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Contents

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:

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1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present specification describes the APIs for the Service Enabler Architecture Layer for Verticals (SEAL). The SEAL and related stage 2 architecture, functional requirements and information flows are specified in 3GPP TS 23.434 [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 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".

[3] 3GPP TS 29.122: "T8 reference point for Northbound Application Programming Interfaces (APIs)".

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

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

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

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

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

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

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

[11] Void

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

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

[14] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[15] Open API: "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

[16] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

[17] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[18] 3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

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

[20] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[21] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[22] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[23] 3GPP TS 29.468: "Group Communication System Enablers for LTE (GCSE_LTE); MB2 reference point; Stage 3".

[24] 3GPP TR 21.900: "Technical Specification Group working methods".

[25] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

[26] 3GPP TS 33.434: "Service Enabler Architecture Layer for Verticals (SEAL); Security Aspects".

[27] 3GPP TS 29.486: "V2X Application Enabler (VAE) Services; Stage 3".

[28] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[29] IEEE 802.1Qcc-2018: "IEEE Standard for Local and Metropolitan Area Networks—Bridges and Bridged Networks".

[30] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[31] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[32] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

3 Definitions of terms and abbreviations

3.1 Terms

For the purposes of the present document, the terms 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].

VAL service: A generic name for any service offered by the VAL service provider to their VAL users.

SEAL service: A generic name for a common service (e.g. group management, configuration management, location management) that can be utilized by multiple vertical applications.

SEAL provider: Provider of SEAL service(s).

VAL server: A generic name for the server application function of a specific VAL service.

SEAL server: An entity that provides the server side functionalities corresponding to the specific SEAL service.

VAL system: The collection of applications, services, and enabling capabilities required to support a VAL service.

VAL group: A defined set of VAL UEs or VAL users configured for specific purpose in a VAL service.

NOTE: The set could be of either VAL UEs or VAL users depending on the specific VAL service.

VAL group home system: The VAL system where the VAL group is defined.

VAL group member: A VAL service user, whose VAL user ID is listed in a particular VAL group.

Vertical application: An application catering to a specific vertical.

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].

5GS 5G System
AEF API Exposing Function

API	Application Programming Interface
DS-TT	Device-Side TSN Translator
JSON	JavaScript Object Notation
NDS	Network Domain Security
NDS/IP	NDS for IP based protocols
NRM	Network Resource Management
NSCE	Network Slice Capability Enablement
PLMN	Public Land Mobile Network
REST	Representational State Transfer
SCEF	Service Capability Exposure Function
SCS	Service Capability Server
SEAL	Service Enabler Architecture Layer for Verticals
TMGI	Temporary Mobile Group Identity
TSC	Time Sensitive Communication
TSN	Time Sensitive Networking
UE	User Equipment
VAL	Vertical Application Layer

4 Overview

3GPP has considered in 3GPP TS 23.434 [2] the development of Service enabler architecture layer for verticals (SEAL) over 3GPP networks to support vertical applications (e.g. V2X applications). It specifies the functional architecture for SEAL and the procedures, information flows and APIs for each service within SEAL in order to support vertical applications over the 3GPP systems. To ensure efficient use and deployment of vertical applications over 3GPP systems, SEAL services includes, group management, configuration management, location management, identity management, key management and network resource management.

3GPP TS 23.434 [2], clause 6 specifies the functional entities and domains of the functional model, reference points descriptions and SEAL APIs for SEAL services.

The present document specifies the APIs needed to support SEAL.

5 Services offered by the SEAL servers

5.1 Introduction of SEAL services

The table 5.1-1 lists the SEAL server APIs below the service name. A service description clause for each API gives a general description of the related API.

Table 5.1-1: List of SEAL Service APIs

Service Name	Service Operations	Operation Semantics	Consumer(s)
SS_LocationReporting	Create_Trigger_Location_Reporting	Request/ Response	VAL server
	Fetch_Location_Report_Trigger	Request/Response	VAL server
	Update_Trigger_Location_Reporting	Request/ Response	VAL server
	Cancel_Trigger_Location_Reporting	Request/ Response	VAL server
SS_LocationInfoEvent	Subscribe_Location_Info	Subscribe/Notify	VAL server
	Notify_Location_Info		VAL server
SS_LocationInfoRetrieval	Obtain_Location_Info	Request/ Response	VAL server
SS_LocationAreaInfoRetrieval	Obtain_UEs_Info	Request/ Response	VAL server
SS_LocationMonitoring	Subscribe_Location_Monitoring	Subscribe/Notify	VAL server
	Notify_Location_Monitoring_Events		
SS_LocationAreaMonitoring	Subscribe_Location_Area_Monitoring	Subscribe/Notify	VAL server
	Notify_Location_Area_Monitoring_Events		
	Update_Location_Area_Monitoring_Subscribe		
	Unsubscribe_Location_Area_Monitoring		
SS_GroupManagement	Query_Group_Info	Request/ Response	VAL server
	Update_Group_Info	Request/ Response	VAL server
	Create_Group	Request/ Response	VAL server
	Delete_Group	Request/Response	VAL server
SS_GroupManagementEvent	Subscribe_Group_Info_Modification	Subscribe/Notify	VAL server
	Notify_Group_Info_Modification		VAL server
	Notify_Group_Creation		VAL server
SS_UserProfileRetrieval	Obtain_User_Profile	Request/ Response	VAL server
SS_UserProfileEvent	Subscribe_User_Profile_Update	Subscribe/Notify	VAL server
	Notify_User_Profile_Update		VAL server
SS_NetworkResourceAdaptation	Reserve_Network_Resource	Request/Response	VAL server
	Request_Unicast_Resource	Request/Response	VAL server
	Update_Unicast_Resource	Request/Response	VAL server
	Request_Multicast_Resource	Request/Response	VAL server
	Notify_UP_Delivery_Mode	Subscribe/Notify	VAL server
	Discover_TSC_Stream_Availability	Request/Response	VAL server
	Create_TSC_Stream	Request/Response	VAL server
	Delete_TSC_Stream	Request/Response	VAL server
SS_EventsMonitoring	Subscribe_Monitoring_Events	Subscribe/Notify	VAL server
	Notify_Monitoring_Events		
SS_Events	Subscribe_Event	Subscribe/Notify	VAL server
	Notify_Event		VAL server
	Unsubscribe_Event		VAL server
SS_KeyInfoRetrieval	Obtain_Key_Info	Request/Response	VAL server
SS_NetworkSliceAdaptation	Request_Network_Slice_Adaptation	Request/Response	VAL server
SS_NetworkResourceMonitoring	Subscribe_Unicast_QoS_Monitoring_Data	Subscribe/Notify	VAL server

	Unsubscribe_Unicast_QoS_Monitoring_Data		VAL server
	Notify_Unicast_QoS_Monitoring_Data		VAL server
	Obtain_Unicast_QoS_Monitoring_Data	Request/Response	VAL server
NOTE: The service operations of SS_Events API are reused by the SS_LocationInfoEvent, SS_LocationMonitoring, SS_LocationAreaMonitoring, SS_GroupManagementEvent, SS_UserProfileEvent and SS_EventsMonitoring for events related services.			

Table 5.1-2 summarizes the corresponding APIs defined in this specification.

Table 5.1-2: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
SS_LocationReporting	7.1	Report Location Information Service.	TS29549_SS_LocationReporting.yaml	ss-lr	A.2
SS_GroupManagement	7.2	Group Management Service	TS29549_SS_GroupManagement.yaml	ss-gm	A.3
SS_UserProfileRetrieval	7.3	User Profile Retrieval Service	TS29549_SS_UserProfileRetrieval.yaml	ss-upr	A.4
SS_Network_Resource_Adaptation	7.4	Network Resource Adaptation Service	TS29549_SS_NetworkResourceAdaptation.yaml	ss-nra	A.5
SS_Events	7.5	Events Notify Service	TS29549_SS_Events.yaml	ss-events	A.6
SS_KeyInfoRetrieval	7.6	Key Information Retrieval Service	TS29549_SS_KeyInfoRetrieval.yaml	ss-kir	A.7
SS_LocationAreaInfoRetrieval	7.1	Location Area Info Retrieval Service	TS29549_SS_LocationAreaInfoRetrieval.yaml	ss-lair	A.8
SS_NetworkSliceAdaptation	7.7	Network Slice Adaptation Service	TS29549_SS_NetworkSliceAdaptation.yaml	ss-nsa	A.9
SS_NetworkResourceMonitoring	7.4	Network Resource Monitoring	TS29549_SS_NetworkResourceMonitoring.yaml	ss-nrm	A.10

5.2 Location management APIs

5.2.1 SS_LocationReporting API

5.2.1.1 Service Description

5.2.1.1.1 Overview

The SS_LocationReporting API, as defined 3GPP TS 23.434 [2], allows VAL server via LM-S reference point to configure reporting trigger of location information to the location management server.

5.2.1.2 Service Operations

5.2.1.2.1 Introduction

The service operation defined for SS_LocationReporting API is shown in the table 5.2.1.2.1-1.

Table 5.2.1.2.1-1: Operations of the SS_LocationReporting API

Service operation name	Description	Initiated by
Create_Trigger_Location_Reporting	This service operation is used by VAL server to create the trigger to report location information.	VAL server
Fetch_Location_Report_Trigger	This service operation is used by VAL server to retrieve the location reporting trigger information.	VAL server
Update_Trigger_Location_Reporting	This service operation is used by VAL server to update the trigger to report location information.	VAL server
Cancel_Trigger_Location_Reporting	This service operation is used by VAL server to cancel the trigger to report location information.	VAL server

5.2.1.2.2 Create_Trigger_Location_Reporting

5.2.1.2.2.1 General

This service operation is used by a VAL server to create the trigger to report location information.

5.2.1.2.2.2 VAL server providing trigger configuration using Create_Trigger_Location_Reporting service operation

To create the reporting trigger configuration, the VAL server shall send HTTP POST request message to location management server. The body of the HTTP POST message shall include the LocationReportConfiguration data type, as specified in the clause 7.1.1.2.2.3.1.

Upon receiving the HTTP POST message as described above, the location management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to provide the trigger;
2. if the VAL server is authorized to provide the triggers, the location management server shall;
   a. create a new resource for Individual SEAL Location Reporting Configuration as specified in clause 7.1.1.2.1; and
   b. return the SEAL Resource URI in the response message.

5.2.1.2.3 Fetch_Location_Report_Trigger

5.2.1.2.3.1 General

This service operation is used by VAL server to retrieve an individual location reporting configuration information.

5.2.1.2.3.2 VAL server fetching trigger configuration using Fetch_Location_Report_Trigger service operation

To fetch the location report trigger configuration, the VAL server shall send HTTP GET request message to location management server on the resource URI representing the individual SEAL location reporting configuration, as specified in 7.1.1.2.3.3.1.

Upon receiving the HTTP GET message as described above, the location management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to fetch the trigger information;
2. if the VAL server is authorized to fetch the trigger information, the location management server shall;
   a. return the location report trigger configuration in LocationReportConfiguration data type, as specified in clause 7.1.1.2.1.

5.2.1.2.4 Update_Trigger_Location_Reporting

5.2.1.2.4.1 General

This service operation is used by a VAL server to update the trigger to report location information.

5.2.1.2.4.2 VAL server providing trigger configuration using Update_Trigger_Location_Reporting service operation

To modify the reporting trigger configuration, the VAL server shall send HTTP PUT message to the location management server to the Resource URI identifying the individual SEAL location reporting configuration resource representation, as specified in the clause 7.1.1.2.3.3.2. If the "PatchUpdate" feature defined in clause 7.1.1.6 is supported, the VAL server may send an HTTP PATCH request message to the Individual SEAL Location Reporting Configuration resource URI as specified in clause 7.1.1.2.3.3.4. The body of the HTTP PATCH request message shall include the requested modifications as specified in clause 7.1.1.2.3.3.4. Upon receiving the HTTP PUT or PATCH request message, the location management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to modify the configuration information;
2. if the VAL server is authorized to modify the information, then the location management server shall;
   a. if the configuration information in the request is valid, update/modify the resource identified by the Resource URI of the configuration received in the request;
   b. return a 200 OK status code with the updated location reporting configuration information in the response or a 204 No Content status code.

5.2.1.2.5 Cancel_Trigger_Location_Reporting

5.2.1.2.5.1 General

This service operation is used by a VAL server to cancel the trigger to report location information.

5.2.1.2.5.2 VAL server providing trigger configuration using Cancel_Trigger_Location_Reporting service operation

To delete the reporting trigger configuration, the VAL server shall send an HTTP DELETE message to the resource representing Individual SEAL Location Reporting Configuration as specified in clause 7.1.1.2.3.3.3.

Upon receiving the HTTP DELETE message, the location management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to delete the configuration information; and
2. if the VAL server is authorized to delete the configuration information, the location management server shall delete the resource pointed by the Resource URI for Individual SEAL Location Reporting Configuration.

5.2.2 SS_LocationInfoEvent API

The SS_LocationInfoEvent API, as defined 3GPP TS 23.434 [2], allows a VAL server via LM-S reference point to subscribe for and receive notifications of location information from the location management server. The SS_LocationInfoEvent API supports this via the event "LM_LOCATION_INFO_CHANGE" of the SS_Events API as specified in clause 7.5. If the event subscription includes an indication for supplementary location information, then the location management server obtains the UE location information from the 3GPP core network.

5.2.3 SS_LocationInfoRetrieval API

The SS_LocationInfoRetrieval API, as defined 3GPP TS 23.434 [2], enables the VAL server via LM-S reference point to obtain location information from the location management server. The SS_LocationInfoRetrieval API supports this

via the event "LM_LOCATION_INFO_CHANGE" of the SS_Events API by setting the "immRep" attribute to true and setting the "notifMethod" attribute to "ONE_TIME" within the "eventReq" attribute, as specified in clause 7.5.

Upon receipt of the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to true in the HTTP POST request, the location management server shall ignore the "notificationDestination" attribute within the SEALEventSubscription data type and include the event details in the "eventDetails" attribute, if available, in the HTTP POST response.

5.2.4 SS_LocationAreaInfoRetrieval API

5.2.4.1 Service Description

5.2.4.1.1 Overview

The SS_LocationAreaInfoRetrieval API, as defined 3GPP TS 23.434 [2], enables the VAL server via LM-S reference point to obtain UE(s) information in an application defined proximity range of a location.

5.2.4.2 Service Operations

5.2.4.2.1 Introduction

The service operation defined for SS_LocationAreaInfoRetrieval API is shown in the table 5.2.4.2.1-1.

Table 5.2.4.2.1-1: Operations of the SS_LocationAreaInfoRetrieval API

Service operation name	Description	Initiated by
Obtain_UEs_Info	This service operation is used by VAL server to obtain UE(s) information in an application defined proximity range of a location.	VAL server

5.2.4.2.2 Obtain_UEs_Info

5.2.4.2.2.1 General

This service operation is used by a VAL server to obtain UE(s) information in an application defined proximity range of a location.

5.2.4.2.2.2 VAL server obtains UE(s) information in an application defined proximity range of a location using Obtain_UEs_Info service operation

To obtain the UE(s) information in an application defined proximity range of a location, the VAL server shall send HTTP GET message to the location management server, on location information collection resource representation URI as specified in the clause 7.1.2.2.2.3.1. The GET message shall include the query parameters: Location information and proximity range.

Upon receiving the HTTP GET message as described above, the location management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to fetch the UE(s) information;
2. if the VAL server is authorized to fetch the UE(s) information, the location management server shall;
   a. determine the VAL UE(s) information that are in the proximity range of the location as per the query parameters in the request message from the VAL server;
   b. return HTTP "200 OK" status code with the determined VAL UE(s) information in the LMInformation data type to the VAL server.

5.2.5 SS_LocationMonitoring API

The SS_LocationMonitoring API, as defined 3GPP TS 23.434 [2], allows a VAL server via the LM-S reference point to monitor the VAL UE(s) in relation to a given area of interest. The VAL server subscribes to the LM server to receive notifications of deviation of VAL UE(s) / User(s) location from a given location information. The SS_LocationMonitoring API supports this via the event "LM_LOCATION_DEVIATION_MONITOR" of the SS_Events API as specified in clause 7.5.

Upon the receipt of "LM_LOCATION_DEVIATION_MONITOR" event subscription request from the VAL server, in order to notify the location deviation events to the VAL server, the location management server shall:

1. periodically obtain the VAL UE location information using the SEAL location information procedures as per the SS_LocationReporting and SS_LocationAreaInfoRetrieval APIs as specified in clauses 5.2.1 and 5.2.4;
2. periodically obtain the VAL UE location information from the 3GPP core network using the MonitoringEvent API as specified in 3GPP TS 29.122 [3] and 3GPP TS 29.522 [28]; and
3. process the location information received in steps 1 and 2 above and continue as follows;
    a. if the location information from the location management client and the 3GPP core network do not match, then notify the VAL server with the "NOTIFY_MISMATCH_LOCATION" value in the event report;
    b. if the location information from the location management client and the 3GPP core network match and is not within the area of interest of the VAL server, then notify the VAL server with the "NOTIFY_ABSENCE" value in the event report; or

c. if the location information from the location management client and the 3GPP core network match and is within the area of interest of the VAL server, then notify to the VAL server with the "NOTIFY_PRESENCE" value in the event report, based on the notification interval parameter in VAL server's event subscription.

5.2.6 SS_LocationAreaMonitoring API

The SS_LocationAreaMonitoring API, as defined 3GPP TS 23.434 [2], allows a VAL server via the LM-S reference point to subscribe for and receive notifications of list of UE(s) moving in or out of a given area of interest from the location management server. The SS_LocationAreaMonitoring API supports this via the event "LM_LOCATION_AREA_MONITOR" of the SS_Events API as specified in clause 7.5. The VAL server may indicate the periodic time interval in which the LM server needs to notify the VAL UE's location information in the Reporting Requirements, during the Subscribe_Event service operation of SS_Events API.

5.3 Group management APIs

5.3.1 SS_GroupManagement API

5.3.1.1 Service Description

5.3.1.1.1 Overview

The SS_GroupManagement API, as defined 3GPP TS 23.434 [2], allows VAL server via GM-S reference point to create, fetch, update and delete VAL group membership and configuration information.

5.3.1.2 Service Operations

5.3.1.2.1 Introduction

The service operation defined for SS_GroupManagement API is shown in the table 5.3.1.2.1-1.

Table 5.3.1.2.1-1: Operations of the SS_GroupManagement API

Service operation name	Description	Initiated by
Query_Group_Info	This service operation is used by VAL server to query for VAL group documents, group membership list and configuration information.	VAL Server
Update_Group_Info	This service operation is used by VAL server to modify group membership and configuration information.	VAL server
Create_Group	This service operation is used by VAL server to configure new VAL group.	VAL server
Delete_Group	This service operation is used by the VAL server to delete the VAL group.	VAL server

5.3.1.2.2 Query_Group_Info

5.3.1.2.2.1 General

This service operation is used by a VAL server to obtain VAL group documents, group membership and configuration information.

5.3.1.2.2.2 VAL server fetching VAL group documents, group membership and configuration information using Query_Group_Info service operation

To obtain membership, configuration information of a VAL group, the VAL server shall send a HTTP GET message to the group management server, on VAL group document's resource representation URI as specified in clause 7.2.1.2.3.3.1. The GET message may include the following query parameters: membership list, group configuration. To obtain VAL groups information, the VAL server shall send a HTTP GET message to the group management server, on VAL group documents collection resource representation URI as specified in clause 7.2.1.2.2.3.2. The GET message may include the following query parameters: VAL Group ID, VAL Service ID.

Upon receiving the HTTP GET message as described above, the group management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to fetch the VAL group information;

2. if the VAL server is authorized to obtain the group information, the group management server shall;

   a. if the request to VAL group document's resource representation URI includes query parameters, then, return in the response message with VAL group information which includes, group membership list information if the request includes membership list query, group configuration information if the request includes group configuration query and VAL group identifier;

   b. if the request to VAL group document's resource representation URI does not include query parameter, then, return the VAL group document resource in the response message;

   c. in the request to VAL group documents collection resource representation URI, return the VAL group documents matching the query parameters in the response message.

5.3.1.2.3 Update_Group_Info

5.3.1.2.3.1 General

This service operation is used by a VAL server to modify group membership and configuration information.

5.3.1.2.3.2 VAL server modifying group membership and configuration using Update_Group_Info service operation

To modify group information of a VAL group, the VAL server shall send HTTP PUT message to the group management server to the Resource URI identifying the VAL group document resource representation, as specified in the clause 7.2.1.2.3.3.2. This request shall not replace valGroupId property in the existing resource. If the "PatchUpdate" feature defined in clause 7.2.1.6 is supported, then the VAL server may send an HTTP PATCH request message to the Individual VAL Group Document resource URI as specified in clause 7.2.1.2.3.3.4, to partially update the VAL group document. The body of the HTTP PATCH request message shall include the requested modifications as specified in clause 7.2.1.2.3.3.4. Upon receiving the HTTP PUT message, the group management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to modify VAL group information;
2. for the HTTP PUT request message, verify that valGroupId in the request is same as valGroupId of the VAL group document resource;
3. if the VAL server is authorized to modify/update the group information and the valGroupId matches, then the group management server shall;
    a. if the group configuration information in the request is valid, update/modify the resource identified by the Resource URI of the group document with group members list, group configuration information, description, VAL service identifiers, external group identifier and location information received in the request;
    b. if the group document information in the request includes 5G LAN-Type communication, invoke the 5GLANParameterProvision API towards the NEF via an HTTP PUT/PATCH message as defined in clause 4.4.15.3 of 3GPP TS 29.522 [28].
    c. return a 200 OK status code with the updated VAL group document in the response or a 204 No Content status code.

NOTE: The group management server maintains a mapping between DNN and S-NSSAI of the 5GVN group and the VAL server requester identity based on operator policy. How such mapping is configured is implementation specific and out of the scope of this specification.

5.3.1.2.4 Create_Group

5.3.1.2.4.1 General

This service operation is used by a VAL server to create VAL group.

5.3.1.2.4.2 VAL server creating new group using Create_Group service operation

To create a VAL group, the VAL server shall send a HTTP POST message to the group management server. The body of the POST message shall include VAL group document information as specified in clause 7.2.1.2.2.3.1. The VAL server shall use this service operation to create the location-based VAL group as specified for Create_LocationBasedGroup_Info service operation of SS_GroupManagement API, in 3GPP TS 23.434 [2]. Upon receiving HTTP POST message, the group management server shall

1. verify the identity of the VAL server and check if the VAL server is authorized to create VAL group document;
2. if the VAL group document information in the request includes location criteria, shall obtain the list of VAL users or VAL UEs within the requested location criteria information from the Location Management server and include them in VAL group members of the new VAL group;
3. if the VAL group document information in the request includes 5G LAN-Type communication, invoke the 5GLANParameterProvision API towards the NEF via an HTTP POST message as defined in clause 4.4.15.2 of 3GPP TS 29.522 [28].
4. if the VAL server is authorized to create VAL group document, shall create a new resource as defined in 7.2.1.2.2.3.1 and return the VAL group document and its Resource URI in the response message.

NOTE: The group management server maintains a mapping between DNN and S-NSSAI of the 5GVN group and the VAL server requester identity based on operator policy. How such mapping is configured is implementation specific and out of the scope of this specification.

5.3.1.2.5 Delete_Group

5.3.1.2.5.1 General

This service operation is used by a VAL server to delete a VAL group.

5.3.1.2.5.2 VAL server deleting VAL group using Delete_Group service operation

To delete a VAL group, the VAL server shall send a HTTP DELETE message to the Group Management server to its resource representation in the Group Management server as specified in clause 7.2.1.2.3.3.3. Upon receiving HTTP DELETE message, the Group Management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to delete the VAL group document;
2. if the VAL server is authorized to delete the VAL group document, the Group Management server shall
   a. if the group communication type is 5GLAN communication, invoke the 5GLANParameterProvision API towards the NEF via an HTTP DELETE message as defined in clause 4.4.15.4 of 3GPP TS 29.522 [28].
   b. delete the resource representation pointed by the group document resource identifier.

5.3.2 SS_GroupManagementEvent API

The SS_GroupManagementEvent API, as defined 3GPP TS 23.434 [2], allows a VAL server via GM-S reference point to subscribe for and receive notifications from Group Management server on new VAL group creations, on modifications to VAL Group membership and configuration information and on temporary VAL group formation. The SS_GroupManagementEvent API supports this via the "GM_GROUP_CREATE", "GM_GROUP_INFO_CHANGE" and "GM_TEMP_GROUP_FORMATION" events of the SS_Events API as specified in clause 7.5. In order to authorize the VAL servers that have to be notified of a "GM_GROUP_CREATE" event, the Group Management server shall identify the VAL services (VAL Service IDs) allowed for the VAL server by the "subscriberId" attribute and shall notify the VAL server if the VAL services enabled for the created VAL group are allowed for the VAL server.

Upon the receipt of the VAL group document from the group management server during Create_Group service operation, if the VAL server is interested in receiving the notifications about newly registered or de-registered VAL UE IDs to the VAL group, then the VAL server may subscribe to "GM_GROUP_INFO_CHANGE" event using the SS_Events API as specified in clause 7.5.1, to receive any VAL group membership update notifications.

Upon the receipt of the message filters information in the "GM_GROUP_INFO_CHANGE" event notification from the group management server, the VAL server shall consider the message filters in VAL specific communication.

