSms API

openapi: 3.0.0 info: title: 3gpp-msisdn-less-mo-sms version: 1.0.1 description: |

```
API for MSISDN-less Mobile Originated SMS.
    © 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}'
    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'
        '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'
        4131:
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        15001:
          $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
```

A.16 RacsParameterProvisioning API

```
openapi: 3.0.0
info:
  title: 3gpp-racs-parameter-provisioning
  version: 1.0.0
  description: |
    API for provisioning UE radio capability parameters.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
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-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
        '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.vaml#/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' '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/ison: schema: \$ref: '#/components/schemas/RacsProvisioningData' '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' minTtems: 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' · 400 · : \$ref: 'TS29122_CommonData.yaml#/components/responses/400' '401':

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\$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. '400': <pref:</pre> 'TS29122_CommonData.yaml#/components/responses/400' '401'**:** \$ref: 'TS29122 CommonData.vaml#/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'

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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

Date	Monting	TDee	CR			e history Subject/Comment	New
Date 2017-04	Meeting CT3#89	TDoc.	UR	Rev	Cat	TS skeleton of T8 reference point stage 3.	0.0.0
2017-04	C13#89					Inclusion of C3-172217, C3-172242, C3-	0.0.0
						172249 and editorial change from Rapporteur.	
2017-05	CT3#90					Inclusion of C3-173256, C3-173257, C3-	0.1.0
2011 00	010//00					173306, C3-173318, C3-173323, C3-173329	0.1.0
						and editorial change from Rapporteur.	
2017-09	CT3#91					Inclusion of C3-174368, C3-174279, C3-	0.2.0
						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	
0017.10	070/00					Rapporteur.	0.0.0
2017-10	CT3#92					Inclusion of C3-175068, C3-175365, C3-	0.3.0
						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.	
2017-12	CT3#93					Inclusion of C3-176329, C3-176218, C3-	0.4.0
	0.000					176356, C3-176375, C3-176357, C3-176334,	00
						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		
0040.04	070/04					editorial changes from Rapporteur.	0.5.0
2018-01	CT3#94					Inclusion of C3-180349, C3-180329, C3-	0.5.0
						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.	
2018-02	CT3#95					Inclusion of C3-181271, C3-181324, C3-	0.6.0
						181340, C3-181273, C3-181333, C3-181334,	
						C3-181276, C3-181325 and editorial changes	
						from Rapporteur.	
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-	1.1.0
						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, C3-182210, 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, C3-182402, C3-182109, C3-	
						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-	
					1	182493, C3-182494, C3-182509, C3-182372	

2018-05	СТ3#97	CP-181038				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, C3-183085, C3- 183624, C3-183627, C3-183075, C3-183777, C3-183836, C3-183419, C3-183630, C3- 183066, C3-183347, C3-183630, C3- 183066, C3-183347, C3-183637, C3- 183862, C3-183789, C3-183637, C3- 1838641, C3-183068, C3-183069, C3- 183641, C3-183059, C3-183071, C3-183606, C3-183779 and editorial changes from Rapporteur. TS sent to plenary for approval	2.0.0
2018-06	CT#80	CP-181038				TS approved by plenary	15.0.0
			0001	6	-		
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	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	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	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

0040.15	OT#22	CP-183116	0405		-	Link of the created resourcesfor	45.0.0
2018-12	CT#82		0122	1	F	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
2018-12	CT#82	CP-183116	0127	1	F	Link of the created resources for NpConfiguration API	15.2.0
2018-12	CT#82	CP-183116	0128	1	F	Link of the created resources for PfdManagement API	15.2.0
2018-12	CT#82	CP-183116	0129	1	F	Link of the created resources for ReportingNetworkStatus API	15.2.0
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History

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