5.4 Configuration management APIs

5.4.1 SS_UserProfileRetrieval API

5.4.1.1 Service Description

5.4.1.1.1 Overview

The SS_UserProfileRetrieval API, as defined in 3GPP TS 23.434 [2], allows VAL server via CM-S reference point to obtain user profile from the configuration management server.

5.4.1.2 Service Operations

5.4.1.2.1 Introduction

The service operation defined for SS_UserProfileRetrieval API is shown in the table 5.4.1.2.1-1.

Table 5.4.1.2.1-1: Operations of the SS_UserProfileRetrieval API

Service operation name	Description	Initiated by
Obtain_User_Profile	This service operation is used by VAL server to obtain user profile.	VAL server

5.4.1.2.2 Obtain_User_Profile

5.4.1.2.2.1 General

This service operation is used by a VAL server to obtain VAL user profile information.

5.4.1.2.2.2 VAL server retrieving VAL user profile information using Obtain_User_Profile service operation

To obtain a VAL user's profile, the VAL server shall send HTTP GET request message to configuration management server, on VAL service's resource representation URI, with query parameters VAL user ID or VAL UE ID and optionally VAL service ID, as specified in 7.3.1.2.2.3.1.

Upon receiving the HTTP GET message as described above, the configuration management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to fetch the VAL user profile information;
2. if the VAL server is authorized to obtain the requested VAL user profile information, the configuration management server shall;
    a. return in the response message with profile information corresponding to the query parameters that was sent in the request message.

5.4.2 SS_UserProfileEvent API

The SS_UserProfileEvent API, as defined in 3GPP TS 23.434 [2], allows a VAL server via CM-S reference point to subscribe for and receive notifications from the Configuration Management server on profile updates to VAL User or VAL UE. The SS_UserProfileEvent API supports this via the "CM_USER_PROFILE_CHANGE" event in SS_Events API as specified in clause 7.5.

5.5 Network resource management APIs

5.5.1 SS_Network_Resource_Adaptation API

5.5.1.1 Service Description

5.5.1.1.1 Overview

The SS_NetworkResourceAdaptation API, as defined 3GPP TS 23.434 [2], allows VAL server via NRM-S reference point to communicate with the network resource management server for network resource adaptation including reserving network resource, requesting and subscribing for unicast and multicast resources.

5.5.1.2 Service Operations

5.5.1.2.1 Introduction

The service operation defined for SS_NetworkResourceAdaptation API is shown in the table 5.5.1.2.1-1.

Table 5.5.1.2.1-1: Operations of the SS_NetworkResourceAdaptation API

Service operation name	Description	Initiated by
Reserve_Network_Resource	Requesting for network resource adaptation	VAL server
Request_Unicast_Resource	Requesting unicast resource	VAL server
Update_Unicast_Resource	Updating unicast resource	VAL server
Request_Multicast_Resource	Requesting multicast resource	VAL server
Notify_UP_Delivery_Mode	Notifying the user plane delivery mode	NRM server
Discover_TSC_Stream_Availability	Requesting the NRM server to discover the connectivity and available QoS characteristics between the source and the destination DS-TT ports.	VAL server
Create_TSC_Stream	Requesting the NRM server to create a TSC stream.	VAL server
Delete_TSC_Stream	Requesting the NRM server to delete a TSC stream.	VAL server

5.5.1.2.2 Reserve_Network_Resource

5.5.1.2.2.1 General

This service operation is used by a VAL server to request for network resource adaptation.

5.5.1.2.2.2 VAL server requesting for network resource adaptation using Reserve_Network_Resource service operation

The VAL server shall send a HTTP POST message to the NRM server. The body of the POST message shall include VAL UE(s) or VAL group information and the VAL service QoS requirement. Upon receiving HTTP POST message, the NRM server shall

1. verify the identity of the VAL server and check if the VAL server is authorized to request for network resource adaptation;
2. if the VAL server is authorized, the NRM server shall determine the QoS requirements for each VAL UE based on the VAL UE(s) or VAL group information;
3. for each VAL UE, the NRM server initiates the PCC procedures; and
4. the NRM server provides result and optionally includes the accepted value for the QoS requirements based on the outcome of the PCC procedure in the response message

5.5.1.2.3 Request_Unicast_Resource

5.5.1.2.3.1 General

This service operation is used by a VAL server to request for unicast resource.

5.5.1.2.3.2 VAL server requesting for unicast resource using Request_Unicast_Resource service operation

The VAL server shall send a HTTP POST message to the NRM server. The body of the POST message shall include VAL user or UE information and the VAL service requirement. Upon receiving HTTP POST message, the NRM server shall

1. verify the identity of the VAL server and check if the VAL server is authorized to request for unicast resource;
2. if the VAL server is authorized, the NRM server evaluates the need for network resources and use of resource sharing;
3. for the VAL user or UE, the NRM server initiates interaction via SIP core;
4. the NRM server creates a unicast subscription as specified in clause 7.4.1.2.4.3.1; and
5. the NRM server provides result in the response message.

5.5.1.2.4 Update_Unicast_Resource

5.5.1.2.4.1 General

This service operation is used by a VAL server to request for updating the unicast resource used by the VAL user or UE.

5.5.1.2.4.2 VAL server requesting for updating the unicast resource using Update_Unicast_Resource service operation

The VAL server shall send a HTTP PUT message to the NRM server. The body of the PUT message shall include VAL user or UE information and the VAL service requirement. Upon receiving HTTP PUT message, the NRM server shall

1. verify the identity of the VAL server and check if the VAL server is authorized to request for updating the unicast resource;
2. if the VAL server is authorized, the NRM server decides the need to update the unicast resource. If NRM server decides that no update is required for the unicast resource, then the NRM server sends a failure indication in the response message;
3. if NRM server decides to update the unicast resource, then the NRM server initiates interaction via SIP core; and
4. the NRM server provides result in the response message.

5.5.1.2.5 Request_Multicast_Resource

5.5.1.2.5.1 General

This service operation is used by a VAL server to request for multicast resource.

5.5.1.2.5.2 VAL server requesting for multicast resource using Request_Multicast_Resource service operation

The VAL server shall send a HTTP POST message to the NRM server. The body of the POST message shall include VAL group information, service announcement mode, QoS information, Broadcast area, the local MBMS information or the local MBMS activation indication and VAL server notification endpoint address information. Upon receiving HTTP POST message, the NRM server shall

1. verify the identity of the VAL server and check if the VAL server is authorized to request for multicast resource;
2. if the VAL server is authorized, the NRM server decides to establish an MBMS bearer in EPS using the procedures defined in 3GPP TS 29.468 [23];
3. the NRM server creates a multicast subscription as specified in clause 7.4.1.2.2.3.1;
4. the NRM server provides the result in the response message.

5.5.1.2.6 Notify_UP_Delivery_Mode

5.5.1.2.6.1 General

This service operation is used by the NRM server to send user plane notifications to the VAL server.

5.5.1.2.6.2 Notifying user plane events using Notify_UP_Delivery_Mode service operation

To notify the user plane events, the NRM server shall send an HTTP POST message using the Notification Destination URI received in the multicast resource request. The body of the HTTP POST message shall include an UserPlaneNotification as specified in clause 7.4.1.3.2.

Upon receiving the HTTP POST message, the VAL server shall process the Event Notification.

5.5.1.2.7 Create_TSC_Stream

5.5.1.2.7.1 General

This service operation is used by a VAL server to request the NRM server to create TSC stream resources.

5.5.1.2.7.2 VAL server requesting for create TSC stream using Create_TSC_Stream service operation

In order to create a TSC stream resource, the VAL server shall send an HTTP PUT message to the NRM server with {valStreamId} in the request URI path to identify the TSC stream to be created. The request body with the "TscStreamData" data structure shall include stream specification and Traffic Specification Information which includes MaxFrameInterval, MaxFrameSize, MaxIntervalFrames, MaxLatency.

Upon reception of the HTTP PUT message, the NRM server shall:

1. verify the requestor identity of the VAL server, check whether the VAL server is authorized to request the NRM server to create a TSC stream with the VAL Stream ID as the TSC stream resource identifier;

NOTE: It's up to the VAL server to secure the uniqueness of the VAL Stream ID.

2. if the VAL server is authorized, the NRM server shall calculate the schedule for the VAL Stream ID based on the information collected earlier from the 5GS. It provides per-stream filtering and policy parameters (e.g as defined in IEEE 802.1Qcc [29]) used to derive the TSC QoS information and related flow information. The NRM server also provides the forwarding rule (e.g.as defined in IEEE 802.1Qcc [29]) used to identify the DS-TT MAC address of the corresponding PDU session. Based on the 5GS bridge delay information it determines the TSC QoS information and TSC Assistance information for the stream;

3. for each VAL UE, the trusted NRM server within the PLMN operator domain acting as a TSCTSF shall initiate the PCC procedures by triggering the Npcf_policy_Authorization_Create service operation as described in 3GPP TS 29.514 [30] for the TSC stream for both uplink QoS flow (sender UE to UPF/bridge) and downlink QoS flow (UPF/bridge to receiver UE). The creation request includes the DS-TT port MAC address, TSC QoS information, TSC Assistance Information, flow bit rate, priority, Service Data Flow Filter containing flow description including Ethernet Packet Filters. The QoS flow will be assigned for the PDU session with the source MAC address for the uplink direction and with the destination MAC address for the downlink direction. This information is delivered to the DS-TT by the 5GS; and

4. after the NRM server receiving a successful response from the PCF, the NRM server shall create an "Individual TSC Stream" resource which represents the created TSC stream, addressed by a URI that contains the {valStreamId} as the VAL Stream ID identifier the TSC Stream, and shall respond to the VAL server with a 201 Created status code, including a Location header field containing the URI for the created resource. If the NRM server receives an error response from the PCF, the NRM server shall not create the resource and shall respond to the VAL server with a proper error status code.

5.5.1.2.8 Delete_TSC_Stream

5.5.1.2.8.1 General

This service operation is used by a VAL server to delete a TSC stream.

5.5.1.2.8.2 VAL server requesting to delete a TSC stream using Delete_TSC_Stream service operation

In order to delete a TSC stream, the VAL server shall send an HTTP DELETE message to the NRM server, with "{apiRoot}/ss-nra/<apiVersion>/tsc-streams/{valStreamId}" as the Resource URI representing the TSC stream identified by the VAL sStream ID to be deleted.

Upon reception of the HTTP DELETE message, the NRM server shall

1. identify the MAC addresses of the DS-TTs involved in the stream based on the stored information for the VAL Stream ID.
2. for each VAL UE, the trusted NRM server within the PLMN operator domain acting as a TSCTSF shall initiate the PCC procedures by triggering the Npcf_policy_Authorization_Delete service operation to delete the QoS flows as defined in 3GPP TS 29.514 [30] with all the MAC addresses referred by the VAL Stream ID; and
3. if the NRM server receive a successful response from the PCF, the NRM server shall delete the existing TSC stream in the "Individual TSC Stream" resource. Then the NRM server shall send an HTTP DELETE response message with "204 No Content" status code to the VAL server as a successful result of TSC stream deletion for the VAL Stream ID. If the NRM server receive an error code from the PCF, the NRM server shall take proper error handling action and shall respond to the VAL server with a proper error status code as unsuccessful result.

5.5.1.2.9 Discover_TSC_Stream_Availability

5.5.1.2.9.1 General

This service operation is used by a VAL server to request the NRM server to retrieve the connectivity information between the source and destination DS-TT ports and the related available QoS characteristics, prior to creating the stream.

5.5.1.2.9.2 VAL server discovering TSC stream availability using Discover_TSC_Stream_Availability service operation

In order to discover the connectivity between the source and destination DS-TT ports and the related available QoS characteristics, the VAL server shall send an HTTP GET request message to the NRM server, with the query parameters containing the targeted stream specifications.

Upon reception of the HTTP GET request message, the NRM server shall:

1. verify if the VAL server is authorized to discover the TSC stream availability;
2. if the VAL server is authorized, the NRM server shall check the connectivity between the DS-TTs ports indicated in the requested TSC stream definition based on the collected 5GS TSC bridge management and port management information, the traffic classes supported by the DS-TTs and the end-to-end latency (including the UE-DS-TT residence times, UPF residence time, and propagation delays) per traffic class;

   The necessary information to process the TSC stream availability discovery request, i.e. 5GS TSC bridge management and port management information, the traffic classes supported by the DS-TTs and the end-to-end latency (including the UE-DS-TT residence times, UPF residence time, and propagation delays) per traffic class, is collected by the NRM server and shall be available at the NRM server prior to the reception of the request from the VAL server.
3. if the discovery result is successful upon the connectivity between the DS-TT ports is discovered, the NRM server shall return an HTTP GET response message to the VAL server with an HTTP "200 OK" status code with

the TscStreamAvailability data structure as the response body which shall include the stream specification matching the received query parameters and the corresponding list of traffic specifications;

4. if there is no stream specification matching the query parameters or no TSC stream availability information was discovered between the DS-TT ports, then the NRM server shall responsde with a 204 No Content status code without response body;

5. Otherwise if error case occur (e.g. the necessary information to process the request is not available at the NRM server), the NRM server shall respond to the VAL server with a proper error status code.

5.5.2 SS_EventsMonitoring API

The SS_EventsMonitoring API, as defined in 3GPP TS 23.434 [2], allows a VAL server via NRM-S reference point to subscribe for and receive notifications from the Network Resource Management server about events related to VAL UE(s). The SS_EventsMonitoring API supports this via the "NRM_MONITOR_UE_USER_EVENTS" event in SS_Events API as specified in clause 7.5. Based on the events of interest information related to the VAL UE(s), the NRM server shall subscribe to UE monitoring types and analytics events as specified in clause 4.4.2 and clause 4.4.14 of 3GPP TS 29.522 [28].

5.5.3 SS_NetworkResourceMonitoring API

5.5.3.1 Service Description

5.5.3.1.1 Overview

The SS_NetworkResourceMonitoring API, as defined in 3GPP TS 23.434 [2], allows VAL server via NRM-S reference point to communicate with the network resource management server for network resource monitoring including requesting unicast QoS monitoring data and managing unicast QoS monitoring subscription.

5.5.3.2 Service Operations

5.5.3.2.1 Introduction

The service operations defined for the SS_NetworkResourceMonitoring API are shown in the table 5.5.3.2.1-1.

Table 5.5.3.2.1-1: Operations of the SS_NetworkResourceMonitoring API

Service operation name	Description	Initiated by
Subscribe_Unicast_QoS_Monitoring	This service operation is used by VAL server to subscribe to unicast QoS monitoring events from SEAL servers.	VAL server
Unsubscribe_Unicast_QoS_Monitoring	This service operation is used by VAL server to unsubscribe from unicast QoS monitoring events from SEAL servers.	VAL server
Notify_Unicast_QoS_Monitoring	This service operation is used by SEAL server to send the notifications to the VAL server.	NRM server
Obtain_Unicast_QoS_Monitoring	This service operation is used by VAL server to obtain unicast QoS monitoring data.	VAL server

5.5.3.2.2 Subscribe_Unicast_QoS_Monitoring

5.5.3.2.2.1 General

This service operation is used by a VAL server to create a unicast QoS monitoring subscription to the NRM server.

5.5.3.2.2.2 VAL server subscribes for Unicast QoS Monitoring using Subscribe_Unicast_QoS_Monitoring

In order to subscribe to unicast QoS monitoring, the VAL server shall send an HTTP POST message to the NRM server targeting the URI of the "Unicast Monitoring Subscriptions" resource as specified in clause 7.4.2.2.2.3.1. The request

body shall include the MonitoringSubscription data structure as defined in clause 7.4.2.4.2.8. The VAL server shall indicate within the ReportingRequirement data structure whether one-time reporting and/or immediate reporting is requested, i.e.:

- the "immRep" attribute set to "true", if immediate reporting of the the unicast QoS Monitoring data is requested; and/or
- the "reportingMode" attribute set to "ONE_TIME" and the "immRep" attribute set to "true", if one-time reporting of the unicast QoS Monitoring data is requested via the Obtain_Unicast_QoS_Monitoring service operation.

Upon reception of the HTTP POST request message, the NRM server shall:

- verify the identity of the VAL server and whether the VAL server is authorized to create a unicast QoS monitoring subscription at the NRM server;
- if the VAL server is not authorized, the NRM server shall respond to the VAL server with an appropriate error code;
- if the VAL server is authorized:
  - if immediate reporting and one-time reporting are requested, the NRM server determines if it the requested data is available internally or not and whether to interact with the NEF to fetch the data using the Nnef_AnalyticsExposure API (UE Communication Analytics Events and DN Performance Analytics) as defined in 3GPP TS 29.522 [28];
  - otherwise, the NRM server shall interact with the NEF to establish the associated QoS monitoring subscriptions by invoking the Nnef_AnalyticsExposure API (UE Communication Analytics Events and DN Performance Analytics) and AsSessionWithQoS API as defined in 3GPP TS 29.522 [28]. The NRM server determines the relevant NEF subscription procedures and the parameters for these subscriptions based on the inputs received from the VAL server;
- upon reception of successful response(s) from the NEF or retrieval of the requested data internally:
  - if immediate reporting and one-time reporting are requested, an HTTP "200 OK" status code, with the response body including the MonitoringReport data structure containing the available requested Unicast QoS Monitoring data as defined in clause 7.4.2.4.2.2; and
  - otherwise, the NRM server shall create a new "Individual Unicast Monitoring Subscription" resource and respond to the VAL server with:
    - an HTTP "201 Created" status code, including a Location header field containing the URI for the created "Individual Unicast Monitoring Subscription" resource and the response body including the MonitoringSubscription data structure containing a representation of the created resource as defined in clause 7.4.2.4.2.8; and
    - if immediate reporting was requested by the VAL server, the returned MonitoringSubscription data structure shall also contain the requested Unicast QoS Monitoring data within the "monRep" attribute, if the requested data is available, as defined in clause 7.4.2.4.2.2.
  - in the case of partial failure, i.e. the request fails for only a subset of the targeted VAL UE(s) or VAL Stream ID(s), the NRM server shall include the "failureRep" attribute within the returned MonitoringReport data structure indicating the list of VAL UE(s) or VAL Stream ID(s) for which the NRM server failed to obtain the requested data and the related failure reasons;

  and

- if the NRM server is unable to satisfy the request, the NRM server shall respond to the VAL server with an appropriate error status code.

5.5.3.2.3 Unsubscribe_Unicast_QoS_Monitoring

5.5.3.2.3.1 General

This service operation is used by a VAL server to terminate a unicast QoS monitoring subscription at the NRM server.

5.5.3.2.3.2 VAL server unsubscribes for Unicast QoS Monitoring using Unsubscribe_Unicast_QoS_Monitoring

In order to terminate a unicast QoS monitoring subscription, the VAL server sends an HTTP DELETE request message to the NRM server, on the corresponding "Individual Unicast Monitoring Subscription" resource representation URI as specified in clause 7.4.2.2.3.3.1.

Upon receiving the HTTP DELETE request message, the NRM server shall:

1. verify the identity of the VAL server and check if the VAL server is authorised to Unsubscribe from the "Individual Unicast Monitoring Subscription" associated with the Resource URI;
2. if the VAL server is authorized to unsubscribe from Unicast QoS Monitoring interact with the NEF to terminate the related QoS monitoring subscriptions;
3. delete the related "Individual Unicast Monitoring Subscription" subscription resource at the NRM server; and
4. upon success, respond to the VAL server with a "204 No Content" status.

5.5.3.2.4 Notify_Unicast_QoS_Monitoring

5.5.3.2.4.1 General

This service operation is used by the NRM server to notify the VAL server of a unicast QoS monitoring data.

5.5.3.2.4.2 NRM server notifies for Unicast QoS Monitoring using Notify_Unicast_QoS_Monitoring

The NRM server receives unicast QoS monitoring data by means of notifications provided by the NEF. The NRM server coordinates and aggregates the received information from the NEF notifications and determines whether to send a notification to the VAL server based on the VAL server subscription's reporting requirements. For event-triggered reporting, the NRM server notifies the VAL server when any given event is triggered. For a VAL group or a list of VAL UEs, the NRM server aggregates QoS monitoring data for each UE belonging to the group or the list; for a VAL stream, the NRM server aggregates the QoS monitoring data for the stream.

The NRM server stops reporting according to the VAL server subscription's termination of reporting requirements. In the case user-triggered termination of reporting is requested or no termination of reporting requirement are provided, the NRM server terminates the Unicast Monitoring Subscription after receiving an explicit request from the VAL Server as specified in clause 5.5.3.2.3. The NRM server may also store internally the QoS monitoring data as needed for later retrieval.

In order to notify the VAL server about Unicast QoS Monitoring information updates, the NRM server shall send an HTTP POST request message to the VAL server targeting the notification URI provided during subscription creation as specified in clause 5.5.3.2.2.2.

Upon receiving the HTTP POST request message, the VAL server shall:

1. process the Unicast QoS Monitoring notification; and
2. upon success, respond to the NRM server with a "204 No Content" status code.

5.5.3.2.5 Obtain_Unicast_QoS_Monitoring_Data

5.5.3.2.5.1 General

This service operation is used by a VAL server to obtain the QoS monitoring data from the NRM server for a time period of interest either in the past or in the present (i.e. current time). This service operation is supported via the Subscribe_Unicast_QoS_Monitoring service operation using the immediate reporting and one-time reporting mechanisms as defined in clause 5.5.3.2.2.2.

5.6 Events APIs

5.6.1 SS_Events API

5.6.1.1 Service Description

5.6.1.1.1 Overview

The SS_Events API, allows a VAL server via LM-S, GM-S, CM-S reference points to subscribe and unsubscribe from SEAL events and to receive notifications from the Location Management Server, Group Management Server and Configuration Management Server respectively.

5.6.1.2 Service Operations

5.6.1.2.1 Introduction

The service operations defined for the SS_Events API are shown in the table 5.6.1.2.1-1.

Table 5.6.1.2.1-1: Operations of the SS_Events API

Service operation name	Description	Initiated by
Subscribe_Event	This service operation is used by VAL server to subscribe for events from SEAL servers.	VAL Server
Unsubscribe_Event	This service operation is used by VAL server to unsubscribe for events from SEAL servers.	VAL Server
Notify_Event	This service operation is used by SEAL servers to send the notifications to the VAL server.	SEAL servers (Location Management, Group Management, Configuration Management).
Update_Subscription	This service operation is used by VAL server to update its events subscription at SEAL server.	VAL Server

5.6.1.2.2 Subscribe_Event

5.6.1.2.2.1 General

This service operation is used by a VAL server to subscribe to the SEAL events.

5.6.1.2.2.2 Subscribing to SEAL events using Subscribe_Event service operation

To subscribe to SEAL events, the VAL server shall send an HTTP POST message to the SEAL server. The body of the HTTP POST message shall include VAL Server Identifier, Event Type, Event Filters, Reporting Requirements and a Notification Destination URI as specified in clause 7.5.1.2.2.3.1.

Upon receiving the above described HTTP POST message, the SEAL server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to subscribe to the SEAL events mentioned in the HTTP POST message;
2. if the VAL server is authorized to subscribe to the SEAL events, the SEAL server shall:
   a. create a new resource as specified in clause 7.5.1.2.1; and
   b. return the SEAL Resource URI in the response message.

5.6.1.2.3 Notify_Event

5.6.1.2.3.1 General

This service operation is used by the SEAL servers to send notifications to the VAL server.

5.6.1.2.3.2 Notifying SEAL events using Notify_Event service operation

To notify the SEAL events, the SEAL server shall send an HTTP POST message using the Notification Destination URI received in the subscription request. The body of the HTTP POST message shall include an Event Notification and SEAL Resource URI.

Upon receiving the HTTP POST message, the VAL server shall process the Event Notification.

5.6.1.2.4 Unsubscribe_Event

5.6.1.2.4.1 General

This service operation is used by a VAL server to un-subscribe from the SEAL events.

5.6.1.2.4.2 Unsubscribing from SEAL events using Unsubscribe_Event service operation

To unsubscribe from SEAL events, the VAL server shall send an HTTP DELETE message to the resource representing the event in the SEAL server as specified in clause 7.5.1.2.3.3.1.

Upon receiving the HTTP DELETE message, the SEAL sever shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to Unsubscribe from the SEAL event associated with the SEAL Resource URI; and
2. if the VAL server is authorized to unsubscribe from the SEAL events, the SEAL server shall delete the resource pointed by the SEAL Resource URI

5.6.1.2.5 Update_Subscription

5.6.1.2.5.1 General

This service operation is used by a VAL server to update its SEAL events subscription.

5.6.1.2.5.2 Updating the SEAL events subscription using Update_Subscription service operation

If the "SubscUpdate" feature as defined in clause 7.5.1.6 is supported, then to request the update/modification of an existing Individual SEAL Events Subscription, the VAL server shall send a HTTP PATCH request (for partial modification) or PUT request (for fully replacement) message to the SEAL server on resource URI "Individual SEAL

Events Subscription" resource as specified in clause 7.5.1.2.3.3.2 for HTTP PATCH message and in clause 7.5.1.2.3.3.3 for HTTP PUT message.

Upon receiving the HTTP PATCH or PUT message from the VAL server, the SEAL server shall:

1. check the update of the existing Individual SEAL Events Subscription from the VAL server is authorized or not;
2. if the VAL server is authorized to update the SEAL Events Subscription, then the SEAL server shall replace/modify the existing resource "Individual SEAL Events Subscription", respond to the VAL server with "204 No Content", or "200 OK" with the updated Individual SEAL Events Subscription message.

5.7 Key management APIs

5.7.1 SS_KeyInfoRetrieval API

5.7.1.1 Service Description

5.7.1.1.1 Overview

As specified in 3GPP TS 33.434 [26], the SS_KeyInfoRetrieval API, allows the VAL server via KM-S reference point to obtain the VAL service specific key management information from the key management server.

5.7.1.2 Service Operations

5.7.1.2.1 Introduction

The service operation defined for SS_KeyInfoRetrieval API is shown in the table 5.7.1.2.1-1.

Table 5.7.1.2.1-1: Operations of the SS_ KeyInfoRetrieval API

Service operation name	Description	Initiated by
Obtain_Key_Info	This service operation is used by VAL server to obtain key management information.	VAL server

5.7.1.2.2 Obtain_Key_Info

5.7.1.2.2.1 General

This service operation is used by the VAL server to obtain VAL service specific key management information.

5.7.1.2.2.2 VAL server obtaining VAL service specific key material using Obtain_Key_Info service operation

To obtain key management information specific to VAL service, the VAL server shall send HTTP GET request message to key management server, on Key records resource collection URI, with query parameters VAL service ID and optionally VAL user ID or VAL UE ID, as specified in 7.6.1.2.2.3.1.

Upon receiving the HTTP GET message as described above, the key management server shall:

1. verify the identity of the VAL server and check if the VAL server is authorized to obtain key management information specific to VAL service, VAL user or VAL UE, the URI in the request is of target SEAL KMS and date/time of the request is in recent time window;
2. if the VAL server is authorized to obtain the requested key management information, the key management server shall;

a. return in the response message with key management information corresponding to the query parameters that were sent in the request message.

5.8 Network slice capability Enablement APIs

5.8.1 SS_NetworkSliceAdaptation API

5.8.1.1 Service Description

5.8.1.1.1 Overview

As specified in 3GPP TS 23.434 [2], the SS_NetworkSliceAdaptation API, enables a VAL server to communicate with the Network Slice Capability Enablement (NSCE) server for network slice adaptation over the NSCE-S reference point.

5.8.1.2 Service Operations

5.8.1.2.1 Introduction

The service operation defined for SS_NetworkSliceAdaptation API is shown in the table 5.8.1.2.1-1.

Table 5.8.1.2.1-1: Operations of the SS_NetworkSliceAdaptation API

Service operation name	Description	Initiated by
Network_slice_adaptation	This service operation is used by a VAL server to request network slice adaptation to the NSCE server.	VAL server

5.8.1.2.2 Network_slice_adaptation

5.8.1.2.2.1 General

This service operation is used by a VAL server to request network slice adaptation to the NSCE server.

5.8.1.2.2.2 VAL server requesting network slice adaptation using Network_slice_adaptation service operation

To request network slice adaptation, the VAL server shall send an HTTP POST request message (i.e. custom operation "Request") to the NSCE server, with the request body containing the NwSliceAdptInfo data structure which shall include the parameters VAL service ID and list of VAL UE ID(s), and may include the parameters Network slice adaptation cause, Requested S-NSSAI and Requested DNN, as specified in clause 7.7.1.3.2.

Upon reception of the HTTP POST request message as described above, the NSCE server shall:

1. process the request and trigger the network slice configuration per VAL UE within the VAL Application to provide the updated S-NSSAI and DNN per VAL UE;

2. send guidance with the information (i.e., the updated S-NSSAI and DNN per VAL UE) to the PCF via NEF as part of the AF-driven guidance for URSP determination to 5G system, using Nnef_ServiceParameter API as defined in 3GPP TS 29.522 [28]; and

3. after receiving a successful response from the NEF, send an HTTP 204 No content response to the VAL server confirming the fulfilment of the network slice adaptation request per VAL application.

6 SEAL Design Aspects Common for All APIs

6.1 General

SEAL APIs allow secure access to the capabilities provided by SEAL.

This document specifies the procedures triggered at different functional entities as a result of API invocation requests and event notifications. The stage-2 level requirements and signalling flows are defined in 3GPP TS 23.434 [2].

Several design aspects, as mentioned in the following clauses, are specified in 3GPP TS 29.122 [3] and referenced by this specification.

6.2 Data Types

6.2.1 General

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 Specification [15] can also be referenced from data structures defined in the subsequent clauses.

NOTE: As a convention, data types names in the present specification are with an upper-case letter in the beginning. Parameters are with a lower-case letter in the beginning. As an exception, data types that are also defined in OpenAPI Specification [15] can use a lower-case case letter in the beginning for consistency.

Table 6.2.1-1 specifies data types re-used by the SEAL from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the SEAL.

Table 6.2.1-1: Re-used Data Types

Data type	Reference	Comments
Uri	3GPP TS 29.122 [3]	
TestNotification	3GPP TS 29.122 [3]	Following clarifications apply: - The SCEF is the SEAL server; and - The SCS/AS is the VAL server.
WebsockNotifConfig	3GPP TS 29.122 [3]	Following clarifications apply: - The SCEF is the SEAL server; and - The SCS/AS is the VAL server.

6.2.2 Referenced structured data types

Table 6.2.2-1 lists structured data types defined in this specification referenced by multiple services:

Table 6.2.2-1: Referenced Structured Data Types

Data type	Reference	Description
VALGroupDocument	Clause 7.2.1.4.2.2	VAL Group document information.
ProfileDoc	Clause 7.3.1.4.2.2	VAL User or VAL UE profile information.

6.2.3 Referenced Simple data types and enumerations

Following simple data types defined in Table 6.2.3-1 are applicable to several APIs in this document:

Table 6.2.3-1: Simple data types applicable to several APIs

Type name	Reference	Description

6.3 Usage of HTTP

For SEAL APIs, support of HTTP/1.1 (IETF RFC 7230 [5], IETF RFC 7231 [6], IETF RFC 7232 [7], IETF RFC 7233 [8], IETF RFC 7234 [9] and IETF RFC 7235 [10]) over TLS is mandatory and support of HTTP/2 (IETF RFC 7540 [12]) over TLS is recommended.

A functional entity desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 7540 [12].

Usage of HTTP over TLS and the TLS profiles shall be as specified in clause 5.1.1.4 of 3GPP TS 33.434 [26].

6.4 Content type

The bodies of HTTP request and successful HTTP responses shall be encoded in JSON format (see IETF RFC 8259 [13]).

The MIME media type that shall be used within the related Content-Type header field is "application/json", as defined in IETF RFC 8259 [13].

The JSON objects defined in clause 5.2.3 of 3GPP TS 29.122 [3] for the HTTP PATCH request shall be supported.

NOTE: This release only supports the content type JSON.

6.5 URI structure

6.5.1 Resource URI structure

All API URIs of SEAL APIs shall be:

{apiRoot}/<apiName>/<apiVersion>

"apiRoot" is configured by means outside the scope of the present document. It includes the scheme ("https"), host and optional port, and an optional prefix string. "apiName" and "apiVersion" shall be set dependent on the API, as defined in the corresponding clauses below.

All resource URIs in the clauses below are defined relative to the above root API URI.

NOTE 1: The "apiVersion" will only be increased if the new API version contains backward incompatible changes. Otherwise, the supported feature mechanism defined in clause 6.8 can be used to negotiate extensions.

NOTE 2: A different root structure can be used when the resource URI is preconfigured in the API invoking entity.

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>

6.5.2 Custom operations URI structure

The custom operation definition is in Annex C of 3GPP TS 29.501 [14].

The URI of a custom operation which is associated with a resource shall have the following structure:

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

Custom operations can also be associated with the service instead of a resource. The URI of a custom operation which is not associated with a resource shall have the following structure:

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

In the above URI structures, "apiRoot", "apiName", "apiVersion" and "apiSpecificResourceUriPart" are as defined in clause 6.5.1 and "custOpName" represents the name of the custom operation as defined in clause 5.1.3.2 of 3GPP TS 29.501 [14]

6.6 Notifications

The functional entities

- shall support the delivery of notifications using a separate HTTP connection towards an address;
- may support testing delivery of notifications; and
- may support the delivery of notification using WebSocket protocol (see IETF RFC 6455 [4]),

as described in 3GPP TS 29.122 [3], with the following clarifications:

- the SCEF is the SEAL server; and
- the SCS/AS is the Subscriber.

6.7 Error Handling

Response bodies for error handling, as described in 3GPP TS 29.122 [3], are applicable to all APIs in the present specification unless specified otherwise, with the following clarifications:

- the SCEF is the SEAL server; and
- the SCS/AS is the functional entity invoking an API.

6.8 Feature negotiation

The functional entity invoking an API (i.e. the VAL server) and the SEAL server use feature negotiation procedures defined in 3GPP TS 29.122 [3] to negotiate the supported features, with the following clarifications:

- description of the SCEF applies to the SEAL server; and
- description of the SCS/AS applies to the functional entity invoking an API.

6.9 HTTP headers

The HTTP headers and the HTTP custom headers described in 3GPP TS 29.122 [3] are applicable to all APIs in this document.

6.10 Conventions for Open API specification files

The conventions for Open API specification files as specified in clause 5.2.9 of 3GPP TS 29.122 [3] shall be applicable for all APIs in this document.

7 SEAL API Definitions

7.1 Location management APIs

7.1.1 SS_LocationReporting API

7.1.1.1 API URI

The SS_LocationReporting service shall use the SS_LocationReporting API.

The request URIs used in HTTP requests from the VAL server towards the location management server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-lr".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.1.1.2.

7.1.1.2 Resources

7.1.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.1.1.2.1-1 depicts the resource URIs structure for the SS_LocationReporting API.

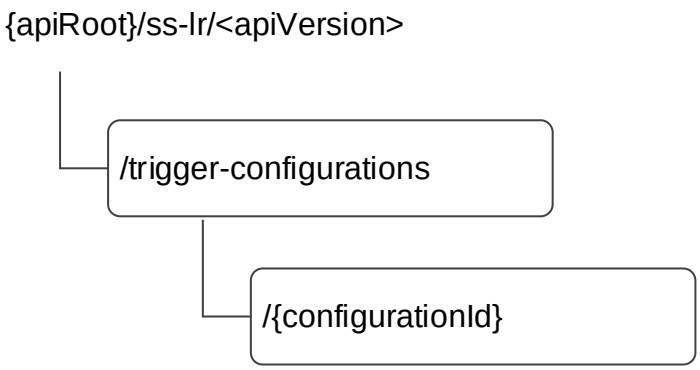

Figure 7.1.1.2.1-1: Resource URI structure of the SS_LocationReporting API

Table 7.1.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.1.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
SEAL Location Reporting Configurations	/trigger-configurations	POST	Creates a new Individual SEAL Location Reporting Configuration information.
Individual SEAL Location Reporting Configuration	/trigger-configurations/{configurationId}	GET	Retrieves an Individual SEAL Location Reporting Configuration information identified by {configurationId}.
		PUT	Updates an Individual SEAL Location Reporting Configuration information identified by {configurationId}.
		PATCH	Partially modifies an Individual SEAL Location Reporting Configuration information identified by {configurationId}.
		DELETE	Delete an Individual SEAL Location Reporting Configuration information identified by {configurationId}.

7.1.1.2.2 Resource: SEAL Location Reporting Configurations

7.1.1.2.2.1 Description

The resource allows the VAL server to request to create a new individual SEAL location reporting configuration information at the location management server.

7.1.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-lr/<apiVersion>/trigger-configurations**

This resource shall support the resource URI variables defined in the table 7.1.1.2.2.2-1.

Table 7.1.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.1.1.2.2.3 Resource Standard Methods

7.1.1.2.2.3.1 POST

Table 7.1.1.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.1.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.1.1.2.2.3.1-3.

Table 7.1.1.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
LocationReportConfiguration	M	1	Location reporting configuration information.

Table 7.1.1.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LocationReportConfiguration	M	1	201 Created	Location reporting configuration is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.1.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-lr/<apiVersion>/trigger-configurations/{configurationId}

7.1.1.2.2.4 Resource Custom Operations

None.

7.1.1.2.3 Resource: Individual SEAL Location Reporting Configuration

7.1.1.2.3.1 Description

The resource represents an individual SEAL location reporting configuration that is created at the location management server.

7.1.1.2.3.2 Resource Definition

Resource URI: **{apiRoot}/ss-lr/<apiVersion>/trigger-configurations/{configurationId}**

This resource shall support the resource URI variables defined in the table 7.1.1.2.3.2-1.

Table 7.1.1.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5
configurationId	string	Represents an individual SEAL location reporting configuration resource.

7.1.1.2.3.3 Resource Standard Methods

7.1.1.2.3.3.1 GET

This operation retrieves an individual SEAL location reporting configuration information. This method shall support the URI query parameters specified in table 7.1.1.2.3.3.1-1.

Table 7.1.1.2.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.1.1.2.3.3.1-2 and the response data structures and response codes specified in table 7.1.1.2.3.3.1-3.

Table 7.1.1.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.1.1.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LocationReportConfiguration	M	1	200 OK	The location reporting configuration information.
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.1.2.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.1.1.2.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.1.1.2.3.3.2 PUT

This operation updates the individual SEAL location reporting configuration. This method shall support the URI query parameters specified in table 7.1.1.2.3.3.2-1.

Table 7.1.1.2.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.1.1.2.3.3.2-2 and the response data structures and response codes specified in table 7.1.1.2.3.3.2-3.

Table 7.1.1.2.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
LocationReportConfiguration	M	1	Updated details of the location reporting configuration.

Table 7.1.1.2.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LocationReportConfiguration	M	1	200 OK	The configuration is updated successfully and the updated configuration information returned in the response.
n/a			204 No Content	The location reporting configuration updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.1.2.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.1.1.2.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.1.1.2.3.3.3 DELETE

This operation deletes the individual SEAL location reporting configuration. This method shall support the URI query parameters specified in table 7.1.1.2.3.3.3-1.

Table 7.1.1.2.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.1.1.2.3.3.3-2 and the response data structures and response codes specified in table 7.1.1.2.3.3.3-3.

Table 7.1.1.2.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.1.1.2.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual configuration matching the configurationId is deleted.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.1.2.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 7.1.1.2.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

7.1.1.2.3.3.4 PATCH

This method shall support the URI query parameters specified in table 7.1.1.2.3.3.4-1.

Table 7.1.1.2.3.3.4-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.1.1.2.3.3.4-2 and the response data structures and response codes specified in table 7.1.1.2.3.3.4-3.

Table 7.1.1.2.3.3.4-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
LocationReportConfigurationPatch	M	1	Contains the modifications to be applied to the Individual SEAL Location Reporting Configuration resource.

Table 7.1.1.2.3.3.4-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LocationReportConfiguration	M	1	200 OK	Individual SEAL Location Reporting Configuration resource is modified successfully and representation of the modified Individual SEAL Location Reporting Configuration resource is returned.
n/a			204 No Content	The Individual SEAL Location Reporting Configuration resource is updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.1.2.3.3.4-4: Headers supported by the 307 Response Code on this resource

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

Table 7.1.1.2.3.3.4-5: Headers supported by the 308 Response Code on this resource

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

7.1.1.2.3.4 Resource Custom Operations

None.

7.1.1.3 Notifications

None.

7.1.1.4 Data Model

7.1.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API.

Table 7.1.1.4.1-1 specifies the data types defined specifically for the SS_LocationReporting API service.

Table 7.1.1.4.1-1: SS_LocationReporting API specific Data Types

Data type	Section defined	Description	Applicability
LocationReportConfiguration	7.1.1.4.2.2		
LocationReportConfigurationPatch	7.1.1.4.2.3	Used to partially update Individual SEAL Location Reporting Configuration resource.	PatchUpdate

Table 7.1.1.4.1-2 specifies data types re-used by the SS_LocationReporting API service.

Table 7.1.1.4.1-2: SS_LocationReporting API Re-used Data Types

Data type	Reference	Comments	Applicability
Accuracy	3GPP TS 29.122 [3]		
DateTime	3GPP TS 29.571 [21]		
DurationSec	3GPP TS 29.571 [21]		
SupportedFeatures	3GPP TS 29.571 [21]	Used to negotiate the applicability of optional features defined in table 7.1.1.6-1.	
ValTargetUe	Clause 7.3.1.4.2.3	Used to indicate either VAL User ID or VAL UE ID, to which location reporting applies.	

7.1.1.4.2 Structured data types

7.1.1.4.2.1 Introduction

7.1.1.4.2.2 Type: LocationReportConfiguration

Table 7.1.1.4.2.2-1: Definition of type LocationReportConfiguration

Attribute name	Data type	P	Cardinality	Description	Applicability
valServerId	string	M	1	Represents the VAL server identifier.	
valTgtUe	ValTargetUe	M	1	Represents the VAL User ID or VAL UE ID to which the location reporting applies.	
immRep	boolean	O	0..1	Indication of immediate reporting. If included, when it is set to true it indicates immediate reporting of the subscribed events, if available. Otherwise, reporting will occur when the event is met.	
monDur	DateTime	O	0..1	Represents the time at which the subscription ceases to exist (i.e the reporting trigger becomes invalid). If omitted, there is no time limit.	
repPeriod	DurationSec	O	0..1	Indicates the time interval between successive location reports.	
accuracy	Accuracy	O	0..1	Represents the desired level of accuracy of the requested location information.	
suppFeat	SupportedFeatures	O	0..1	Used to negotiate the supported features of the API as defined in clause 7.1.1.6. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

7.1.1.4.2.3 Type: LocationReportConfigurationPatch

Table 7.1.1.4.2.3-1: Definition of type LocationReportConfigurationPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
valTgtUe	ValTarget Ue	O	1	Represents the VAL User ID or VAL UE ID to which the location reporting applies.	
monDur	DateTime	O	0..1	Represents the time at which the subscription ceases to exist (i.e the reporting trigger becomes invalid). If omitted, there is no time limit.	
repPeriod	DurationSec	O	0..1	Indicates the time interval between successive location reports.	
accuracy	Accuracy	O	0..1	Represents the desired level of accuracy of the requested location information.	

7.1.1.4.3 Simple data types and enumerations

7.1.1.5 Error Handling

General error responses are defined in clause 6.7.

7.1.1.6 Feature negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.1.1.6-1: Supported Features

Feature number	Feature Name	Description
1	PatchUpdate	Indicates the support of the PATCH method for updating an Individual SEAL Location Reporting Configuration resource.

7.1.2 SS_LocationAreaInfoRetrieval API

7.1.2.1 API URI

The request URI used in each HTTP request from the VAL server towards the location management server shall have the structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-lair".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.1.2.2.

7.1.2.2 Resources

7.1.2.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.1.2.2.1-1 depicts the resource URIs structure for the SS_LocationAreaInfoRetrieval API.

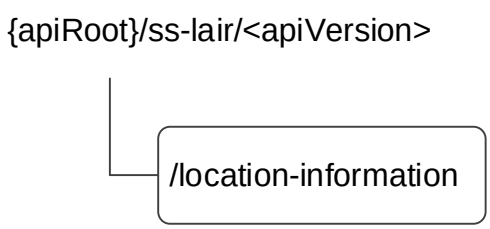

Figure 7.1.2.2.1-1: Resource URI structure of the SS_LocationAreaInfoRetrieval API

Table 7.1.2.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.1.2.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Location Information	/location-information	GET	Obtains the UE(s) information in an application defined proximity range of a location.

7.1.2.2.2 Resource: Location Information

7.1.2.2.2.1 Description

The Location Information resource represents the collection of UE(s) location information at the location management server.

7.1.2.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-lair/<apiVersion>/location-information**

This resource shall support the resource URI variables defined in the table 7.1.2.2.2.2-1.

Table 7.1.2.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.1.2.2.2.3 Resource Standard Methods

7.1.2.2.2.3.1 GET

This operation obtains the UE(s) information in an application defined proximity range of a location. This method shall support the URI query parameters specified in table 7.1.2.2.2.3.1-1.

Table 7.1.2.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
location-info	LocationInfo	M	1	Location information around which the UE(s) information is requested.
range	Float	M	1	The range information over which the UE(s) information is required, expressed in meters. Minimum = 0

This method shall support the request data structures specified in table 7.1.2.2.2.3.1-2 and the response data structures and response codes specified in table 7.1.2.2.2.3.1-3.

Table 7.1.2.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.1.2.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(LMInformation)	O	1..N	200 OK	The UE(s) information in an application defined proximity range of a location
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative location management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.1.2.2.2.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.1.2.2.2.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.1.2.2.4 Resource Custom Operations

None.

7.1.2.3 Notifications

None.

7.1.2.4 Data Model

7.1.2.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API.

Table 7.1.2.4.1-1 specifies the data types defined specifically for the SS_LocationAreaInfoRetrieval API service.

Table 7.1.2.4.1-1: SS_LocationAreaInfoRetrieval API specific Data Types

Data type	Section defined	Description	Applicability

Table 7.1.2.4.1-2 specifies data types re-used by the SS_LocationAreaInfoRetrieval API service.

Table 7.1.2.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
Float	3GPP TS 29.571 [21]	Used to represent number of range.	
Locationinfo	3GPP TS 29.122 [3]	Location information	
LMInformation	7.5.1.4.2.8	The location information for a VAL User ID or a VAL UE ID.	

7.1.2.4.2 Structured Data Types

None.

7.1.2.4.3 Simple data types and enumerations

None.

7.1.2.5 Error Handling

General error responses are defined in clause 6.7.

7.1.2.6 Feature Negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.1.2.6-1: Supported Features

Feature number	Feature Name	Description

7.2 Group management APIs

7.2.1 SS_GroupManagement API

7.2.1.1 API URI

The SS_GroupManagement service shall use the SS_GroupManagement API.

The request URIs used in HTTP requests from the VAL server towards the Group management server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-gm".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.2.1.2

7.2.1.2 Resources

7.2.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.2.1.2.1-1 depicts the resource URIs structure for the SS_GroupManagement API.

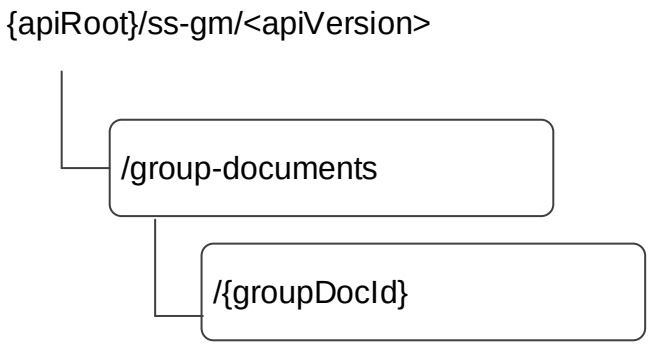

Figure 7.2.1.2.1-1: Resource URI structure of the SS_GroupManagement API

Table 7.2.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.2.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
VAL Group Documents	/group-documents	POST	Create a new VAL group document.
		GET	Retrieve VAL group documents according to the query parameters. If there are no query parameters, do not fetch any VAL group document.
Individual VAL Group Document	/group-documents/{groupDocId}	GET	Retrieve an individual VAL group's membership and configuration information according to query parameter on the resource identified by {groupDocId}. If there are no query parameter, fetch the whole VAL group document resource identified by {groupDocId}.
		PUT	Update an individual VAL group's membership and configuration information identified by {groupDocId}.
		PATCH	Partially update an individual VAL group's membership and configuration information identified by {groupDocId}

7.2.1.2.2 Resource: VAL Group Documents

7.2.1.2.2.1 Description

The VAL Group Documents resource represents all the VAL group documents that are created at a given group management server.

7.2.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-gm/<apiVersion>/group-documents**

This resource shall support the resource URI variables defined in the table 7.2.1.2.2.2-1.

Table 7.2.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.2.1.2.2.3 Resource Standard Methods

7.2.1.2.2.3.1 POST

This method shall support the URI query parameters specified in table 7.2.1.2.2.3.1-1.

Table 7.2.1.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.2.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.2.1.2.2.3.1-3.

Table 7.2.1.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
VALGroupDocument	M	1	Details of the VAL group that needs to be created,

Table 7.2.1.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VALGroupDocument	M	1	201 Created	VAL group created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-gm/<apiVersion>/group-documents/{groupDocId}

7.2.1.2.2.3.2 GET

This operation retrieves VAL group documents satisfying filter criteria. This method shall support the URI query parameters specified in table 7.2.1.2.2.3.2-1.

Table 7.2.1.2.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
val-group-id	string	O	0..1	String identifying the VAL group.
val-service-id	string	O	0..1	String identifying the VAL service.

This method shall support the request data structures specified in table 7.2.1.2.2.3.2-2 and the response data structures and response codes specified in table 7.2.1.2.2.3.2 -3.

Table 7.2.1.2.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.2.1.2.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(VALGroupDocument)	M	0..N	200 OK	List of VAL group documents. This response shall include VAL group documents matching the query parameters provided in the request.
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.2.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.2.1.2.2.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.2.1.2.2.4 Resource Custom Operations

None.

7.2.1.2.3 Resource: Individual VAL Group Document

7.2.1.2.3.1 Description

The Individual VAL Group Document resource represents an individual group document that is created at a given group management server.

7.2.1.2.3.2 Resource Definition

Resource URI: **{apiRoot}/ss-gm/<apiVersion>/group-documents/{groupDocId}**

This resource shall support the resource URI variables defined in the table 7.2.1.2.3.2-1.

Table 7.2.1.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5
groupDocId	string	Represents an individual group document resource.

7.2.1.2.3.3 Resource Standard Methods

7.2.1.2.3.3.1 GET

This operation retrieves VAL group information satisfying filter criteria. This method shall support the URI query parameters specified in table 7.2.1.2.3.3.1-1.

Table 7.2.1.2.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
group-members	boolean	O	0..1	When set to 'true', it indicates the group management server to send the members list information of the VAL group. Set to false or omitted otherwise.
group-configuration	boolean	O	0..1	When set to 'true', it indicates the group management server to send the configuration information of the VAL group. Set to false or omitted otherwise.

This method shall support the request data structures specified in table 7.2.1.2.3.3.1-2 and the response data structures and response codes specified in table 7.2.1.2.3.3.1-3.

Table 7.2.1.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.2.1.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VALGroupDocument	M	1	200 OK	The VAL group information based on the request from the VAL server. This response shall include VAL group members list if group-members flag is set to true in the request, VAL group configuration information if the group-configuration flag is set to true in the request, VAL group identifier, whole VAL group document resource if both group-members and group-configuration flags are omitted/set to false in the request.
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.2.1.2.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.2.1.2.3.3.2 PUT

This operation updates the VAL group document. This method shall support the URI query parameters specified in table 7.2.1.2.3.3.2-1.

Table 7.2.1.2.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.2.1.2.3.3.2-2 and the response data structures and response codes specified in table 7.2.1.2.3.3.2-3.

Table 7.2.1.2.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
VALGroupDocument	M	1	Updated details of the VAL group document.

Table 7.2.1.2.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VALGroupDocument	M	1	200 OK	The VAL group document updated successfully and the updated VAL group document returned in the response.
n/a			204 No Content	The VAL group document updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.2.1.2.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.2.1.2.3.3.3 DELETE

This operation deletes the VAL group document. This method shall support the URI query parameters specified in table 7.2.1.2.3.3.3-1.

Table 7.2.1.2.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.2.1.2.3.3.3-2 and the response data structures and response codes specified in table 7.2.1.2.3.3.3-3.

Table 7.2.1.2.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.2.1.2.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual VAL group document matching the groupDocId is deleted.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative group management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 7.2.1.2.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

7.2.1.2.3.3.4 PATCH

This method shall support the URI query parameters specified in table 7.2.1.2.3.3.4-1.

Table 7.2.1.2.3.3.4-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.2.1.2.3.3.4-2 and the response data structures and response codes specified in table 7.2.1.2.3.3.4-3.

Table 7.2.1.2.3.3.4-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
VALGroupDocumentPatch	M	1	Contains the modifications to be applied to the Individual VAL Group Document resource.

Table 7.2.1.2.3.3.4-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VALGroupDocument	M	1	200 OK	Individual VAL Group Document resource is modified successfully and representation of the modified VAL Group Document resource is returned.
n/a			204 No Content	The Individual VAL Group Document resource is updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.2.1.2.3.3.4-4: Headers supported by the 307 Response Code on this resource

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

Table 7.2.1.2.3.3.4-5: Headers supported by the 308 Response Code on this resource

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

7.2.1.2.3.4 Resource Custom Operations

None.

7.2.1.3 Notifications

None.

7.2.1.4 Data Model

7.2.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API

Table 7.2.1.4.1-1 specifies the data types defined specifically for the SS_GroupManagement API service.

Table 7.2.1.4.1-1: SS_GroupManagement API specific Data Types

Data type	Section defined	Description	Applicability
VALGroupDoument	7.2.1.4.2.2	VAL group document details.	
VALGroupDocumentPatch	7.2.1.4.2.3	Represent partially update of VAL group document.	PatchUpdate

Table 7.2.1.4.1-2 specifies data types re-used by the SS_GroupManagement API service.

Table 7.2.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
SupportedFeatures	3GPP TS 29.571 [21]	Used to negotiate the applicability of optional features defined in table 7.2.1.6-1.	
LocationInfo	3GPP TS 29.122 [3]	The location information related to VAL group.	
ValTargetUe	Clause 7.3.1.4.2.3	Used to indicate either VAL User ID or VAL UE ID, to which location reporting applies.	
LocationArea5G	3GPP TS 29.122 [3]	The locations information related to the VAL group.	
ExternalGroupId	3GPP TS 29.122 [3]	Used to represent the the external group identifier related to the member UEs of the group.	
PduSessionType	3GPP TS 29.571 [21]	Identifies PDU Session Type.	

7.2.1.4.2 Structured data types

7.2.1.4.2.1 Introduction

7.2.1.4.2.2 Type: VALGroupDocument

Table 7.2.1.4.2.2-1: Definition of type VALGroupDocument

Attribute name	Data type	P	Cardinality	Description	Applicability
valGroupId	string	M	1	This is VAL group identity (VAL group ID) as per TS 23.434 [2], which is a unique identifier within the VAL service that represents a VAL group, set of VAL users or VAL UEs according to the VAL service.	
grpDesc	string	O	0..1	Text description of the VAL group.	
members	array(ValTargetUe)	O	1..N	List of VAL User IDs or VAL UE IDs, which are members of the VAL group.	
valGrpConf	string	O	0..1	Configuration data for the VAL group. Shall be present in HTTP POST request message from VAL server to Group Management server.	
valServiceIds	array(string)	O	1..N	List of VAL services whose communications enabled on the group.	
suppFeat	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in clause 6.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	
resUri	Uri	O	0..1	The URI for individual VAL group document resource. (NOTE 1)	
locInfo	LocationInfo	O	0..1	The location information related to the VAL group. This information is used to determine the members of the group.	
addLocInfo	LocationArea5G	O	0..1	The additional location information related to the VAL group. This information is used to determing the members of the group.	
extGrpId	ExternalGroupId	O	0..1	The external group identifier, identifying the member UEs of the VAL group at the 3GPP core network.	
com5GLanType	PduSessionType	O	0..1	Identifies the 5G LAN-Type communication. (NOTE 2)	
valSvcInf	string	O	0..1	VAL service specific information that may be present during group membership update and in the notification of the events "GM_GROUP_INFO_CHANGE" and "GM_GROUP_CREATE".	
NOTE 1: The "resUri" attribute is not modifiable by the VAL server. NOTE 2: The enumeration value "UNSTRUCTURED" in data type "PduSessionType" is not applicable.					

7.2.1.4.2.3 Type: VALGroupDocumentPatch

Table 7.2.1.4.2.3-1: Definition of type VALGroupDocumentPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
grpDesc	string	O	0..1	Text description of the VAL group.	
members	array(ValTargetUe)	O	1..N	List of VAL User IDs or VAL UE IDs, which are members of the VAL group.	
valGrpConf	string	O	0..1	Configuration data for the VAL group.	
valServiceIds	array(string)	O	1..N	List of VAL services whose communications enabled on the group.	
locInfo	LocationInfo	O	0..1	The location information related to the VAL group. This information is used to determine the members of the group.	
addLocInfo	LocationArea5G	O	0..1	The additional location information related to the VAL group. This information is used to determining the members of the group.	
extGrpId	ExternalGroupId	O	0..1	The external group identifier, identifying the member UEs of the VAL group at the 3GPP core network.	
com5GLanType	PduSessionType	O	0..1	Identifies the 5G LAN-Type communication. (NOTE 1)	
NOTE 1: The enumeration value "UNSTRUCTURED" in data type "PduSessionType" is not applicable.					

7.2.1.4.3 Simple data types and enumerations

None.

7.2.1.5 Error Handling

General error responses are defined in clause 6.7.

7.2.1.6 Feature negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.2.1.6-1: Supported Features

Feature number	Feature Name	Description
1	PatchUpdate	Indicates the support of the PATCH method for updating an Individual VAL Group Document resource.

7.3 Configuration management APIs

7.3.1 SS_UserProfileRetrieval API

7.3.1.1 API URI

The SS_UserProfileRetrieval service shall use the SS_UserProfileRetrieval API.

The request URIs used in HTTP requests from the VAL server towards the Configuration management server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-upr".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.3.1.2.

7.3.1.2 Resources

7.3.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.3.1.2.1-1 depicts the resource URIs structure for the SS_UserProfileRetrieval API.

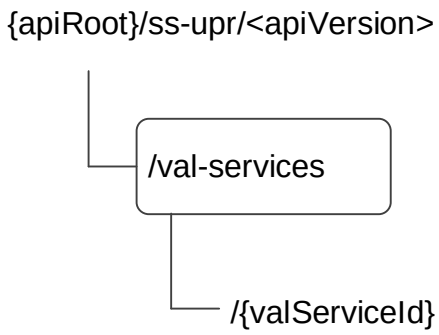

Figure 7.3.1.2.1-1: Resource URI structure of the SS_UserProfileRetrieval API

Table 7.3.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.3.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
VAL Services	/val-services	GET	Retrieve VAL User or VAL UE's profile information.

7.3.1.2.2 Resource: VAL Services

7.3.1.2.2.1 Description

The VAL Services resource represents all the VAL services that are created at a given configuration management server.

7.3.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-upr/<apiVersion>/val-services**

This resource shall support the resource URI variables defined in the table 7.3.1.2.2.2-1.

Table 7.3.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.3.1.2.2.3 Resource Standard Methods

7.3.1.2.2.3.1 GET

This operation retrieves VAL User or VAL UE profile information satisfying the filter criteria. This method shall support the URI query parameters specified in table 7.3.1.2.2.3.1-1.

Table 7.3.1.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
val-tgt-ue	ValTargetUe	M	1	Identifying a VAL target UE.
val-service-id	string	O	0..1	String identifying a VAL service.

This method shall support the request data structures specified in table 7.3.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.3.1.2.2.3.1 -3.

Table 7.3.1.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.3.1.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(ProfileDoc)	M	0..N	200 OK	List of VAL User / VAL UE profile documents. This response shall include user profile information matching the query parameters provided in the request.
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative configuration management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative configuration management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.3.1.2.2.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.3.1.2.2.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.3.1.2.2.4 Resource Custom Operations

None.

7.3.1.3 Notifications

None.

7.3.1.4 Data Model

7.3.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API

Table 7.3.1.4.1-1 specifies the data types defined specifically for the SS_UserProfileRetrieval API service.

Table 7.3.1.4.1-1: SS_UserProfileRetrieval API specific Data Types

Data type	Section defined	Description	Applicability
ProfileDoc	7.3.1.4.2.2	Profile information associated with VAL user ID or VAL UE ID.	
ValTargetUe	7.3.1.4.2.3	Information identifying a VAL user ID or VAL UE ID.	

Table 7.3.1.4.1-2 specifies data types re-used by the SS_UserProfileRetrieval API service.

Table 7.3.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
n/a			

7.3.1.4.2 Structured data types

7.3.1.4.2.1 Introduction

7.3.1.4.2.2 Type: ProfileDoc

Table 7.3.1.4.2.2-1: Definition of type ProfileDoc

Attribute name	Data type	P	Cardinality	Description	Applicability
profileInformation	string	M	1	Profile information associated with valTgtUe.	
valTgtUe	ValTargetUe	M	1	Unique identifier of a VAL user or a VAL UE.	

7.3.1.4.2.3 Type: ValTargetUe

Table 7.3.1.4.2.3-1: Definition of type ValTargetUe

Attribute name	Data type	P	Cardinality	Description	Applicability
valUserId	string	O	0..1	Unique identifier of a VAL user.	
valUeId	string	O	0..1	Unique identifier of a VAL UE.	
NOTE: Either "valUserId" or "valUeId" shall be provided.					

7.3.1.4.3 Simple data types and enumerations

None.

7.3.1.5 Error Handling

General error responses are defined in clause 6.7.

7.3.1.6 Feature negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.3.1.6-1: Supported Features

Feature number	Feature Name	Description

7.4 Network resource management APIs

7.4.1 SS_Network_Resource_Adaptation API

7.4.1.1 API URI

The SS_Network_Resource_Adaptation service shall use the SS_Network_Resource_Adaptation API.

The request URIs used in HTTP requests from the VAL server towards the NRM server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-nra".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.4.1.2

7.4.1.2 Resources

7.4.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.4.1.2.1-1 depicts the resource URIs structure for the SS_NetworkResourceAdaptation API.

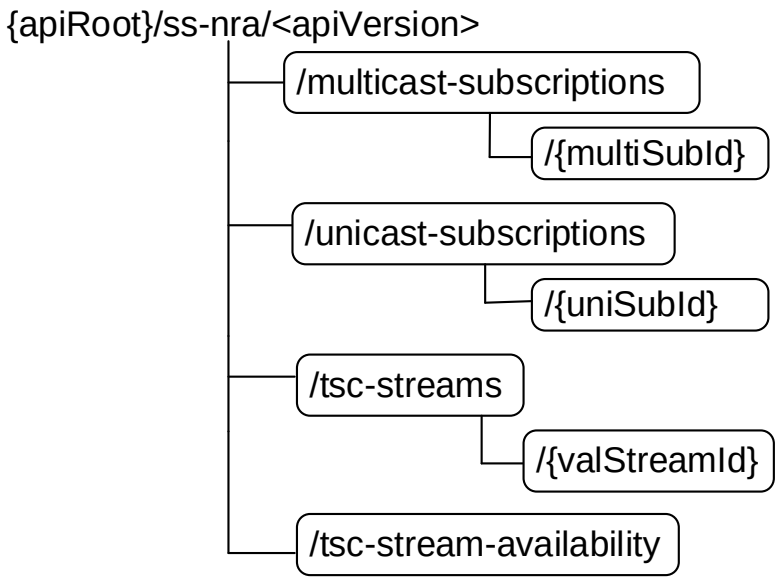

Figure 7.4.1.2.1-1: Resource URI structure of the SS_NetworkResourceAdaptation API

Table 7.4.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.4.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Multicast Subscriptions	/multicast-subscriptions	POST	Create a new Individual Multicast Subscription resource.
Individual Multicast Subscription	/multicast-subscriptions/{multiSubId}	GET	Read an Individual Multicast Subscription resource.
		DELETE	Remove an Individual Multicast Subscription resource.
Unicast Subscriptions	/unicast-subscriptions	POST	Create a new Individual Unicast Subscription resource.
Individual Unicast Subscription	/unicast-subscriptions/{uniSubId}	GET	Read an Individual Unicast Subscription resource.
		DELETE	Remove an Individual Unicast Subscription resource.
TSC Stream Availability	/tsc-stream-availability	GET	Retrieve TSC stream availability information.
TSC Streams	/tsc-streams	GET	Retrieve TSC stream information.
Individual TSC Stream	/tsc-streams/{valStreamId}	GET	Read an Individual TSC stream resource.
		PUT	Create a new Individual TSC stream resource.
		DELETE	Remove an Individual TSC stream resource.
		GET	Read an Individual TSC stream resource.

7.4.1.2.2 Resource: Multicast Subscriptions

7.4.1.2.2.1 Description

7.4.1.2.2.2 Resource Definition

Resource URI: {apiRoot}/ss-nra/<apiVersion>/multicast-subscriptions

This resource shall support the resource URI variables defined in table 7.4.1.2.2.2-1.

Table 7.4.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.4.1.2.2.3 Resource Standard Methods

7.4.1.2.2.3.1 POST

Table 7.4.1.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 7.4.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.4.1.2.2.3.1-3.

Table 7.4.1.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
MulticastSubscription	M	1	

Table 7.4.1.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MulticastSubscription	M	1	201 Created	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-nra/<apiVersion>/multicast-subscriptions/{multiSubId}

7.4.1.2.2.4 Resource Custom Operations

None.

7.4.1.2.3 Resource: Individual Multicast Subscription

7.4.1.2.3.1 Description

7.4.1.2.3.2 Resource Definition

Resource URI: {apiRoot}/ss-nra/<apiVersion>/multicast-subscriptions/{multiSubId}

This resource shall support the resource URI variables defined in table 7.4.1.2.3.2-1.

Table 7.4.1.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	6.5
multiSubId	string	The multicast subscription identifier.

7.4.1.2.3.3 Resource Standard Methods

7.4.1.2.3.3.1 GET

Table 7.4.1.2.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.3.3.1-2 and the response data structures and response codes specified in table 7.4.1.2.3.3.1-3.

Table 7.4.1.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MulticastSubscription	M	1	200 OK	
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.3.3.2 DELETE

Table 7.4.1.2.3.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.3.3.2-2 and the response data structures and response codes specified in table 7.4.1.2.3.3.2-3.

Table 7.4.1.2.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual Multicast Subscription resource was deleted.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.3.4 Resource Custom Operations

None.

7.4.1.2.4 Resource: Unicast Subscriptions

7.4.1.2.4.1 Description

7.4.1.2.4.2 Resource Definition

Resource URI: {apiRoot}/ss-nra/<apiVersion>/unicast-subscriptions

This resource shall support the resource URI variables defined in table 7.4.1.2.4.2-1.

Table 7.4.1.2.4.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.4.1.2.4.3 Resource Standard Methods

7.4.1.2.4.3.1 POST

Table 7.4.1.2.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 7.4.1.2.4.3.1-2 and the response data structures and response codes specified in table 7.4.1.2.4.3.1-3.

Table 7.4.1.2.4.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
UnicastSubscription	M	1	

Table 7.4.1.2.4.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UnicastSubscription	M	1	201 Created	
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.4.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-nra/<apiVersion>/unicast-subscriptions/{uniSubId}

7.4.1.2.4.4 Resource Custom Operations

None.

7.4.1.2.5 Resource: Individual Unicast Subscription

7.4.1.2.5.1 Description

7.4.1.2.5.2 Resource Definition

Resource URI: {apiRoot}/ss-nra/<apiVersion>/unicast-subscriptions/{uniSubId}

This resource shall support the resource URI variables defined in table 7.4.1.2.5.2-1.

Table 7.4.1.2.5.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5.
uniSubId	string	The unicast subscription identifier.

7.4.1.2.5.3 Resource Standard Methods

7.4.1.2.5.3.1 GET

Table 7.4.1.2.5.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.5.3.1-2 and the response data structures and response codes specified in table 7.4.1.2.5.3.1-3.

Table 7.4.1.2.5.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.5.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UnicastSubscription	M	1	200 OK	
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.5.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.5.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.5.3.2 DELETE

Table 7.4.1.2.5.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.5.3.2-2 and the response data structures and response codes specified in table 7.4.1.2.5.3.2-3.

Table 7.4.1.2.5.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.5.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual Unicast Subscription resource was deleted.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] shall also apply.				

Table 7.4.1.2.5.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.5.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.5.4 Resource Custom Operations

None.

7.4.1.2.6 Resource: TSC Stream Availability

7.4.1.2.6.1 Description

The TSC stream availability represent for TSC stream availability discovery with the given stream specification.

7.4.1.2.6.2 Resource Definition

Resource URI: **{apiRoot}/ss-nra/<apiVersion>/tsc-stream-availability**

This resource shall support the resource URI variables defined in table 7.4.1.2.6.2-1.

Table 7.4.1.2.6.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5.

7.4.1.2.6.3 Resource Standard Methods

7.4.1.2.6.3.1 GET

This operation retrieves the TSC stream availability information. This method shall support the URI query parameters specified in table 7.4.1.2.6.3.1-1.

Table 7.4.1.2.6.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
stream-specs	array(StreamSpecification)	M	1..N	The MAC address(es) of the source DS-TT port(s) and the destination DS-TT port(s).

This method shall support the request data structures specified in table 7.4.1.2.6.3.1-2 and the response data structure and response codes specified in table 7.4.1.2.6.3.1-3, table 7.4.1.2.6.3.1-4 and table 7.4.1.2.6.3.1-5.

Table 7.4.1.2.6.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.6.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(TscStreamAvailability)	M	1..N	200 OK	List of TSC stream availability information, each including the stream specification and list of traffic specifications. This response shall include stream specification matching the query parameters provided in the request.
N/A	O	0..1	204 No Content	Indicates no stream specification matching with the query parameters, no TSC stream avaiability information.
N/A			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
N/A			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.4.1.2.6.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.6.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.6.4 Resource Custom Operations

None.

7.4.1.2.7 Resource: TSC streams

7.4.1.2.7.1 Description

The TSC streams represent the resources for TSC communication with the given stream specification.

7.4.1.2.7.2 Resource Definition

Resource URI: **{apiRoot}/ss-nra/<apiVersion>/tsc-streams**

This resource shall support the resource URI variables defined in table 7.4.1.2.7.2-1.

Table 7.4.1.2.7.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5.

7.4.1.2.7.3 Resource Standard Methods

7.4.1.2.7.3.1 GET

This method shall support the URI query parameters specified in the table 7.4.1.2.7.3.1-1.

Table 7.4.1.2.7.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
val-stream-ids	array(string)	O	1..N	Retrieval of all the TSC stream resources managed by the NRM server or the TSC Stream resource(s) identified by the VAL Stream ID(s).

This method shall support the request data structures specified in table 7.4.1.2.7.3.1-2 and the response data structure and response codes specified in table 7.4.1.2.7.3.1-3, table 7.4.1.2.7.3.1-4 and table 7.4.1.2.7.3.1-5.

Table 7.4.1.2.7.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.7.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(TscStream Data)	M	1..N	200 OK	Retrieval of TSC stream data information.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.1.2.7.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.7.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.7.4 Resource Custom Operations

None.

7.4.1.2.8 Resource: Individual TSC Stream

7.4.1.2.8.1 Description

7.4.1.2.8.2 Resource Definition

Resource URI: {apiRoot}/ss-nra/<apiVersion>/tsc-streams/{valStreamId}

This resource shall support the resource URI variables defined in table 7.4.1.2.8.2-1.

Table 7.4.1.2.8.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5.
valStreamId	string	The VAL Stream ID identifies the TSC stream.

7.4.1.2.8.3 Resource Standard Methods

7.4.1.2.8.3.1 GET

This operation retrieves an individual TSC stream information. This method shall support the URI query parameters specified in the table 7.4.1.2.8.3.1-1.

Table 7.4.1.2.8.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.8.3.1-2 and the response data structure and response codes specified in table 7.4.1.2.8.3.1-3, table 7.4.1.2.8.3.1-4 and table 7.4.1.2.8.3.1-5.

Table 7.4.1.2.8.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.1.2.8.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TscStreamData	M	1	200 OK	
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.1.2.8.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.8.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	String	M	1	An alternative URI of the resource located in an alternative network resource management server.

7.4.1.2.8.3.2 PUT

This operation create an individual TSC stream identified by VAL Stream ID. This method shall support the URI query parameters specified in the table 7.4.1.2.8.3.2-1.

Table 7.4.1.2.8.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.2.8.3.2-2 and the response data structure and response codes specified in table 7.4.1.2.8.3.2-3 and table 7.4.1.2.8.3.2-4.

Table 7.4.1.2.8.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
TscStreamData	M	1	TSC stream creation request data from the VAL server to the NRM server.

Table 7.4.1.2.8.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TscStreamData	M	1	201 Created	TSC stream created data response from the NRM server to the VAL server.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.1.2.8.3.2-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	String	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-nra/<apiVersion>/tsc-streams/{valStreamId}

7.4.1.2.8.3.3 DELETE

This operation deletes the individual TSC stream resource. This method shall support the URI query parameters specified in the table 7.4.1.2.8.3.3-1.

Table 7.4.1.2.8.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 7.4.1.2.8.3.3-2 and the response data structure and response codes specified in table 7.4.1.2.8.3.3-3, table 7.4.1.2.8.3.3-4 and table 7.4.1.2.8.3.3-5.

Table 7.4.1.2.8.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description

Table 7.4.1.2.8.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual TSC Stream resource was deleted.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative network resource management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.1.2.8.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.2.8.3.3-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.2.8.4 Resource Custom Operations

None.

7.4.1.3 Notifications

7.4.1.3.1 General

Table 7.4.1.3.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Notify_UP_Delivery_Mode	{notifUri}	POST	Report User Plane notification

7.4.1.3.2 Notify_UP_Delivery_Mode

7.4.1.3.2.1 Description

7.4.1.3.2.2 Notification definition

Callback URI: {**notifUri**}

This method shall support the URI query parameters specified in table 7.4.1.3.2.2-1.

Table 7.4.1.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.1.3.2.2-2 and the response data structures and response codes specified in table 7.4.1.3.2.2-3.

Table 7.4.1.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
UserPlaneNotification	M	1	

Table 7.4.1.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
n/a			307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative notification destination where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative notification destination where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] also apply.				

Table 7.4.1.3.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.1.3.2.2-5: Headers supported by the 308 Response Code on this resource

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

7.4.1.4 Data Model

7.4.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API

Table 7.4.1.4.1-1 specifies the data types defined specifically for the SS_NetworkResourceAdaptation API service.

Table 7.4.1.4.1-1: SS_NetworkResourceAdaptation API specific Data Types

Data type	Section defined	Description	Applicability
DeliveryMode	7.4.1.4.3.2		
MulticastSubscription	7.4.1.4.2.2		
NrmEvent	7.4.1.4.3.3		
NrmEventNotification	7.4.1.4.2.5		
ServiceAnnoucementMode	7.4.1.4.3.1		
StreamSpecification	7.4.1.4.2.9		
TrafficSpecification	7.4.1.4.2.10		
TscStreamAvailability	7.4.1.4.2.8		
UserPlaneNotification	7.4.1.4.2.4		
UnicastSubscription	7.4.1.4.2.3		
TrafficSpecInformation	7.4.1.4.2.7		
TscStreamData	7.4.1.4.2.6		

Table 7.4.1.4.1-2 specifies data types re-used by the SS_NetworkResourceAdaptation API service.

Table 7.4.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.571 [21]		
MacAddr48	3GPP TS 29.571 [21]	Identifies a MAC address.	
DurationSec	3GPP TS 29.122 [3]	Seconds of duration.	
LocalMbmsInfo	3GPP TS 29.486 [27]		LocalMBMS
MbmsLocArea	3GPP TS 29.122 [3]		
SupportedFeatures	3GPP TS 29.571 [21]		
Uint32	3GPP TS 29.571 [21]		
Uinteger	3GPP TS 29.571 [21]		
Uri	3GPP TS 29.571 [21]		
WebsockNotifConfig	3GPP TS 29.122 [3]		
ValTargetUe	7.3.1.4.2.3	Used to identify either a VAL User ID or a VAL UE ID.	
Ipv4Addr	3GPP TS 29.571 [21]		
Ipv6Addr	3GPP TS 29.571 [21]		
Port	3GPP TS 29.122 [3]		

7.4.1.4.2 Structured data types

7.4.1.4.2.1 Introduction

7.4.1.4.2.2 Type: MulticastSubscription

Table 7.4.1.4.2.2-1: Definition of type MulticastSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
valGroupId	string	M	1	The identity of the group that the MBMS bearer is requested for.	
anncMode	ServiceAnnoucementMode	M	1	Indicates whether the service announcement is sent by NRM server or by the VAL server.	
multiQosReq	string	M	1	The QoS requirement for the multicast.	
locArea	MbmsLocArea	O	0..1	Indicate the area where the MBMS bearer is requested for.	
duration	DateTime	O	0..1	Identifies the absolute time at which the subscription resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the VAL server. When omitted in the response, it indicates the resource is set to valid forever by the VAL server.	
tmgi	Uint32	O	0..1	TMGI. Shall be provided by the NRM server if announcement mode is set to VAL.	
localMbmsInfo	LocalMbmsInfo	O	0..1	Contains the local MBMS information. The information only can be provided by the NF service consumer in the trust domain.	LocalMBMS
localMbmsActInd	boolean	O	0..1	Set to true by the NF service consumer to indicate that the local MBMS is activated. Set to false or omitted otherwise.	LocalMBMS
notifUri	Uri	M	1	Identifies the notification URI where the NRM notification shall be sent to.	
reqTestNotif	boolean	O	0..1	Set to true by the NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
wsNotifCfg	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	M	1	This parameter shall be supplied by VAL server in the POST request that request the creation of a Multicast Subscription resource and shall be supplied in the reply of corresponding request.	
upIpv4Addr	Ipv4Addr	O	0..1	Ipv4address of the user plane. (NOTE)	
upIpv6Addr	Ipv6Addr	O	0..1	Ipv6address of the user plane. (NOTE)	
upPortNum	Port	O	0..1	UDP port number of the user plane.	
radioFreqs	array(Uint32)	O	1..N	The radio frequencies which may be provided by the NRM server.	
NOTE: At least one of upIpv4Addr or upIpv6Addr shall be provided by the NRM server.					

7.4.1.4.2.3 Type: UnicastSubscription

Table 7.4.1.4.2.3-1: Definition of type UnicastSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
valTgtUe	ValTarget Ue	M	1	The identity of the VAL user or VAL UE that the unicast bearer is requested for.	
uniQosReq	string	O	0..1	The QoS requirement for the unicast.	
duration	DateTime	O	0..1	Identifies the absolute time at which the subscription resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the VAL server. When omitted in the response, it indicates the resource is set to valid forever by the VAL server.	
notifUri	Uri	M	1	Identifies the notification URI where the NRM notification shall be sent to.	
reqTestNotif	Boolean	O	0..1	Set to true by the NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
wsNotifCfg	Websock NotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	Supported Features	O	1	This parameter may be supplied by VAL server in the POST request that request the creation of a Unicast Subscription resource and may be supplied in the reply of corresponding request.	

7.4.1.4.2.4 Type: UserPlaneNotification

Table 7.4.1.4.2.4-1: Definition of type UserPlaneNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	Uri	M	1	The subscription resource Uri to which this notification is related.	
eventNotifs	array(NrmEventNotification)	M	1..N	Notifications about Individual Events	

7.4.1.4.2.5 Type: NrmEventNotification

Table 7.4.1.4.2.5-1: Definition of type NrmEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	NrmEvent	M	1	Event that is notified.	
ts	DateTime	M	1	Time at which the event is observed.	
deliveryMode	DeliveryMode	C	0..1	Indicates delivery of the user data to the UE(s) via unicast mode or multicast mode. Shall be present if event is UP_DELIVERY_MODE.	
streamIds	array(string)	O	1..N	Indicates the media streams (unicast or multicast) to be used. May be present if event is UP_DELIVERY_MODE and NRM already has the streams available.	

7.4.1.4.2.6 Type: TscStreamData

Table 7.4.1.4.2.6-1: Definition of type TscStreamData

Attribute name	Data type	P	Cardinality	Description	Applicability
streamSpec	StreamSpecification	M	1	Stream specification includes MAC addresses of the source and destination DS-TT ports.	
trafficSpecInfo	TrafficSpecInformation	M	1	Traffic Specification Information includes Priority Code Point (PCP), MaxFrameInterval, MaxFrameSize, MaxIntervalFrames, MaxLatency, etc. (e.g. as described in IEEE 802.1Qcc [29] in clause 46.2).	

7.4.1.4.2.7 Type: TrafficSpecInformation

Table 7.4.1.4.2.7-1: Definition of type TrafficSpecInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
pcpValue	Uint32	M	1	The Priority Code Point (PCP) value identify the traffic class, with value between 0 to 7.	
maxFramInt	DurationSec	M	1	Maximum Frame Interval.	
maxFramSize	Uint32	M	1	Maximum frame size will transmit, excluding the overhead.	
maxIntFrames	Uint32	M	1	Maximum interval frames.	
maxLatency	Uint32	M	1	Indicates the end-to-end latency (including the UE-DS-TT residence times, UPF residence time, and propagation delays) in milliseconds.	

7.4.1.4.2.8 Type: TscStreamAvailability

Table 7.4.1.4.2.8-1: Definition of type TscStreamAvailability

Attribute name	Data type	P	Cardinality	Description	Applicability
streamSpec	StreamSpecification	M	1	Stream specification includes MAC addresses of the source and destination DS-TT ports.	
trafficSpecs	array(TrafficSpecification)	M	1..N	The traffic classes supported by the DS-TTs and available end-to-end maximum latency values.	

7.4.1.4.2.9 Type: StreamSpecification

Table 7.4.1.4.2.9-1: Definition of type StreamSpecification

Attribute name	Data type	P	Cardinality	Description	Applicability
srcMacAddr	MacAddr48	M	1	The MAC address of the source DS-TT port.	
dstMacAddr	MacAddr48	M	1	The MAC address of the destination DS-TT port.	

7.4.1.4.2.10 Type: TrafficSpecification

Table 7.4.1.4.2.10-1: Definition of type TrafficSpecification

Attribute name	Data type	P	Cardinality	Description	Applicability
trafficClass	Uint32	M	1	The traffic class supported by the DS-TTs with value between 0 to 7.	
e2eMaxLatency	Uinteger	M	1	Indicates the end to end maximum latency (including the UE-DS-TT residence times, UPF residence time, and propagation delays), in the units of milliseconds.	

7.4.1.4.3 Simple data types and enumerations

7.4.1.4.3.1 Enumeration: ServiceAnnoucementMode

Table 7.4.1.4.3.1-1: Enumeration ServiceAnnoucementMode

Enumeration value	Description	Applicability
NRM	NRM server performs the service announcement.	
VAL	VAL server performs the service announcement.	

7.4.1.4.3.2 Enumeration: DeliveryMode

Table 7.4.1.4.3.2-1: Enumeration DeliveryMode

Enumeration value	Description	Applicability
UNICAST	Unicast delivery	
MULTICAST	Multicast delivery	

7.4.1.4.3.3 Enumeration: NrmEvent

Table 7.4.1.4.3.3-1: Enumeration NrmEvent

Enumeration value	Description	Applicability
UP_DELIVERY_MODE	User Plane delivery mode.	

7.4.1.5 Error Handling

7.4.1.6 Feature negotiation

Table 7.4.1.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.6. This feature requires that the Notification_test_event feature is also supported.
3	LocalMBMS	Indicate the support of local MBMS transmission.

7.4.2 SS_NetworkResourceMonitoring API

7.4.2.1 API URI

The SS_NetworkResourceMonitoring service shall use the SS_NetworkResourceMonitoring API.

The request URIs used in HTTP requests from the VAL server towards the NRM server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-nrm".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.4.2.2

7.4.2.2 Resources

7.4.2.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.4.2.2.1-1 depicts the resource URIs structure for the SS_NetworkResourceMonitoring API.

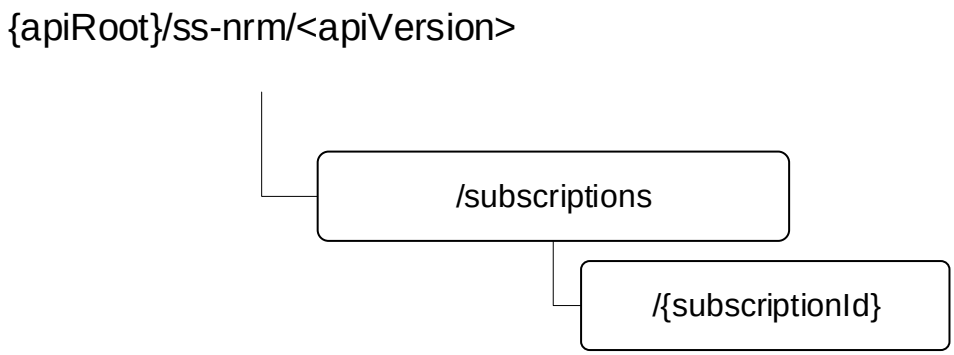

Figure 7.4.2.2.1-1: Resource URI structure of the SS_NetworkResourceMonitoring API

Table 7.4.2.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.4.2.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Unicast Monitoring Subscriptions	/subscriptions	POST	Create individual unicast monitoring subscription resource or obtain unicast QoS monitoring data for VAL UEs, VAL Group, or VAL Streams.
Individual Unicast Monitoring Subscription	/subscriptions/{subscriptionId}	DELETE	Remove an existing individual unicast monitoring subscription resource according to the subscriptionId.
		GET	Read an existing individual unicast monitoring subscription resource according to the subscriptionId.

7.4.2.2.2 Resource: Unicast Monitoring Subscriptions

7.4.2.2.2.1 Description

7.4.2.2.2.2 Resource Definition

Resource URI: {**apiRoot**}/**ss-nrm**/<**apiVersion**>/**subscriptions**

This resource shall support the resource URI variables defined in table 7.4.2.2.2.2-1.

Table 7.4.2.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.4.2.1.

7.4.2.2.2.3 Resource Standard Methods

7.4.2.2.2.3.1 POST

This method enables a VAL Server to request the creation of a unicast QoS monitoring subscription at the NRM server. This method shall support the URI query parameters specified in table 7.4.2.2.2.3.1-1.

Table 7.4.2.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 7.4.2.2.2.3.1-2 and the response data structures and response codes specified in table 7.4.2.2.2.3.1-3.

Table 7.4.2.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
MonitoringSubscription	M	1	

Table 7.4.2.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MonitoringSubscription	M	1	201 Created	The requested individual monitoring subscription resource is successfully created and a representation of the created resource is returned in the response body.
MonitoringReport	M	1	200 OK	The requested unicast QoS monitoring data is returned.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.2.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-nrm/<apiVersion>/subscriptions{subscriptionId}

7.4.2.2.2.4 Resource Custom Operations

None.

7.4.2.2.3 Resource: Individual Unicast Monitoring Subscription

7.4.2.2.3.1 Description

7.4.2.2.3.2 Resource Definition

Resource URI: {**apiRoot**}/**ss-nrm**/<**apiVersion**>/**subscriptions**/{**subscriptionId**}

This resource shall support the resource URI variables defined in table 7.4.2.2.3.2-1.

Table 7.4.2.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 7.4.2.1.
subscriptionId	string	Represents the identifier of an individual unicast monitoring subscription resource.

7.4.2.2.3.3 Resource Standard Methods

7.4.2.2.3.3.1 DELETE

This operation deletes the Individual Unicast Monitoring Subscription resource. This method shall support the URI query parameters specified in table 7.4.2.2.3.3.1-1.

Table 7.4.2.2.3.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.2.2.3.3.1-2 and the response data structures and response codes specified in table 7.4.2.2.3.3.1-3.

Table 7.4.2.2.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.2.2.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The Individual Unicast Monitoring Subscription resource matching the subscriptionId is deleted.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NRM server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NRM server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.4.2.2.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.2.2.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.4.2.2.3.3.2 GET

This operation reads the individual unicast monitoring subscription resource. This method shall support the URI query parameters specified in table 7.4.2.2.3.3.2-1.

Table 7.4.2.2.2.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 7.4.2.2.3.3.2-2 and the response data structures and response codes specified in table 7.4.2.2.3.3.2-3.

Table 7.4.2.2.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.4.2.2.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MonitoringSubscription	M	1	200 OK	The requested individual unicast monitoring subscription is returned.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NRM server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NRM server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.122 [3] shall also apply.				

Table 7.4.2.2.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.2.2.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.4.2.3 Notifications

7.4.2.3.1 General

Table 7.4.2.3.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Individual Unicast Monitoring Notification	{notifUri}	POST	Notify on updates of the individual monitoring resource accodring to the requested reporting settings.

7.4.2.3.2 Individual Unicast Monitoring Notification

7.4.2.3.2.1 Description

7.4.2.3.2.2 Notification definition

Callback URI: {**notifUri**}

This method shall support the URI query parameters specified in table 7.4.2.3.2.2-1.

Table 7.4.2.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.4.2.3.2.2-2 and the response data structures and response codes specified in table 7.4.2.3.2.2-3.

Table 7.4.2.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
MonitoringReport	M	1	Represents the reported monitoring data.

Table 7.4.2.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The notification is successfully received.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative VAL server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative VAL server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.4.2.3.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.4.2.3.2.2-5: Headers supported by the 308 Response Code on this resource

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

7.4.2.4 Data Model

7.4.2.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API

Table 7.4.2.4.1-1 specifies the data types defined specifically for the SS_NetworkResourceMonitoring API service.

Table 7.4.2.4.1-1: SS_NetworkResourceMonitoring API specific Data Types

Data type	Section defined	Description	Applicability
FailureReport	7.4.2.4.2.9	Represents the failure report indicating the VAL UE(s) or VAL Stream ID(s) for which the NRM server failed to obtain the requested data.	
FailureReason	7.4.2.4.3.3	Represents the failure reason.	
MeasurementData	7.4.2.4.2.3	Presents the aggregated measurement data.	
MeasurementDataType	7.4.2.4.3.1	Indicates the requested measurement data type.	
MeasurementPeriod	7.4.2.4.2.4	Indicates the measurement time period.	
MeasurementRequirements	7.4.2.4.2.6	Indicates the measurement requirements.	
MonitoringReport	7.4.2.4.2.2	Indicates the monitoring report for VAL UEs list, VAL Group, or VAL Stream.	
MonitoringSubscription	7.4.2.4.2.7	The monitoring subscription request.	
ReportingRequirements	7.4.2.4.2.5	Indicates the requested requirements of reporting.	
TerminationMode	7.4.2.4.3.2	Indicates the termination mode.	

Table 7.4.2.4.1-2 specifies data types re-used by the SS_NetworkResourceMonitoring API service.

Table 7.4.2.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
AverWindow	3GPP TS 29.571 [21]		
BitRate	3GPP TS 29.571 [21]		
DateTime	3GPP TS 29.571 [21]		
DurationSec	3GPP TS 29.571 [21]		
NotificationMethod	3GPP TS 29.508 [32]		
PacketLossRate	3GPP TS 29.571 [21]		
SupportedFeatures	3GPP TS 29.571 [21]		
Uinteger	3GPP TS 29.571 [21]		
Uri	3GPP TS 29.571 [21]		
ValTargetUe	clause 7.3.1.4.2.3	Used to identify either a VAL User ID or a VAL UE ID.	
WebsockNotifConfig	3GPP TS 29.122 [3]		

7.4.2.4.2 Structured data types

7.4.2.4.2.1 Introduction

7.4.2.4.2.2 Type: MonitoringReport

Table 7.4.2.4.2.2-1: Definition of type MonitoringReport

Attribute name	Data type	P	Cardinality	Description	Applicability
valUeIds	array(ValTargetUe)	C	1..N	List of VAL UEs whose measurement data is provided (NOTE).	
valGroupId	string	C	0..1	The group ID used for the VAL group for which measurement data is provided (NOTE).	
valStreamIds	array(string)	C	1..N	List of VAL stream IDs whose measurement data (NOTE).	
measData	MeasurementData	M	1	The aggregated measurement data.	
timestamp	DateTime	M	1	The timestamp of the measurement.	
failureRep	array(FailureReport)	C	1..N	The failure report from the NRM server indicating the VAL UE(s) or VAL Stream ID(s) whose measurement data is not obtained successfully and is not provided in the monitoring report. This attribute shall be provided by the NRM server when the requested measurement data is not obtained successfully for all the requested VAL UE(s) or VAL Stream ID(s).	
NOTE: Only one of these attributes shall be provided.					

7.4.2.4.2.3 Type: MeasurementData

Table 7.4.2.4.2.3-1: Definition of type MeasurementData

Attribute name	Data type	P	Cardinality	Description	Applicability
dlDelay	Uinteger	O	0..1	The downlink packet delay in milliseconds (NOTE).	
ulDelay	Uinteger	O	0..1	The uplink packet delay in milliseconds (NOTE).	
rtDelay	Uinteger	O	0..1	The round trip packet delay in milliseconds (NOTE).	
avgPlr	PacketLossRate	O	0..1	The average packet loss rate (NOTE).	
avgDataRate	BitRate	O	0..1	The average data rate (NOTE).	
maxDataRate	BitRate	O	0..1	The maximum data rate (NOTE).	
avrDlTrafficVol	Uinteger	O	0..1	The average traffic volume for downlink in bytes (NOTE).	
avrUlTrafficVol	Uinteger	O	0..1	The average traffic volume for uplink in bytes (NOTE).	
NOTE: At least one of the measurement indexes shall be provided.					

7.4.2.4.2.4 Type: MeasurementPeriod

Table 7.4.2.4.2.4-1: Definition of type MeasurementPeriod

Attribute name	Data type	P	Cardinality	Description	Applicability
measStartTime	DateTime	M	1	Indicate the starting time for the measurement.	
measDuration	DurationSec	M	1	Indicate the duration for the measurement starting from the measStartTime.	

7.4.2.4.2.5 Type: ReportingRequirements

Table 7.4.2.4.2.5-1: Definition of type ReportingRequirements

Attribute name	Data type	P	Cardinality	Description	Applicability
reportingMode	NotificationMethod	M	1	The indication of the requested reporting option: one-time, periodic or event-triggered (i.e. "ON_EVENT_DETECTION") This attribute may be set to the value "ONE_TIME" only if the "immRep" attribute is provided and set to "true"..	
reportingPeriod	DurationSec	C	0..1	Identifies the reporting time interval for the periodic reporting. (NOTE 1).	
reportingThr	MeasurementData	C	0..1	Identifies reporting threshold corresponding to the measurement index (NOTE 2).	
immRep	boolean	O	0..1	It indicates immediate reporting. When included and set to true, it indicates that immediate reporting of the subscribed event(s) is requested.	
repTerminMode	TerminationMode	O	0..1	The indication of the requested reporting termination mode: time-triggered, event-triggered (number of reports reached), event-triggered (threshold reached) or user-triggered. If absent, user-triggered reporting is used as the default termination mode.	
expirationTimer	DurationSec	C	0..1	Identifies the reporting time interval for the time triggered termination mode. (NOTE 3).	
maxNumRep	Uinteger	C	0..1	Indicates the maximum number of reports (number of reports reached). (NOTE 4).	
termThr	MeasurementData	C	0..1	Indicates the reporting termination threshold(s) corresponding to the measurement index(ex). (NOTE 5). For each measurement data type, the default condition is defined in table 7.4.2.4.2.3.	

NOTE 1: The "reportingPeriod" attribute shall be present only when the "reportingMode" attribute is set to "PERIODIC".
NOTE 2: The "reportingThr" attribute shall be present only when the "reportingMode" attribute is set to "EVENT_TRIGGERED".
NOTE 3: The "expirationTimer" attribute shall be present only if the "repTerminMode" attribute is present and set to "TIME_TRIGGERED".
NOTE 4: The "maxNumRep" attribute shall be present only if the "repTerminMode" attribute is present and set to "EVENT_TRIGGERED_NUM_REPORTS_REACHED".
NOTE 5: The "termThr" attributes shall be present only when the "repTerminMode" attribute is present and set to "EVENT_TRIGGERED_MEAS_THR_REACHED".

7.4.2.4.2.6 Type: MeasurementRequirements

Table 7.4.2.4.2.6-1: Definition of type MeasurementRequirements

Name	Data type	P	Cardinality	Description	Applicability
measDataTypes	array(MeasurementDataType)	M	1..N	Indicates the required types of measurement data. At least one measurement data type shall be present in the array structure.	
measAggrGranWnd	AverWindow	O	0..1	It indicates the aggregation granularity window for the measured data (NOTE 1).	
measPeriod	MeasurementPeriod	O	0..1	It indicates the required measurement time period (NOTE 2).	
NOTE 1: If absent, 1 minute shall be used as default setting. NOTE 2: If absent, current time and 5 minutes duration shall be used as default setting.					

7.4.2.4.2.7 Type: MonitoringSubscription

Table 7.4.2.4.2.7-1: Definition of type MonitoringSubscription

Name	Data type	P	Cardinality	Description	Applicability
valUeIds	array(ValTargetUe)	C	1..N	List of VAL UEs which measurement data reporting is requested (NOTE 1).	
valGroupId	string	C	0..1	The group ID used for the VAL group for which measurement data reporting is requested (NOTE 1).	
valStreamIds	array(string)	C	1..N	List of VAL streams for which measurement data reporting is requested (NOTE 1)	
measReqs	MeasurementRequirements	O	0..1	It indicates the measurement requirements (NOTE 2).	
reportReqs	ReportingRequirements	O	0..1	It indicates the requested requirements of reporting (NOTE 3).	
notifiUri	Uri	C	0..1	It indicates the URI where the notification should be delivered to. The notifiUri attribute shall be presented for subscription without immediate report.	
monRep	MonitoringReport	C	0..1	Contains the unicast QoS monitoring data reporting. The NRM server shall provide this attribute when immediate reporting is requested and the requested data is available.	
reqTestNotif	boolean	O	0..1	Set to true by the NF service consumer to request the VAL server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
wsNotifCfg	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	This parameter shall be supplied by VAL server in the POST request that request the creation of an individual measurement resource and shall be supplied in the reply of corresponding request.	
NOTE 1: Only one of these query parameters shall be provided. NOTE 2: If absent, the default values shall be used. NOTE 3: If absent, the default event triggered reporting is used.					

7.4.2.4.2.9 Type: FailureReport

Table 7.4.2.4.2.9-1: Definition of type FailureReport

Attribute name	Data type	P	Cardinality	Description	Applicability
valUeIds	array(ValTargetUe)	C	1..N	List of VAL UE(s) whose measurement data is not obtained successfully and is not provided (NOTE). The VAL UE(s) may be member(s) of the VAL group identified by the "valGroupId" attribute in the MonitoringReport data structure.	
valStreamIds	array(string)	C	1..N	List of VAL stream ID(s) whose measurement data is not obtained successfully and is not provided (NOTE).	
failureReason	FailureReason	M	1	Identifies the failure reason.	
measDataType	MeasurementDataType	C	0..1	The indication of the measurement data type that is not obtained successfully and is not provided in the monitoring report. This attribute shall be provided if the failure reason does not apply to all the requested measurement data types.	
NOTE: Only one of these attributes shall be provided.					

7.4.2.4.3 Simple data types and enumerations

7.4.2.4.3.1 Enumeration: MeasurementDataType

Table 7.4.2.4.3.1-1: Enumeration MeasurementDataType

Enumeration value	Description	Applicability
DL_DELAY	The indication for requesting the downlink packet delay data type.	
UL_DELAY	The indication for requesting the uplink packet delay data type.	
RT_DELAY	The indication for requesting the round trip packet delay data type.	
AVG_PLR	The indication for requesting the average packet loss rate data type.	
AVG_DATA_RATE	The indication for requesting the average data rate data type.	
MAX_DATA_RATE	The indication for requesting the maximum data rate data type.	
AVG_DL_TRAFFIC_VOLUME	The indication for requesting the average traffic volume for downlink data type.	
AVG_UL_TRAFFIC_VOLUME	The indication for requesting the average traffic volume for uplink data type.	

7.4.2.4.3.2 Enumeration: TerminationMode

Table 7.4.2.4.3.2-1: Enumeration TerminationMode

Enumeration value	Description	Applicability
TIME_TRIGGERED	The time-triggered termination mode.	
EVENT_TRIGGERED_NUM_REPORTS_REACHED	The event-triggered termination number of reports reached mode.	
EVENT_TRIGGERED_MEAS_THR_REACHED	The event-triggered termination measurement index threshold reached mode.	
USER_TRIGGERED	The user-triggered termination mode.	

7.4.2.4.3.3 Enumeration: FailureReason

Table 7.4.2.4.3.3-1: Enumeration FailureReason

Enumeration value	Description	Applicability
USER_NOT_FOUND	The user is not found.	
STREAM_NOT_FOUND	The stream is not found.	
DATA_NOT_AVAILABLE	The requested data is not available.	
OTHER_REASON	Other reason (unspecified).	

7.4.2.5 Error Handling

General error responses are defined in clause 6.7.

7.4.2.6 Feature negotiation

General feature negotiation procedures are defined in clause 6.8. Table 7.4.2.6-1 lists the supported features for SS_NetworkResourceMonitoring API.

Table 7.4.2.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.6. This feature requires that the Notification_test_event feature is also supported.

7.5 Event APIs

7.5.1 SS_Events API

7.5.1.1 API URI

The SS_Events service shall use the SS_Events API.

The request URIs use in HTTP requests from the VAL server towards the SEAL server shall have the Resource URI structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-events".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.5.1.2.

7.5.1.2 Resources

7.5.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.5.1.2.1-1 depicts the resource URIs structure for the SS_Events API.

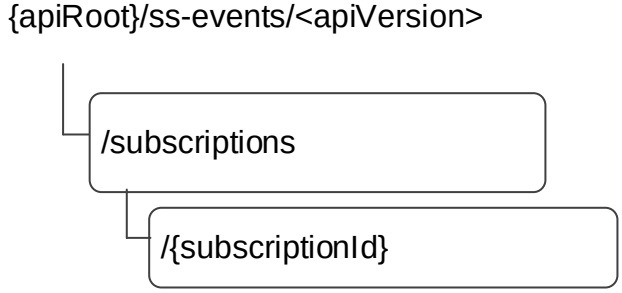

Figure 7.5.1.2.1-1: Resource URI structure of the SS_Events API

Table 7.5.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.5.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
SEAL Events Subscriptions	/subscriptions	POST	Creates a new individual SEAL Event Subscription.
Individual SEAL Events Subscription	/subscriptions/{subscriptionId}	DELETE	Deletes an individual SEAL Event Subscription identified by the subscriptionId.
		PATCH	Modifies an individual SEAL Event subscription identified by the subscriptionId.
		PUT	Updates an individual SEAL Event subscription identified by the subscriptionId.

7.5.1.2.2 Resource: SEAL Events Subscriptions

7.5.1.2.2.1 Description

The SEAL Events Subscriptions represents all event subscriptions on the SEAL server.

7.5.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-events/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in the table 7.5.1.2.2.2-1.

Table 7.5.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.5.1.2.2.3 Resource Standard Methods

7.5.1.2.2.3.1 POST

This method shall support the URI query parameters specified in the table 7.5.1.2.2.3.1-1.

Table 7.5.1.2.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.5.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.5.1.2.2.3.1-3.

Table 7.5.1.2.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SEALEventSubscription	M	1	Create a new individual SEAL Events Subscription resource.

Table 7.5.1.2.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SEALEventSubscription	M	1	201 Created	SEAL Events Subscription resource created successfully. The URI of the created resource shall be returned in the "Location" HTTP header
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.5.1.2.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/ss-events/<apiVersion>/subscriptions/{subscriptionId}

7.5.1.2.4 Resource Custom Operations

None.

7.5.1.2.3 Resource: Individual SEAL Events Subscription

7.5.1.2.3.1 Description

The Individual SEAL Events Subscription resource represents an individual event subscription of a VAL server.

7.5.1.2.3.2 Resource Definition

Resource URI: **{apiRoot}/ss-events/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in the table 7.5.1.2.3.2-1.

Table 7.5.1.2.3.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5
SubscriptionId	string	Identifies an Individual Events Subscription

7.5.1.2.3.3 Resource Standard Methods

7.5.1.2.3.3.1 DELETE

This method shall support the URI query parameters specified in table 7.5.1.2.3.3.1-1.

Table 7.5.1.2.3.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.5.1.2.3.3.1-2 and the response data structures and response codes specified in table 7.5.1.2.3.3.1-3.

Table 7.5.1.2.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.5.1.2.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The individual SEAL Events Subscription matching the subscriptionId is deleted.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.5.1.2.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.5.1.2.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.5.1.2.3.3.2 PATCH

This method shall support the URI query parameters specified in table 7.5.1.2.3.3.2-1.

Table 7.5.1.2.3.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.5.1.2.3.3.2-2 and the response data structures and response codes specified in table 7.5.1.2.3.3.2-3.

Table 7.5.1.2.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
SEALEventSubscriptionPatch	M	1	Contains the modifications to be applied to the SEAL Event subscription resource.

Table 7.5.1.2.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SEALEventSubscription	M	1	200 OK	SEAL Events Subscription resource is modified successfully and representation of the modified SEAL Event subscription is returned.
n/a			204 No Content	The SEAL Events Subscription is updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.5.1.2.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.5.1.2.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

7.5.1.2.3.3.3 PUT

This method requests fully replacement of an existing Individual SEAL Events Subscription at the SEAL server. The request shall not change the values of the "subscriberId", "requestTestNotification", "websockNotifConfig" and/or "suppFeat" attributes within the SEALEventSubscription data type. This method shall support the URI query parameters specified in table 7.5.1.2.3.3.3-1.

Table 7.5.1.2.3.3.3-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.5.1.2.3.3.3-2 and the response data structures and response codes specified in table 7.5.1.2.3.3.3-3.

Table 7.5.1.2.3.3.3-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
SEALEventSubscription	M	1	Contains the SEAL Event subscription to be updated.

Table 7.5.1.2.3.3.3-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SEALEventSubscription	M	1	200 OK	SEAL Event Subscription resource is updated successfully and representation of the modified SEAL Event subscription is returned.
n/a			204 No Content	The SEAL Events Subscription is updated successfully.
n/a			307 Temporary Redirect	Temporary redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource termination. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SEAL server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.5.1.2.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 7.5.1.2.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

7.5.1.2.3.4 Resource Custom Operations

None.

7.5.1.3 Notifications

7.5.1.3.1 General

The delivery of notifications shall conform to clause 6.6.

Table 7.5.1.3.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
SEAL Event Notification	{notificationDestination}	POST	Notifies subscriber of a SEAL Event

7.5.1.3.2 SEAL Event Notification

7.5.1.3.2.1 Description

SEAL Event Notification is used by the SEAL server notify a VAL server of an Event. The VAL server shall be subscribed to such SEAL Event Notifications via the Individual SEAL Events Subscription Resource.

7.5.1.3.2.2 Notification definition

The POST method shall be used for the event notification and the callback URI shall be the one provided by the VAL server during the subscription to the event.

Callback URI: **{notificationDestination}**

This method shall support the URI query parameters specified in table 7.5.1.3.2.2-1.

Table 7.5.1.3.2.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 7.5.1.3.2.2-2 and the response data structures and response codes specified in table 7.5.1.3.2.2-3.

Table 7.5.1.3.2.2-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SEALEventNotification	M	1	Notification information of a SEAL Event

Table 7.5.1.3.2.2-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
n/a			307 Temporary Redirect	Temporary redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative notification destination where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative notification destination where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.5.1.3.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 7.5.1.3.2.2-5: Headers supported by the 308 Response Code on this resource

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

7.5.1.4 Data Model

7.5.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API.

Table 7.5.1.4.1-1 specifies the data types defined specifically for the SS_Events API service.

Table 7.5.1.4.1-1: SS_Events API specific Data Types

Data type	Section defined	Description	Applicability
SEALEventSubscription	7.5.1.4.2.2	Represents an individual SEAL Event Subscription resource	
SEALEventSubscriptionPatch	7.5.1.4.2.22	Represents the parameters to request the modification of an SEAL Event subscription resource.	SubscUpdate
SEALEventNotification	7.5.1.4.2.3	Represents an individual SEAL Event Subscription Notification	
EventSubscription	7.5.1.4.2.4	Represents the subscription to a single SEAL event.	
SEALEventDetail	7.5.1.4.2.5	Represents the SEAL event detail	
VALGroupFilter	7.5.1.4.2.6	Represents a filter of VAL group identifiers belonging to a VAL service.	
IdentityFilter	7.5.1.4.2.7	Represents a filter of VAL User / UE identities belonging to a VAL service.	
SEALEvent	7.5.1.4.3.3	Represents the type of SEAL events that can be subscribed.	
LMInformation	7.5.1.4.2.8	The location information for a VAL User ID or a VAL UE ID.	
MessageFilter	7.5.1.4.2.9	The message filter information applicable to member VAL UEs or Users of the VAL group in the group change notification.	
MonitorFilter	7.5.1.4.2.10	Represents the filter information VAL User or UEs and the related events to be monitored.	NRM_EventMonitor
MonitorEvents	7.5.1.4.2.11	Represents the details of the monitoring and analytics events.	NRM_EventMonitor
MonitorEventsReport	7.5.1.4.2.12	Represents the monitoring and analytics events information related to VAL UE or User.	NRM_EventMonitor
ValidityConditions	7.5.1.4.2.13	Represents the temporal and/or spatial conditions applied for the events to be monitored.	NRM_EventMonitor
MonitorLocationInterestFilter	7.5.1.4.2.14	Filter information to subscribe for monitoring the VAL UE/User location in a given area of interest.	
LocationDevMonReport	7.5.1.4.2.15	Represents the event report to notify the VAL UE/User's location deviation from a given location.	
LocDevNotification	7.5.1.4.3.4	Enumeration of location deviation notification reports.	
TempGroupInfo	7.5.1.4.2.16	Represents the created temporary VAL group information.	GM_TempGroup
MonLocAreaInterestFltr	7.5.1.4.2.17	Filter information to subscribe for location area monitoring information for a given area of interest.	
LocationInfoCriteria	7.5.1.4.2.18	Represents the location information to be monitored. It includes the geographic location information or a reference UE along with the application defined proximity range from the reference UE.	
ReferenceUEDetail	7.5.1.4.2.19	Represents the reference UE details	
LocationAreaMonReport	7.5.1.4.2.20	Represents the event report to notify the VAL UEs moving in or moving out from a given location.	
MoveInOutUEDetails	7.5.1.4.2.21	Represents the list of UEs either moved in to the location area or moved out of the location area	
MonLocTriggerEvent	7.5.1.4.3.5	Identifies the triggering event in the location area monitor filtering.	

Table 7.5.1.4.1-2 specifies data types re-used by the SS_Events API service:

Table 7.5.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
ReportingInformation	3GPP TS 29.523 [20]	Used to indicate the reporting requirement, only the following information are applicable for SEAL: - immRep - notifMethod - maxReportNbr - monDur - repPeriod	
SupportedFeatures	3GPP TS 29.571 [21]	Used to negotiate the applicability of optional features defined in table 7.5.1.6-1.	
TestNotification	3GPP TS 29.122 [3]	Following differences apply: - The SCEF is the SEAL server; and - The SCS/AS is the subscribing VAL server.	
Uri	3GPP TS 29.122 [3]		
WebsockNotifConfig	3GPP TS 29.122 [3]	Following differences apply: - The SCEF is the CAPIF core function; and - The SCS/AS is the Subscribing functional entity.	
VALGroupDocument	Clause 7.2.1.4.2.2	Used to send VAL group document as part of event detail in the event notification.	
ProfileDoc	Clause 7.3.1.4.2.2	Used to send VAL User or VAL UE profile information as part of event detail in the event notification.	
LocationInfo	3GPP TS 29.122 [3]	Location information	
MonitoringType	3GPP TS 29.122 [3]	Monitoring event type in 3GPP system core network.	NRM_EventMonitor
TimeWindow	3GPP TS 29.122 [3]	Time window identified by a start time and a stop time.	NRM_EventMonitor
LocationArea5G	3GPP TS 29.122 [3]	User location area when the UE is attached to 5G.	NRM_EventMonitor
AnalyticsEvent	3GPP TS 29.522 [28]	Analytics event in NWDAF.	NRM_EventMonitor
ValTargetUe	7.3.1.4.2.3	Used to identify a VAL user ID or a VAL UE ID.	
ScheduledCommunicationTime	3GPP TS 29.122 [3]	Used to define the time frame for message filters.	
Uinteger	3GPP TS 29.571 [21]	Used to represent maximum number of messages in MesageFilter data type.	
DurationSec	3GPP TS 29.571 [21]	Used to indicate the notification interval in the location monitoring filter.	
DateTime	3GPP TS 29.571 [21]		
GeographicArea	3GPP TS 29.572 [31]	Identifies the geographical information of the user(s).	

7.5.1.4.2 Structured data types

7.5.1.4.2.1 Introduction

7.5.1.4.2.2 SEALEventSubscription

Table 7.5.1.4.2.2-1: Definition of type SEALEventSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
subscriberId	string	M	1	String identifying the subscriber of the event.	
eventSubs	array(EventSubscription)	M	1..N	Subscribed events.	
eventReq	ReportingInformation	M	1	Represents the reporting requirements of the event subscription.	
notificationDestination	Uri	M	1	URI where the notification should be delivered to.	
requestTestNotification	boolean	O	0..1	Set to true by Subscriber to request the SEAL server to send a test notification as defined in clause 6.6. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.6.	Notification_websocket
eventDetails	array(SEALEventDetail)	C	1..N	Detailed information of individual Events. Shall only be present in the response from the server if the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute is set to true, and the reports are available.	
suppFeat	SupportedFeatures	O	0..1	Used to negotiate the supported optional features of the API as described in clause 6.8. This attribute shall be provided in the HTTP POST request and in the response of successful resource creation.	

7.5.1.4.2.3 SEALEventNotification

Table 7.5.1.4.2.3-1: Definition of type SEALEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
subscriptionId	string	M	1	Identifier of the subscription resource to which the notification is related – SEAL resource identifier	
eventDetails	array(SEALEventDetail)	M	1..N	Detailed notifications of individual Events.	

7.5.1.4.2.4 EventSubscription

Table 7.5.1.4.2.4-1: Definition of type EventSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
eventId	SEALEvent	M	1	Subscribed event	
valGroups	array(VALGroupFilter)	C	1..N	Each element of the array represents the VAL group identifier(s) of a VAL service that the subscriber wants to know in the interested event. This parameter shall be present only if the event subscribed is "GM_GROUP_INFO_CHANGE".	GM_GroupInfoChange
Identities	array(IdentityFilter)	C	1..N	Each element of the array represents the VAL User / UE IDs of a VAL service that the event subscriber wants to know in the interested event. This parameter shall be present only if the event subscribed is "CM_USER_PROFILE_CHANGE" or "LM_LOCATION_INFO_CHANGE". (NOTE)	CM_UserProfileChange, LM_LocationInfoChange
monFltr	array(MonitorFilter)	C	1..N	Each element of the array represents the event monitoring request details that the subscriber wishes to monitor the events related to a set of VAL UEs, VAL group and/or VAL service. This parameter shall be present only if the event subscribed is "NRM_MONITOR_UE_USER_EVENTS"	NRM_EventMonitor
areaInt	array(MonitorLocationInterestFilter)	C	1..N	Each element represent the list of VAL User / UE IDs and the area of interest information for which the subscriber wishes to monitor the location deviation of the VAL User / UEs. This parameter shall be present only if the subscribed event is "LM_LOCATION_DEVIATION_MONITOR".	LM_LocationDeviation
locAreaMon	array(MonLocAreaInterestFltr)	C	1..N	Each element represent the location area monitoring details that the subscriber wishes to monitor for the VAL UEs moving in or moving out of the provided location area. This parameter shall be present only if the subscribed event is "LM_LOCATION_AREA_MONITOR".	LM_LocationAreaMonitor
NOTE: The "valSvcId" attribute within IdentityFilter is not applicable for the event "LM_LOCATION_INFO_CHANGE".					

7.5.1.4.2.5 SEALEventDetail

Table 7.5.1.4.2.5-1: Definition of type SEALEventDetail

Attribute name	Data type	P	Cardinality	Description	Applicability
eventId	SEALEvent	M	1	Event that is notified	
lmInfos	array(LMInformation)	C	1..N	The location information for the interested VAL User IDs or VAL UE IDs. This parameter shall be present only if the event in event notification is "LM_LOCATION_INFO_CHANGE".	LM_LocationInfoChange
valGroupDocuments	array(VALGroupDocument)	C	1..N	Newly created VAL group documents or the VAL groups documents with modified membership and configuration information. This parameter shall be present only if the event in event notification is "GM_GROUP_INFO_CHANGE" or "GM_GROUP_CREATE".	GM_GroupInfoChange, GM_GroupCreate
profileDocs	array(ProfileDoc)	C	1..N	Updated profile information associated with VAL Users or VAL UEs. This parameter shall be present only if the event in event notification is "CM_USER_PROFILE_CHANGE".	CM_UserProfileChange
msgFltrs	array(MessageFilter)	C	1..N	The message filters applicable to various member VAL User or UEs of the VAL group. This parameter may be present only if the event in the even notification is "GM_GROUP_INFO_CHANGE"	GM_MessageFilter
monRep	array(MonitorEventsReport)	C	1..N	The events report with details of the events related to VAL UE(s). This parameter shall be present only if the event in the event notification is "NRM_MONITOR_UE_USER_EVENTS"	NRM_EventMonitor
locAdhr	array(LocationDevMonReport)	C	1..N	The location deviation information for the interested VAL User IDs or VAL UE IDs in a given location. This parameter shall be present only if the event in event notification is "LM_LOCATION_DEVIATION_MONITOR".	LM_LocationDeviation
tempGroupInfo	TempGroupInfo	C	0..1	Contains the created temporary VAL group information. This attribute shall be present only if the "eventId" attribute is set to the value "GM_TEMP_GROUP_FORMATION".	GM_TempGroup
locAreaMonRep	array(LocationAreaMonReport)	C	1..N	The location area monitoring information of the given area of interest. This parameter shall be present only if the event in event notification is "LM_LOCATION_AREA_MONITOR".	LM_LocationAreaMonitor

7.5.1.4.2.6 VALGroupFilter

Table 7.5.1.4.2.6-1: Definition of type VALGroupFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
valSvcId	string	O	0..1	Identity of the VAL Service that the subscriber is interested in.	
valGrpIds	array(string)	M	1..N	VAL Group identifiers that the event subscriber wants to know in the interested event.	

7.5.1.4.2.7 IdentityFilter

Table 7.5.1.4.2.7-1: Definition of type IdentityFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
valSvcId	string	O	0..1	Identity of the VAL Service that the subscriber is interested in.	
valTgtUes	array(ValTargetUe)	C	1..N	VAL User IDs or VAL UE IDs that the event subscriber wants to know in the interested event. This parameter shall be present if the event subscribed is "CM_USER_PROFILE_CHANGE" or "LM_LOCATION_INFO_CHANGE".	
suppLoc	boolean	O	0..1	Indication to request for supplementary location information of the VAL UE IDs. Set to true by Subscriber to request the SEAL server to send supplementary location information from the 3GPP core network. Set to false or omitted otherwise.	LM_SuppLoc

7.5.1.4.2.8 LMInformation

Table 7.5.1.4.2.8-1: Definition of type LMInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
valTgtUe	ValTargetUe	M	1	VAL User ID or UE ID that the event subscriber wants to know in the interested event.	
locInfo	LocationInfo	M	1	The location information associated with the valTgtUe.	
timeStamp	DateTime	O	0..1	Timestamp of the location report	
valSvcId	string	O	0..1	The VAL service ID of the VAL application for which the location information is subscribed.	

7.5.1.4.2.9 MessageFilter

Table 7.5.1.4.2.9-1: Definition of type MessageFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
reqUe	ValTarget Ue	M	1	Identity of the VAL User ID or UE ID that the message filter information is related to.	
tgtUe	array(ValT argetUe)	O	1..N	List of VAL USER or UE IDs whose messages will be sent to the VAL User or UE in reqUe attribute.	
maxMsgs	Uinteger	O	0..1	Total number of messages allowed to be sent to the VAL User or UE in the given time frame in the filter.	
scheds	array(Sch eduledCo mmunicati onTime)	O	1..N	Time frame associated to the total number of messages in mxMsgs attribute.	
msgTypes	array(strin g)	O	1..N	List of message types be sent to VAL UE.	

7.5.1.4.2.10 MonitorFilter

Table 7.5.1.4.2.10-1: Definition of type MonitorFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
idnts	array(ValT argetUe)	C	1..N	Identities of the VAL Users or UEs whose events monitoring is requested. (NOTE 1)	
valSvcId	string	O	0..1	Identity of the VAL service.	
valGrpId	string	C	0..1	Identity of the VAL group of the target UEs whose events monitoring is requested. (NOTE 1)	
profId	string	C	0..1	The monitoring profile ID identifying a list of monitoring and/or analytics events. (NOTE 2)	
valCnds	array(Vali dityConditi ons)	O	1..N	The temporal and/or spatial conditions applied for the events to be considered as valid.	
evntDets	array(Moni torEvents)	C	1..N	List of monitoring and/or analytics events that the VAL server is interested in. (NOTE 2)	
NOTE 1: Either VAL users/UEs or a VAL group identifying VAL UEs shall be present. NOTE 2: Either event details or monitoring profile ID shall be present in the subscription request. The monitoring profile ID shall present in the subscription response when event details are provided in the subscription request.					

7.5.1.4.2.11 MonitorEvents

Table 7.5.1.4.2.11-1: Definition of type MonitorEvents

Attribute name	Data type	P	Cardinality	Description	Applicability
cnEvnts	array(Moni toringType)	O	1..N	List of monitoring events related to VAL UE.	
anlEvnts	array(Anal yticsEvent)	O	1..N	List of analytics events related to VAL UE.	

7.5.1.4.2.12 MonitorEventsReport

Table 7.5.1.4.2.12-1: Definition of type MonitorEventsReport

Attribute name	Data type	P	Cardinality	Description	Applicability
tgtUe	ValTarget Ue	M	1..N	VAL UE for which the events are related.	
evnts	array(Moni torEvents)	M	1..N	List of monitoring and analytics events related to VAL UE.	

7.5.1.4.2.13 ValidityConditions

Table 7.5.1.4.2.13-1: Definition of type ValidityConditions

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationAr ea5G	O	0..1	Spatial validity conditions.	
tmWdws	array(Tim eWindow)	O	1..N	Time window validity conditions	

7.5.1.4.2.14 MonitorLocationInterestFilter

Table 7.5.1.4.2.14-1: Definition of type MonitorLocationInterestFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
tgtUes	array(ValT argetUe)	M	1..N	List of VAL User(s) or UE ID(s) for which location monitoring is requested for the given location information.	
locInt	LocationIn fo	M	1..N	Location information where the VAL server wishes to monitor the target VAL UE(s) location deviation.	
notInt	DurationS ec	M	1	Periodic time interval in which the LM server needs to notify the VAL UE's location information.	

7.5.1.4.2.15 LocationDevMonReport

Table 7.5.1.4.2.15-1: Definition of type LocationDevMonReport

Attribute name	Data type	P	Cardinality	Description	Applicability
tgtUes	array(ValT argetUe)	M	1..N	VAL User ID(s) or UE ID(s) to which the report is related.	
locInfo	LocationIn fo	M	1	The location information associated with the valTgtUe.	
notifType	LocDevNo tification	M	1	Notification about the deviation of the VAL UE(s) in "valTgtUe" attribute to the location in "locInfo" attribute.	

7.5.1.4.2.16 TempGroupInfo

Table 7.5.1.4.2.16-1: Definition of type TempGroupInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
valGrpIds	array(string)	M	1..N	Contains a list of the identifiers of the VAL groups constituting the created temporary VAL group.	
tempValGrpId	string	M	1	Contains the identifier of the created temporary VAL group.	
valServIds	array(string)	O	1..N	Contains a list of the identifiers of the VAL services for which communications are to be enabled on the created temporary VAL group.	

7.5.1.4.2.17 MonLocAreaInterestFltr

Table 7.5.1.4.2.17-1: Definition of type MonLocAreaInterestFltr

Attribute name	Data type	P	Cardinality	Description	Applicability
locInfoCri	LocationInfoCriteria	M	1	Location area information where the VAL server wishes to monitor the VAL UE(s) moving in or moving out	
trigEvnts	array(MonLocTriggerEvent)	O	1..N	Identifies the triggering events when to send the notification.	

7.5.1.4.2.18 LocationInfoCriteria

Table 7.5.1.4.2.18-1: Definition of type LocationInfoCriteria

Attribute name	Data type	P	Cardinality	Description	Applicability
geoArea	GeographicArea	C	0..1	Geographic location information where the VAL server wishes to monitor the VAL UE(s) moving in or moving out.	
refUe	ReferenceUEDetail	C	0..1	Reference UE details with proximity range where the VAL server wishes to monitor the VAL UE(s) moving in or moving out.	
NOTE: Either "locInt" or "refUe" shall be provided.					

7.5.1.4.2.19 ReferenceUEDetail

Table 7.5.1.4.2.19-1: Definition of type ReferenceUEDetail

Attribute name	Data type	P	Cardinality	Description	Applicability
valTgtUe	ValTargetUe	M	1	VAL User ID or UE ID that the event subscriber wants to know in the interested event.	
proxRange	Uinteger	M	1	Proximity range of the area around the VAL target UE	

7.5.1.4.2.20 LocationAreaMonReport

Table 7.5.1.4.2.20-1: Definition of type LocationAreaMonReport

Attribute name	Data type	P	Cardinality	Description	Applicability
curPreUEs	array(ValTargetUe)	O	0..1	List of the identities of all VAL UEs who are currently present in the given location area.	
moveInOutUEs	MoveInOutUEDetails	O	0..1	List of UEs either moved in to the location area or moved out of the location area.	
trigEvnt	MonLocTriggerEvent	O	0..1	Event that triggered the sending of the notification.	
NOTE: For first notification report "curPreUEs" shall be provided, for next notification report either "curPreUEs" or "moveInOutUEs" shall be present.					

7.5.1.4.2.21 MoveInOutUEDetails

Table 7.5.1.4.2.21-1: Definition of type MoveInOutUEDetails

Attribute name	Data type	P	Cardinality	Description	Applicability
moveInUEs	array(ValTargetUe)	O	0..1	List of the identities of the VAL UEs who moved in to the given location area since previous notification.	
moveOutUEs	array(ValTargetUe)	O	0..1	List of the identities of the VAL UEs who moved out of the given location area since previous notification.	

7.5.1.4.2.22 SEALEventSubscriptionPatch

Table 7.5.1.4.2.22-1: Definition of type SEALEventSubscriptionPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
eventSubs	array(EventSubscription)	O	1..N	Subscribed events.	
eventReq	ReportingInformation	O	0..1	Represents the reporting requirements of the event subscription.	
notificationDestination	Uri	O	0..1	URI where the notification should be delivered to.	

7.5.1.4.3 Simple data types and enumerations

7.5.1.4.3.1 Introduction

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

7.5.1.4.3.2 Simple data types

None.

7.5.1.4.3.3 Enumeration: SEALEvent

Table 7.5.1.4.3.3-1: Enumeration SEALEvent

Enumeration value	Description	Applicability
LM_LOCATION_INFO_CHANGE	Events related to the location information of VAL Users or VAL UEs from the Location Management Server.	LM_LocationInfoChange
GM_GROUP_INFO_CHANGE	Events related to the modification of VAL group membership and configuration information from the Group Management Server.	GM_GroupInfoChange
CM_USER_PROFILE_CHANGE	Events related to update of user profile information from the Configuration Management Server.	CM_UserProfileChange
GM_GROUP_CREATE	Events related to creation of new VAL groups from the Group Management Server.	GM_GroupCreate
NRM_MONITOR_UE_USER_EVENTS	Monitoring and analytic events related to VAL UEs, users or VAL group from the Network Resource Management Server.	NRM_EventMonitor
LM_LOCATION_DEVIATION_MONITOR	Events from Location Management Server, related to the deviation of the VAL User(s) / UE(s) location from an area of interest.	LM_LocationDeviation
GM_TEMP_GROUP_FORMATION	Events related to the formation of new temporary VAL groups from the Group Management Server.	GM_TempGroup
LM_LOCATION_AREA_MONITOR	Events from Location Management Server, related to the list of UEs moving in or moving out of the specific location.	LM_LocationAreaMonitor

7.5.1.4.3.4 Enumeration: LocDevNotification

Table 7.5.1.4.3.4-1: Enumeration LocDevNotification

Enumeration value	Description	Applicability
NOTIFY_MISMATCH_LOCATION	This value indicates that the location information of the VAL UE(s) from the SEAL LM client and the core network are not matching.	
NOTIFY_ABSENCE	This value indicates that the current location information of the VAL UE(s) is deviating from the VAL server's area of interest.	
NOTIFY_PRESENCE	This value indicates that the current location information of the VAL UE(s) is within the VAL server's area of interest.	

7.5.1.4.3.5 Enumeration: MonLocTriggerEvent

Table 7.5.1.4.3.5-1: Enumeration MonLocTriggerEvent

Enumeration value	Description	Applicability
DISTANCE_TRAVELLED	Trigger event for the location area monitoring based on the distance travelled by the reference UE.	

7.5.1.5 Error Handling

General error responses are defined in clause 6.7.

7.5.1.6 Feature Negotiation

General feature negotiation procedures are defined in clause 6.8. Table 7.5.1.6-1 lists the supported features for SS_Events API.

Table 7.5.1.6-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	Testing of notification connection is supported according to clause 6.6.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.6. This feature requires that the Notification_test_event feature is also supported.
3	LM_LocationInfoChange	This feature supports the location information change event.
4	GM_GroupInfoChange	This feature supports the group information change event.
5	CM_UserProfileChange	This feature supports the user profile change event.
6	GM_GroupCreate	This feature supports the group creation event.
7	GM_MessageFilter	This feature supports the message filter information in group information change event.
8	NRM_EventMonitor	This feature supports the monitoring of events related to VAL UEs or Users.
9	LM_LocationDeviation	This feature supports the monitoring of VAL UE / User's deviation from a given area of interest.
10	GM_TempGroup	This feature supports the functionality of temporary VAL group formation within a VAL system.
11	LM_LocationAreaMonitor	This feature supports the monitoring of VAL UEs which are moving in or moving out from a given area of interest.
12	SubscUpdate	Indicates the support for updating an SEAL event subscription resource.
13	LM_SuppLoc	Indicates the support of supplementary location information.

7.6 Key management APIs

7.6.1 SS_KeyInfoRetrieval API

7.6.1.1 API URI

The request URI used in each HTTP request from the VAL server towards the Key management server shall have the structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-kir".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 7.6.1.2.

7.6.1.2 Resources

7.6.1.2.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.6.1.2.1-1 depicts the resource URIs structure for the SS_KeyInfoRetrieval API.

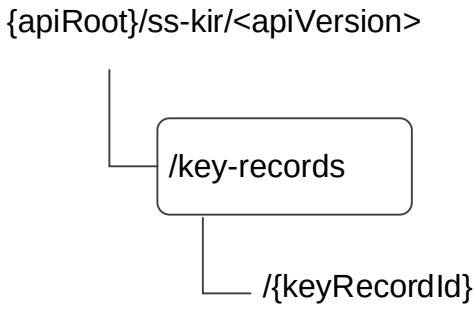

Figure 7.6.1.2.1-1: Resource URI structure of the SS_KeyInfoRetrieval API

Table 7.6.1.2.1-1 provides an overview of the resources and applicable HTTP methods.

Table 7.6.1.2.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Key records	/key-records	GET	Retrieve key management information uniquely applicable to VAL service, VAL user or VAL UE.

7.6.1.2.2 Resource: Key Records

7.6.1.2.2.1 Description

The Key Records resource represents the key management information of all VAL services that are created at a given key management server.

7.6.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/ss-kir/<apiVersion>/key-records**

This resource shall support the resource URI variables defined in the table 7.6.1.2.2.2-1.

Table 7.6.1.2.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.5

7.6.1.2.2.3 Resource Standard Methods

7.6.1.2.2.3.1 GET

This operation retrieves VAL service key management information satisfying the filter criteria. This method shall support the URI query parameters specified in table 7.6.1.2.2.3.1-1.

Table 7.6.1.2.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
val-tgt-ue	ValTargetUe	O	0..1	Identifying a VAL user or a VAL UE.
val-service-id	string	M	1	String identifying a VAL service.

This method shall support the request data structures specified in table 7.6.1.2.2.3.1-2 and the response data structures and response codes specified in table 7.6.1.2.2.3.1 -3.

Table 7.6.1.2.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.6.1.2.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ValKeyInfo	M	1	200 OK	Key management information specific to VAL service, VAL user or VAL UE. This response shall include key management information matching the query parameters provided in the request.
n/a			307 Temporary Redirect	Temporary redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative key management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection, during resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative key management server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [3] also apply.				

Table 7.6.1.2.2.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 7.6.1.2.2.3.1-5: Headers supported by the 308 Response Code on this resource

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

7.6.1.2.2.4 Resource Custom Operations

None.

7.6.1.3 Notifications

None.

7.6.1.4 Data Model

7.6.1.4.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API.

Table 7.6.1.4.1-1 specifies the data types defined specifically for the SS_KeyInfoRetrieval API service.

Table 7.6.1.4.1-1: SS_KeyInfoRetrieval API specific Data Types

Data type	Section defined	Description	Applicability
ValKeyInfo	7.6.1.4.2.3	Key management information associated with VAL server, VAL user or VAL UE.	

Table 7.6.1.4.1-2 specifies data types re-used by the SS_KeyInfoRetrieval API service.

Table 7.6.1.4.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
ValTargetUe	Clause 7.3.1.4.2.3	Used to identify a VAL User ID or VAL UE ID applicable to key management information.	

7.6.1.4.2 Structured Data Types

7.6.1.4.2.1 Introduction

7.6.1.4.2.2 ValKeyInfo

Table 7.6.1.4.2.3-1: Definition of type ValKeyInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
userUri	Uri	M	1	URI of the user for which the response is intended.	
skmsId	string	O	0..1	String identifying the SEAL key management server, sending the response.	
valService	string	M	1	String identifying the VAL service. This attribute shall be same as in the HTTP GET request.	
valTgtUe	ValTarget Ue	O	0..1	String identifying a VAL user or VAL UE. This value depends on the value that was in the HTTP GET request.	
keyInfo	string	M	1	Key management information uniquely applicable to the requested VAL service, VAL user or VAL UE or VAL client.	

7.6.1.4.3 Simple data types and enumerations

None.

7.6.1.5 Error Handling

General error responses are defined in clause 6.7.

7.6.1.6 Feature Negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.6.1.6-1: Supported Features

Feature number	Feature Name	Description

7.7 Network slice capability Enablement APIs

7.7.1 SS_NetworkSliceAdaptation API

7.7.1.1 API URI

The request URI used in each HTTP request from the VAL server towards the NSCE server shall have the structure as defined in clause 6.5 with the following clarifications:

- The <apiName> shall be "ss-nsa".
- The <apiVersion> shall be "v1".
- The <custOpName> shall be set as described in clause 7.7.1.3.

7.7.1.2 Resources

There are no resources defined for this API in this release of the specification.

7.7.1.3 Custom Operations without associated resources

7.7.1.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 7.7.1.3.1-1 depicts the resource URIs structure for the SS_NetworkSliceAdaptation API.

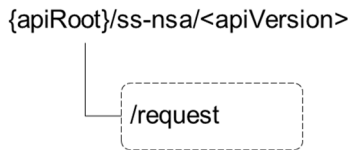

Figure 7.7.1.3.1-1: Custom operation URI structure of the SS_NetworkSliceAdaptation API

Table 7.7.1.3.1-1 provides an overview of the custom operation and applicable HTTP methods.

Table 7.7.1.3.1-1: Custom operations without associated resources

Operation name	Custom operation URI	Mapped HTTP method	Description
Request	/request	POST	Request the network slice adaptation.

7.7.1.3.2 Operation: Request

7.7.1.3.2.1 Description

The custom operation allows a VAL server to request network slice adaptation to the NSCE server.

7.7.1.3.2.2 Operation Definition

This operation shall support the request and response data structures and response code specified in table 7.7.1.3.2.2-1 and table 7.7.1.3.2.2-2.

Table 7.7.1.3.2.2-1: Data structures supported by the POST Request Body for this operation

Data type	P	Cardinality	Description
NwSliceAdptInfo	M	1	Parameters to request network slice adaptation.

Table 7.7.1.3.2.2-2: Data structures supported by the POST Response Body for this operation

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The success of the network slice adaptation with the underlying network.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI representing an alternative NSCE server to which the request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI representing an alternative NSCE server to which the request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [3].
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [22] also apply.				

Table 7.7.1.3.2.2-3: Headers supported by 307 Response Code for this operation

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing an alternative NSCE server to which the request should be redirected.

Table 7.7.1.3.2.2-4: Headers supported by 308 Response Code for this operation

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing an alternative NSCE server to which the request should be redirected.

7.7.1.4 Notifications

None.

7.7.1.5 Data Model

7.7.1.5.1 General

This clause specifies the application data model supported by the API. Data types listed in clause 6.2 apply to this API.

Table 7.7.1.5.1-1 specifies the data types defined specifically for the SS_NetworkSliceAdaptation API service.

Table 7.7.1.5.1-1: SS_NetworkSliceAdaptation API specific Data Types

Data type	Section defined	Description	Applicability
NwSliceAdptInfo	7.7.1.5.2.3	The information associated with requested network slice adaptation with the underlying network.	

Table 7.7.6.1.4.1-2 specifies data types re-used by the NetworkSliceAdaptation API service.

Table 7.7.1.5.1-2: Re-used Data Types

Data type	Reference	Comments	Applicability
Snssai	3GPP TS 29.571 [21]	Identifies the S-NSSAI.	
Dnn	3GPP TS 29.571 [21]	Identifies a DNN.	
SupportedFeatures	3GPP TS 29.571 [21]	Used to negotiate the applicability of the optional features.	
NOTE: Properties marked with a feature as defined in clause 5.14.6 are applicable as described in clause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.			

7.7.1.5.2 Structured Data Types

7.7.1.5.2.1 Introduction

7.7.1.5.2.2 Type: NwSliceAdptInfo

Table 7.7.1.5.2.2-1: Definition of type NwSliceAdptInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
valServiceId	string	M	1	The VAL service ID of the VAL application for which the network slice adaptation may corresponds to.	
valTgtUeIds	array(string)	M	1..N	List of the VAL UE IDs within the VAL service for which the slice adaptation request corresponds.	
nwSliceAdptCause	string	O	0..1	The cause which necessitates the network slice change (e.g. VAL service profile change, VAL service operation change).	
reqSnssai	Snssai	O	0..1	Indication of the new S-NSSAI which is requested.	
reqDnn	Dnn	O	0..1	Indication of the new DNN which is requested.	
suppFeat	Supported Features	O	0..1	This parameter shall be supplied by VAL server in the POST request that requests the network slice adaptation and shall be supplied in the reply of corresponding request.	
NOTE: Properties marked with a feature as defined in clause 7.7.1.7 are applicable as described in clause 5.2.7 of 3GPP TS 29.122 [3]. If no feature is indicated, the related property applies for all the features.					

7.7.1.5.3 Simple data types and enumerations

None.

7.7.1.6 Error Handling

General error responses are defined in clause 6.7.

7.7.1.7 Feature Negotiation

General feature negotiation procedures are defined in clause 6.8.

Table 7.7.1.7-1: Supported Features

Feature number	Feature Name	Description

8 Using Common API Framework

8.1 General

When CAPIF is used with a SEAL service, the SEAL server shall support the following as defined in 3GPP TS 29.222 [16]:

- the API exposing function and related APIs over CAPIF-2/2e and CAPIF-3/3e reference points;
- the API publishing function and related APIs over CAPIF-4/4e reference point;
- the API management function and related APIs over CAPIF-5/5e reference point; and
- at least one of the security methods for authentication and authorization, and related security mechanisms.

In a centralized deployment as defined in 3GPP TS 23.222 [17], 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-3/3e, CAPIF-4/4e and CAPIF-5/5e reference points.

When CAPIF is used with a SEAL service, the SEAL server shall register all the features for northbound APIs in the CAPIF Core Function.

8.2 Security

When CAPIF is used for external exposure, before invoking the API exposed by the SEAL server, the VAL server as API invoker shall negotiate the security method (PKI, TLS-PSK or OAUTH2) with CAPIF core function and ensure the SEAL server has enough credential to authenticate the VAL server (see 3GPP TS 29.222 [16], clause 5.6.2.2 and clause 6.2.2.2).

If PKI or TLS-PSK is used as the selected security method between the VAL server and the SEAL server, upon API invocation, the SEAL server shall retrieve the authorization information from the CAPIF core function as described in 3GPP TS 29.222 [16], clause 5.6.2.4.

As indicated in 3GPP TS 33.122 [18], the access to the SEAL APIs may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [19]), using the "Client Credentials" authorization grant, where the CAPIF core function (see 3GPP TS 29.222 [16]) 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 VAL server and the SEAL server, the VAL server, prior to consuming services offered by the SEAL APIs, shall obtain a "token" from the authorization server, by invoking the Obtain_Authorization service, as described in 3GPP TS 29.222 [16], clause 5.6.2.3.2.

The SEAL APIs do not define any scopes for OAuth2 authorization. It is the SEAL server responsibility to check whether the VAL server is authorized to use an API based on the "token". Once the SEAL server verifies the "token", it shall check whether the SEAL server 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 VAL server has full authority to access any resource or operation for the invoked API

NOTE 2: For aforementioned security methods, the SEAL server needs to apply admission control according to access control policies after performing the authorization checks.

9 Security

9.1 General

The security aspects of SEAL reference points are specified in 3GPP TS 33.434 [26].

9.2 SEAL-S security

As specified in clause 5.1.1.8 of 3GPP TS 33.434 [26], the protection of SEAL-S reference point shall be supported according to NDS/IP as specified in 3GPP TS 33.210 [25].

When CAPIF is not used, then TLS and OAuth 2.0 shall be supported as described in clause 5.1.1.8 of 3GPP TS 33.434 [26]. When TLS is used, mutual authentication based on client and server certificates shall be performed between the SEAL server and VAL server using TLS. After the authentication, the SEAL server determines whether the VAL server is authorized to send requests to the SEAL server. The SEAL server shall authorize the requests from VAL server using OAuth-based authorization mechanism.

When CAPIF is used, the security mechanisms described in clause 8.2 shall be applied.

Annex A (normative): OpenAPI specification

A.1 General

This annex is based on the OpenAPI Specification [15] and provides corresponding representations of all APIs defined in the present specification in YAML format.

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.

NOTE: 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 file contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [24] and clause 5.3.1 of the 3GPP TS 29.501 [14] for further information).

A.2 SS_LocationReporting API

```
openapi: 3.0.0
info:
  title: SS_LocationReporting
  description: |
    API for SEAL Location Reporting Configuration.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-lr/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /trigger-configurations:
    post:
      description: Creates a new location reporting configuration.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocationReportConfiguration'
      responses:
        '201':
          description: Location reporting configuration resource is created sucessfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LocationReportConfiguration'
          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'

/trigger-configurations/{configurationId}:
  get:
    description: Retrieves an individual SEAL location reporting configuration information.
    parameters:
      - name: configurationId
        in: path
        description: String identifying an individual configuration resource.
        required: true
        schema:
          type: string
    responses:
      '200':
        description: The location reporting configuration information.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocationReportConfiguration'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/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'
  put:
    description: Updates an individual SEAL location reporting configuration.
    parameters:
      - name: configurationId
        in: path
        description: String identifying an individual configuration resource.
        required: true
        schema:
          type: string
    requestBody:
      description: Configuration information to be updated in location management server.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/LocationReportConfiguration'
    responses:
```

```
      '200':
        description: The configuration is updated successfully.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocationReportConfiguration'
      '204':
        description: No Content
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  delete:
    description: Deletes an individual SEAL location reporting configuration.
    parameters:
      - name: configurationId
        in: path
        description: String identifying an individual configuration resource.
        required: true
        schema:
          type: string
    responses:
      '204':
        description: The individual configuration matching configurationId is deleted.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  patch:
    description: Modify an existing SEAL Location Reporting Configuration.
    parameters:
      - name: configurationId
        in: path
        description: Identifier of an individual SEAL location reporting configuration.
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
```

```
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/LocationReportConfigurationPatch'
      responses:
        '200':
          description: >
            The individual SEAL location reporting configuration is modified successfully and
            a representation of the updated SEAL location reporting configuration is returned
            in the request body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LocationReportConfiguration'
        '204':
          description: >
            No Content. The individual SEAL location reporting configuration is
            modified successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    LocationReportConfiguration:
      description: Represents Location reporting configuration information.
      type: object
      properties:
        valServerId:
          type: string
        valTgtUe:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        immRep:
          type: boolean
        monDur:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        repPeriod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        accuracy:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/Accuracy'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - valServerId
        - valTgtUe

    LocationReportConfigurationPatch:
      description: Represents Location reporting configuration information patch.
      type: object
```

```
      properties:
        valTgtUe:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        monDur:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        repPeriod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        accuracy:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/Accuracy'
```

A.3 SS_GroupManagement API

```
openapi: 3.0.0
info:
  title: SS_GroupManagement
  description: |
    API for SEAL Group management.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-gm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /group-documents:
    post:
      description: Creates a new VAL group document.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VALGroupDocument'
      responses:
        '201':
          description: VAL group created sucessfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/VALGroupDocument'
          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'
  get:
    description: Retrieves VAL group documents satisfying filter criteria
    parameters:
      - name: val-group-id
        in: query
        description: String identifying the VAL group.
        schema:
          type: string
      - name: val-service-id
        in: query
        description: String identifying the Val service.
        schema:
          type: string
    responses:
      '200':
        description: List of VAL group documents matching the query parameters in the request.
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/VALGroupDocument'
              minItems: 0
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/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'

/group-documents/{groupDocId}:
  get:
    description: Retrieves VAL group information satisfying filter criteria.
    parameters:
      - name: groupDocId
        in: path
        description: String identifying an individual VAL group document resource.
        required: true
        schema:
          type: string
      - name: group-members
        in: query
        description: >
          When set to true indicates the group management server to send the members
          list information of the VAL group.
        schema:
          type: boolean
      - name: group-configuration
        in: query
        description: >
          When set to true indicates the group management server to send the group
          configuration information of the VAL group.
        schema:
          type: boolean
    responses:
      '200':
        description: >
          The VAL group information based on the request from the VAL server. Includes
```

```
          VAL group members list if group-members flag is set to true in the request,
          VAL group configuration information if the group-configuration flag is set to
          true in the request, VAL group identifier, whole VAL group document resource
          if both group-members and group-configuration flags are omitted/set to false
          in the request.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VALGroupDocument'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/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'

  put:
    description: Updates an individual VAL group document.
    parameters:
      - name: groupDocId
        in: path
        description: String identifying an individual VAL group document resource
        required: true
        schema:
          type: string
    requestBody:
      description: VAL group document to be updated in Group management server.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/VALGroupDocument'
    responses:
      '200':
        description: VAL group document updated successfully.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VALGroupDocument'
      '204':
        description: No Content
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  delete:
    description: Deletes a VAL Group.
    parameters:
      - name: groupDocId
        in: path
        description: String identifying an individual VAL group document resource.
        required: true
        schema:
          type: string
    responses:
      '204':
        description: The individual VAL group matching groupDocId was deleted.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  patch:
    description: Modify an existing VAL Group document.
    parameters:
      - name: groupDocId
        in: path
        description: Identifier of an individual VAL group document.
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/VALGroupDocumentPatch'
    responses:
      '200':
        description: >
          The individual VAL Group document is modified successfully and a
          representation of the updated VAL Group document is returned in the request body.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VALGroupDocument'
      '204':
        description: No Content. The individual VAL group document is modified successfully.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    VALGroupDocument:
      description: Represents details of the VAL group document information.
      type: object
      properties:
        valGroupId:
          type: string
          description: The VAL group idenitity.
        grpDesc:
          type: string
          description: The text description of the VAL group.
        members:
          type: array
          description: The list of VAL User IDs or VAL UE IDs, which are members of the VAL group.
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          minItems: 1
        valGrpConf:
          type: string
          description: Configuration data for the VAL group.
        valServiceIds:
          type: array
          description: The list of VAL services enabled on the group.
          items:
            type: string
          minItems: 1
        valSvcInf:
          type: string
          description: VAL service specific information.
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        resUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        locInfo:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
        addLocInfo:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        extGrpId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        com5GLanType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
      required:
        - valGroupId

    VALGroupDocumentPatch:
      description: Represents details of the partial update of VAL group document information.
      type: object
      properties:
        grpDesc:
          type: string
          description: The text description of the VAL group.
        members:
          type: array
          description: The list of VAL User IDs or VAL UE IDs, which are members of the VAL group.
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          minItems: 1
        valGrpConf:
          type: string
```

```
        description: Configuration data for the VAL group.
      valServiceIds:
        type: array
        description: The list of VAL services enabled on the group.
        items:
          type: string
        minItems: 1
      locInfo:
        $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
      addLocInfo:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
      extGrpId:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
      com5GLanType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
```

A.4 SS_UserProfileRetrieval API

```
openapi: 3.0.0
info:
  title: SS_UserProfileRetrieval
  description: |
    API for SEAL User Profile Retrieval.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-upr/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /val-services:
    get:
      description: Retrieve VAL User or VAL UE profile information.
      parameters:
        - name: val-service-id
          in: query
          description: String identifying an individual VAL service
          required: false
          schema:
            type: string
        - name: val-tgt-ue
          in: query
          description: Identifying a VAL target UE.
          required: true
          schema:
            $ref: '#/components/schemas/ValTargetUe'
      responses:
        '200':
          description: The Profile information of the VAL User or VAL UE.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/ProfileDoc'
                minItems: 0
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/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:
    ProfileDoc:
      description: Represents Profile information associated with a VAL user ID or a VAL UE ID.
      type: object
      properties:
        profileInformation:
          type: string
          description: Profile information associated with the valUserId or valUeId.
        valTgtUe:
          $ref: '#/components/schemas/ValTargetUe'
      required:
        - profileInformation
        - valTgtUe

    ValTargetUe:
      description: Represents information identifying a VAL user ID or a VAL UE ID.
      type: object
      properties:
        valUserId:
          type: string
          description: Unique identifier of a VAL user.
        valUeId:
          type: string
          description: Unique identifier of a VAL UE.
      oneOf:
        - required: [valUserId]
        - required: [valUeId]
```

A.5 SS_NetworkResourceAdaptation API

```
openapi: 3.0.0
info:
  version: 1.1.0
  title: SS_NetworkResourceAdaptation
  description: |
    SS Network Resource Adaptation Service.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0; Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/ss-nra/v1'
    variables:
      apiRoot:
```

```
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /multicast-subscriptions:
    post:
      summary: Creates a new Individual Multicast Subscription resource
      operationId: CreateMulticastSubscription
      tags:
        - Multicast Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MulticastSubscription'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MulticastSubscription'
          headers:
            Location:
              description: >
                Contains the URI of the created individual multicast subscription resource.
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      callbacks:
        UserPlaneNotification:
          '{$request.body#/notifUri}':
            post:
              requestBody:
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/UserPlaneNotification'
              responses:
                '204':
                  description: No Content, Notification was succesfull
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
```

```
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /multicast-subscriptions/{multiSubId}:
    get:
      summary: "Reads an existing Individual Multicast Subscription"
      operationId: GetMulticastSubscription
      tags:
        - Individual Multicast Subscription (Document)
      parameters:
        - name: multiSubId
          in: path
          description: Multicast Subscription ID
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MulticastSubscription'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: "Delete an existing Individual Multicast Subscription"
      operationId: DeleteMulticastSubscription
      tags:
        - Individual Multicast Subscription (Document)
      parameters:
        - name: multiSubId
          in: path
          description: Multicast Subscription ID
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /unicast-subscriptions:
    post:
      summary: Creates a new Individual Unicast Subscription resource
      operationId: CreateUnicastSubscription
      tags:
        - Unicast Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UnicastSubscription'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UnicastSubscription'
          headers:
            Location:
              description: >
                Contains the URI of the created individual unicast subscription resource.
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      callbacks:
        UserPlaneNotification:
          '{$request.body#/notifUri}':
            post:
              requestBody:
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/UserPlaneNotification'
              responses:
                '204':
                  description: No Content, Notification was succesfull
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
```

```
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /unicast-subscriptions/{uniSubId}:
    get:
      summary: "Reads an existing Individual Unicast Subscription"
      operationId: GetUnicastSubscription
      tags:
        - Individual Unicast Subscription (Document)
      parameters:
        - name: uniSubId
          in: path
          description: Unicast Subscription ID
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UnicastSubscription'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: "Delete an existing Individual Unicast Subscription"
      operationId: DeleteUnicastSubscription
      tags:
        - Individual Unicast Subscription (Document)
      parameters:
        - name: uniSubId
          in: path
          description: Unicast Subscription ID
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
```

```
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /tsc-stream-availability:
    get:
      summary: Discover the TSC stream availability information.
      operationId: GetTscStreamAvailability
      tags:
        - TSC stream availability discovery
      parameters:
        - name: stream-specs
          in: query
          description: >
            The MAC address(es) of the source DS-TT port(s) and the destination DS-TT port(s).
          required: true
          schema:
            type: array
            items:
              $ref: '#/components/schemas/StreamSpecification'
            minItems: 1
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/TscStreamAvailability'
                minItems: 0
        '204':
          description: No Content.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /tsc-streams:
    get:
      summary: Retrieval of TSC stream data.
      operationId: GetTscStream
      tags:
        - TSC stream retrieval
      parameters:
```

```
        - name: val-stream-ids
          in: query
          description: Retrieval of TSC Stream data, identified by the VAL Stream ID(s).
          required: false
          schema:
            type: array
            items:
              type: string
            minItems: 1

      responses:
        '200':
          description: OK (successful query of TSC stream resource)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/TscStreamData'
                minItems: 1

        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /tsc-streams/{valStreamId}:
    get:
      summary: "Reads an existing Individual TSC stream data information"
      operationId: GetTscStreamData
      tags:
        - Individual TSC Stream Retrieval
      parameters:
        - name: valStreamId
          in: path
          description: The VAL Stream ID identifies the TSC stream.
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TscStreamData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    summary: Create a TSC stream identified by a VAL stream identifier.
    operationId: PutTscStream
    tags:
      - TSC stream creation
    description: Create an individual TSC stream identified by VAL Stream ID.
    parameters:
      - name: valStreamId
        in: path
        description: VAL stream identifier
        required: true
        schema:
          type: string
    requestBody:
      description: TSC stream creation request data from the VAL server to the NRM server.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TscStreamData'
    responses:
      '201':
        description: Success
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TscStreamData'
        headers:
          Location:
            description: Contains the URI of the created individual TSC stream 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'
  delete:
    summary: "Delete an existing Individual TSC stream"
    operationId: DeleteTscStream
    tags:
      - Individual TSC Stream Deletion
    parameters:
      - name: valStreamId
        in: path
        description: The VAL Stream ID identifies the TSC stream.
        required: true
        schema:
          type: string
    responses:
      '204':
        description: No Content. Resource was succesfully deleted
      '307':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    MulticastSubscription:
      description: Represents a multicast subscription.
      type: object
      properties:
        valGroupId:
          type: string
        anncMode:
          $ref: '#/components/schemas/ServiceAnnoucementMode'
        multiQosReq:
          type: string
        locArea:
          $ref: 'TS29122_GMDviaMBMSbyMB2.yaml#/components/schemas/MbmsLocArea'
        duration:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        tmgi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        localMbmsInfo:
          $ref: 'TS29486_VAE_FileDistribution.yaml#/components/schemas/LocalMbmsInfo'
        localMbmsActInd:
          type: boolean
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        reqTestNotif:
          type: boolean
        wsNotifCfg:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        upIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        upIpv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        upPortNum:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Port'
        radioFreqs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
          minItems: 1
      required:
        - valGroupId
        - anncMode
        - multiQosReq
        - notifUri

    UnicastSubscription:
      description: Represents a unicast subscription.
      type: object
      properties:
```

```
      valTgtUe:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      uniQosReq:
        type: string
      duration:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      notifUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      reqTestNotif:
        type: boolean
      wsNotifCfg:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
      suppFeat:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - valTgtUe
      - notifUri

  UserPlaneNotification:
    description: Represents a notification on User Plane events.
    type: object
    properties:
      notifId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      eventNotifs:
        type: array
        items:
          $ref: '#/components/schemas/NrmEventNotification'
        minItems: 1
    required:
      - notifId
      - eventNotifs

  NrmEventNotification:
    description: Represents a notification on an individual User Plane event.
    type: object
    properties:
      event:
        $ref: '#/components/schemas/NrmEvent'
      ts:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      deliveryMode:
        $ref: '#/components/schemas/DeliveryMode'
      streamIds:
        type: array
        items:
          type: string
        minItems: 1
    required:
      - event
      - ts

  TscStreamAvailability:
    description: >
      TSC stream availability information includes the stream specification and list of traffic
      specifications. This response shall include stream specification matching one of the query
      parameters provided in the request.
    type: object
    properties:
      streamSpec:
        $ref: '#/components/schemas/StreamSpecification'
      trafficSpecs:
        type: array
        items:
          $ref: '#/components/schemas/TrafficSpecification'
        minItems: 1
    required:
      - streamSpec
      - trafficSpecs

  StreamSpecification:
    description: >
      Stream specification includes MAC addresses of the source and destination DS-TT ports.
    type: object
    properties:
      srcMacAddr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
      dstMacAddr:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
      required:
        - srcMacAddr
        - dstMacAddr

    TrafficSpecification:
      description: >
        The traffic classe supported by the DS-TTs and available end-to-end maximum latency value.
      type: object
      properties:
        trafficClass:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        e2eMaxLatency:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      required:
        - trafficClass
        - e2eMaxLatency

    TscStreamData:
      description: TSC stream data information.
      type: object
      properties:
        streamSpec:
          $ref: '#/components/schemas/StreamSpecification'
        trafficSpecInfo:
          $ref: '#/components/schemas/TrafficSpecInformation'
      required:
        - streamSpec
        - trafficSpecInfo

    TrafficSpecInformation:
      description: >
        The traffic classe supported by the DS-TTs and available end-to-end latency
        value and Priority Code Point (PCP) value.
      type: object
      properties:
        pcpValue:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        maxFramInt:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        maxFramSize:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        maxIntFrames:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
        maxLatency:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
      required:
        - pcpValue
        - maxFramInt
        - maxFramSize
        - maxIntFrames
        - maxLatency


# Simple data types and Enumerations

    ServiceAnnoucementMode:
      anyOf:
      - type: string
        enum:
          - NRM
          - VAL
      - 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:
        - NRM: NRM server performs the service announcement.
        - VAL: VAL server performs the service announcement.

    DeliveryMode:
      anyOf:
      - type: string
        enum:
          - UNICAST
          - MULTICAST
```

```
      - 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:
        - UNICAST: Unicast delivery.
        - MULTICAST: Multicast delivery.

    NrmEvent:
      anyOf:
      - type: string
        enum:
          - UP_DELIVERY_MODE
      - 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:
        - UP_DELIVERY_MODE: User Plane delivery mode.
```

A.6 SS_Events API

```
openapi: 3.0.0
info:
  title: SS_Events
  description: |
    API for SEAL Events management.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-events/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /subscriptions:
    post:
      description: Creates a new individual SEAL Event Subscription.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SEALEventSubscription'
      callbacks:
        notificationDestination:
          '{request.body#/notificationDestination}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/SEALEventNotification'
              responses:
                '204':
                  description: No Content (successful notification)
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
```

```
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    responses:
      '201':
        description: SEAL Events subscription resource created successfully.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SEALEventSubscription'
        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'

  /subscriptions/{subscriptionId}:
    delete:
      description: Deletes an individual SEAL Event Subscription.
      parameters:
        - name: subscriptionId
          in: path
          description: Identifier of an individual Events Subscription
          required: true
          schema:
            type: string
      responses:
        '204':
          description: >
            The individual SEAL Events Subscription matching the subscriptionId is deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
```

```
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  patch:
    description: Modify an existing SEAL Event Subscription.
    parameters:
      - name: subscriptionId
        in: path
        description: Identifier of an individual Events Subscription
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/SEALEventSubscriptionPatch'
    responses:
      '200':
        description: >
          The definition SEAL event subscription is modified successfully and
          a representation of the updated service API is returned in the request body.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SEALEventSubscription'
      '204':
        description: No Content. The SEAL Event Subscription is modified successfully.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    description: Replace an existing SEAl event subscription.
    parameters:
      - name: subscriptionId
        in: path
        description: Identifier of an individual Events Subscription
        required: true
        schema:
          type: string
    requestBody:
      description: Individual SEAL events subscription to be replaced.
      required: true
```

```
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SEALEventSubscription'
      responses:
        '200':
          description: SEAL Event subscription updated successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SEALEventSubscription'
        '204':
          description: No Content. Individual SEAL event subscription was updated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    SEALEventSubscription:
      description: Represents an individual SEAL Event Subscription resource.
      type: object
      properties:
        subscriberId:
          type: string
          description: String identifying the subscriber of the event.
        eventSubs:
          type: array
          items:
            $ref: '#/components/schemas/EventSubscription'
          minItems: 1
          description: Subscribed events.
        eventReq:
          $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by Subscriber to request the SEAL server to send a test notification.
            Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        eventDetails:
          type: array
          items:
            $ref: '#/components/schemas/SEALEventDetail'
          minItems: 1
        suppFeat:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - subscriberId
      - eventSubs
      - eventReq
      - notificationDestination

  SEALEventSubscriptionPatch:
    description: Represents the partial update of individual SEAL Event Subscription resource.
    type: object
    properties:
      eventSubs:
        type: array
        items:
          $ref: '#/components/schemas/EventSubscription'
        minItems: 1
        description: Subscribed events.
      eventReq:
        $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
      notificationDestination:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'

  SEALEventNotification:
    description: Represents notification information of a SEAL Event.
    type: object
    properties:
      subscriptionId:
        type: string
        description: Identifier of the subscription resource.
      eventDetails:
        type: array
        items:
          $ref: '#/components/schemas/SEALEventDetail'
        minItems: 1
        description: Detailed notifications of individual events.
    required:
      - subscriptionId
      - eventDetails

  EventSubscription:
    description: Represents the subscription to a single SEAL event.
    type: object
    properties:
      eventId:
        $ref: '#/components/schemas/SEALEvent'
      valGroups:
        type: array
        items:
          $ref: '#/components/schemas/VALGroupFilter'
        minItems: 1
        description: >
          Each element of the array represents the VAL group identifier(s) of a VAL service
          that the subscriber wants to know in the interested event.
      identities:
        type: array
        items:
          $ref: '#/components/schemas/IdentityFilter'
        minItems: 1
        description: >
          Each element of the array represents the VAL User / UE IDs of a VAL service
          that the event subscriber wants to know in the interested event.
      monFltr:
        type: array
        items:
          $ref: '#/components/schemas/MonitorFilter'
        minItems: 1
        description: >
          List of event monitoring details that the subscriber wishes to mmonitor the VAL UEs,
          VAL group and/or VAL service.
      areaInt:
        type: array
        items:
          $ref: '#/components/schemas/MonitorLocationInterestFilter'
        minItems: 1
        description: >
          Represents the list of VAL User / UE IDs and the area of interest information
          which the subscriber wishes to monitor the location deviation of VAL User / UEs.
      locAreaMon:
```

```
        type: array
        items:
          $ref: '#/components/schemas/MonLocAreaInterestFltr'
        minItems: 1
        description: >
          Each element represents the location area monitoring details to monitor the
          VA UEs moving in and out of the provided location area.
    required:
      - eventId

  SEALEventDetail:
    description: Represents the SEAL event details.
    type: object
    properties:
      eventId:
        $ref: '#/components/schemas/SEALEvent'
      lmInfos:
        type: array
        items:
          $ref: '#/components/schemas/LMInformation'
        minItems: 1
      valGroupDocuments:
        type: array
        items:
          $ref: 'TS29549_SS_GroupManagement.yaml#/components/schemas/VALGroupDocument'
        minItems: 1
        description: >
          The VAL groups documents with modified membership and configuration information.
      profileDocs:
        type: array
        items:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ProfileDoc'
        minItems: 1
        description: Updated profile information associated with VAL Users or VAL UEs.
      msgFltrs:
        type: array
        items:
          $ref: '#/components/schemas/MessageFilter'
        minItems: 1
        description: >
          The message filter information for various member VAL User or UEs of the VAL group.
      monRep:
        type: array
        items:
          $ref: '#/components/schemas/MonitorEventsReport'
        minItems: 1
        description: The events reports with details of the events related to the VAL UE(s).
      locAdhr:
        type: array
        items:
          $ref: '#/components/schemas/LocationDevMonReport'
        minItems: 1
        description: >
          The location deviation information for the interested VAL User ID or UE IDs
          in a given location.
      tempGroupInfo:
        $ref: '#/components/schemas/TempGroupInfo'
      locAreaMonRep:
        type: array
        items:
          $ref: '#/components/schemas/LocationAreaMonReport'
        minItems: 1
        description: The location area monitoring of the given area of interest.
    required:
      - eventId

  VALGroupFilter:
    description: Represents a filter of VAL group identifiers belonging to a VAL service.
    type: object
    properties:
      valSvcId:
        type: string
        description: Identity of the VAL service
      valGrpIds:
        type: array
        items:
          type: string
        minItems: 1
```

```
      description: >
        VAL group identifiers that event subscriber wants to know in the interested event.
  required:
    - valGrpIds

IdentityFilter:
  description: Represents a filter of VAL User / UE identities belonging to a VAL service.
  type: object
  properties:
    valSvcId:
      type: string
      description: Identity of the VAL service
    valTgtUes:
      type: array
      items:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      minItems: 1
      description: >
        VAL User IDs or VAL UE IDs that the event subscriber wants to know
        in the interested event.
    suppLoc:
      type: boolean
      description: Set to true by Subscriber to request the supplementary location information.

LMInformation:
  description: Represents the location information for a VAL User ID or a VAL UE ID.
  type: object
  properties:
    valTgtUe:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
    locInfo:
      $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
    timeStamp:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    valSvcId:
      type: string
      description: Identity of the VAL service
  required:
    - locInfo
    - valTgtUe

MessageFilter:
  description: Represents the message filters applicable to a VAL User ID or VAL UE ID.
  type: object
  properties:
    reqUe:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
    tgtUe:
      type: array
      items:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      minItems: 1
      description: List of VAL User or UE IDs whose message to be sent.
    maxMsgs:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    scheds:
      type: array
      items:
        $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'
      minItems: 1
      description: Time frame associated with total number of messages.
    msgTypes:
      type: array
      items:
        type: string
      minItems: 1
      description: List of message types to be sent to VAL UE.
  required:
    - reqUe

MonitorFilter:
  description: Represents the event monitoring filters applicable to a VAL User ID or VAL UE ID.
  type: object
  properties:
    idnts:
      type: array
      items:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
```

```
        minItems: 1
        description: List of VAL User or UE IDs whose events monitoring is requested.
      valSvcId:
        type: string
        description: Identity of the VAL service.
      valGrpId:
        type: string
        description: Identity of the group of the target UEs.
      profId:
        type: string
        description: The monitoring profile ID identifying a list of monitoring, analytics events.
      valCnds:
        type: array
        items:
          $ref: '#/components/schemas/ValidityConditions'
        minItems: 1
        description: The temporal,spatial conditions for the events to be considered valid.
      evntDets:
        type: array
        items:
          $ref: '#/components/schemas/MonitorEvents'
        minItems: 1
        description: List of monitoring, analytics events to be monitored.

  MonitorEvents:
    description: List of event types to be monitored in the context of events monitoring service.
    type: object
    properties:
      cnEvnts:
        type: array
        items:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/MonitoringType'
        minItems: 1
        description: List of monitoring events related to VAL UE.
      anlEvnts:
        type: array
        items:
          $ref: 'TS29522_AnalyticsExposure.yaml#/components/schemas/AnalyticsEvent'
        minItems: 1
        description: List of analytics events related to VAL UE.

  MonitorEventsReport:
    description: List of monitoring and/or analytics events related to VAL UE.
    type: object
    properties:
      tgtUe:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      evnts:
        type: array
        items:
          $ref: '#/components/schemas/MonitorEvents'
        minItems: 1
        description: List of monitoring and analytics events related to VAL UE.
    required:
      - tgtUe
      - evnts

  ValidityConditions:
    description: List of monitoring and/or analytics events related to VAL UE.
    type: object
    properties:
      locArea:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
      tmWdws:
        type: array
        items:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
        minItems: 1
        description: Time window validity conditions.

  MonitorLocationInterestFilter:
    description: Represents the location monitoring filter information.
    type: object
    properties:
      tgtUes:
        type: array
        items:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
```

```
        minItems: 1
        description: List of VAL Users or UE IDs for which location monitoring is requested.
      locInt:
        $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
      notInt:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    required:
      - tgtUes
      - locInt
      - notInt

  LocationDevMonReport:
    description: Location deviation monitoring report.
    type: object
    properties:
      tgtUes:
        type: array
        items:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        minItems: 1
        description: List of VAL Users or UE IDs for which report is related to.
      locInfo:
        $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
      notifType:
        $ref: '#/components/schemas/LocDevNotification'
    required:
      - tgtUes
      - locInfo
      - notifType

  TempGroupInfo:
    description: Represents the created temporary VAL group information.
    type: object
    properties:
      valGrpIds:
        type: array
        items:
          type: string
        minItems: 1
      tempValGrpId:
        type: string
      valServIds:
        type: array
        items:
          type: string
        minItems: 1
    required:
      - valGrpIds
      - tempValGrpId

  MonLocAreaInterestFltr:
    description: Filter information indicate the area of interest and triggering events.
    type: object
    properties:
      locInfoCri:
        $ref: '#/components/schemas/LocationInfoCriteria'
      trigEvnts:
        type: array
        items:
          $ref: '#/components/schemas/MonLocTriggerEvent'
        minItems: 1
        description: Triggering events when to send information.
    required:
      - locInfoCri

  LocationInfoCriteria:
    description: >
      Geographic location and reference UE details, where the UEs moving in and out
      to be monitored.
    type: object
    properties:
      geoArea:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
      refUe:
        $ref: '#/components/schemas/ReferenceUEDetail'

  ReferenceUEDetail:
    description: Reference UE details, where the UEs moving in and out to be monitored.
```

```
      type: object
      properties:
        valTgtUe:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        proxRange:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      required:
        - valTgtUe
        - proxRange

    LocationAreaMonReport:
      description: Event report to notify the VAL UEs moving in or out from a given location.
      type: object
      properties:
        curPreUEs:
          type: array
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          minItems: 1
          description: List of identities of all VAL UEs present in the given location area.
        moveInOutUEs:
          $ref: '#/components/schemas/MoveInOutUEDetails'
        trigEvnt:
          $ref: '#/components/schemas/MonLocTriggerEvent'

    MoveInOutUEDetails:
      description: List of UEs moved in and out.
      type: object
      properties:
        moveInUEs:
          type: array
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          minItems: 1
          description: >
            List of identities of VAL UEs who moved in to given location area
            since previous notification.
        moveOutUEs:
          type: array
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          minItems: 1
          description: >
            List of identities of VAL UEs who moved out of the given location area
            since previous notification.

    SEALEvent:
      anyOf:
      - type: string
        enum:
          - LM_LOCATION_INFO_CHANGE
          - GM_GROUP_INFO_CHANGE
          - CM_USER_PROFILE_CHANGE
          - GM_GROUP_CREATE
          - NRM_MONITOR_UE_USER_EVENTS
          - LM_LOCATION_DEVIATION_MONITOR
          - GM_TEMP_GROUP_FORMATION
          - LM_LOCATION_AREA_MONITOR
      - 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:
        - LM_LOCATION_INFO_CHANGE: Events related to the location information of VAL Users or VAL
UEs from the Location Management Server.
        - GM_GROUP_INFO_CHANGE: Events related to the modification of VAL group membership and
configuration information from the Group Management Server.
        - CM_USER_PROFILE_CHANGE: Events related to update of user profile information from the
Configuration Management Server.
        - GM_GROUP_CREATE: Events related to creation of new VAL groups from the Group Mananagement
Server.
        - NRM_MONITOR_UE_USER_EVENTS: Monitoring and analytic events related to VAL UEs, users or
VAL group, from the Network Resource Management Server.
        - LM_LOCATION_DEVIATION_MONITOR: Events from Location Management server, related to the
deviation of the VAL User(s) / UE(s) location from an area of interest.
```

```
        - GM_TEMP_GROUP_FORMATION: Events related to the formation of new temporary VAL groups from
the Group Management Server.
        - LM_LOCATION_AREA_MONITOR: Events from Location Management server, related to the list of
UEs moving in or moving out of the specific location.

    LocDevNotification:
      anyOf:
      - type: string
        enum:
          - NOTIFY_MISMATCH_LOCATION
          - NOTIFY_ABSENCE
          - NOTIFY_PRESENCE
      - 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:
        - NOTIFY_MISMATCH_LOCATION: This value indicates that the location information of the VAL
UE(s) from the SEAL LM client and the core network are not matching.
        - NOTIFY_ABSENCE: This value indicates that the current location information of the VAL
UE(s)is deviating from the VAL server's area of interest.
        - NOTIFY_PRESENCE: This value indicates that the current location information of the VAL
UE(s) is within the VAL server's area of interest.

    MonLocTriggerEvent:
      anyOf:
      - type: string
        enum:
          - DISTANCE_TRAVELLED
      - 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:
        - DISTANCE_TRAVELLED: This value indicates the trigger event for the location area
monitoring based on the distance travelled by the reference UE.
```

A.7 SS_KeyInfoRetrieval API

```
openapi: 3.0.0
info:
  title: SS_KeyInfoRetrieval
  description: |
    API for SEAL Key Information Retrieval.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.1.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-kir/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /key-records:
    get:
      description: Retrieve Key mamangement information specific to VAL service.
      parameters:
        - name: val-service-id
          in: query
          description: String identifying an individual VAL service
          required: true
```

```
          schema:
            type: string
        - name: val-tgt-ue
          in: query
          description: Identifying a VAL target.
          required: false
          schema:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      responses:
        '200':
          description: The key management information of the VAL service, VAL User or VAL UE.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ValKeyInfo'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/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:
    ValKeyInfo:
      description: >
        Represents key management information associated with VAL server, VAL user or VAL UE.
      type: object
      properties:
        userUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        skmsId:
          type: string
          description: String identifying the key management server.
        valService:
          type: string
          description: Unique identifier of a VAL Service.
        valTgtUe:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        keyInfo:
          type: string
          description: Key management information specific to VAL service, VAL User or VAL UE.
      required:
        - userUri
        - valService
        - keyInfo
```

A.8 SS_LocationAreaInfoRetrieval API

```
openapi: 3.0.0
info:
  title: SS_LocationAreaInfoRetrieval
  description: |
```

```
    API for SEAL Location Area Info Retrieval.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-lair/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /location-retrievals:
    get:
      description: >
        Retrieve the UE(s) information in an application defined proximity range of a location.
      parameters:
        - name: location-info
          in: query
          description: Location information around which the UE(s) information is requested.
          required: true
          schema:
            $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
        - name: range
          in: query
          description: >
            The range information over which the UE(s) information is required,
            expressed in meters.
          required: true
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
      responses:
        '200':
          description: >
            The UE(s) information in an application defined proximity range of a location.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: 'TS29549_SS_Events.yaml#/components/schemas/LMInformation'
                minItems: 0
                description: >
                  The UE(s) information in an application defined proximity range of a location.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/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: {}
```

A.9 SS_NetworkSliceAdaptation API

```
openapi: 3.0.0
info:
  title: SS_NetworkSliceAdaptation
  description: |
    API for SEAL Network Slice Adaptation.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-nsa/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /request:
    post:
      summary: request the network slice adaptation.
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NwSliceAdptInfo'
      responses:
        '204':
          description: No Content. The requested network slice adaptation is successfully processed.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/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:
    NwSliceAdptInfo:
      description: The requested network slice adaptation with the underlying network.
      type: object
```

```
      properties:
        valServiceId:
          type: string
        valTgtUeIds:
          type: array
          items:
            type: string
        nwSliceAdptCause:
          type: string
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - valServiceId
        - valTgtUeIds
```

A.10 SS_NetworkResourceMonitoring API

```
openapi: 3.0.0
info:
  title: SS_NetworkResourceMonitoring
  description: |
    API for SEAL Network Resource Monitoring.
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    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: >
    3GPP TS 29.549 V17.5.0 Service Enabler Architecture Layer for Verticals (SEAL);
    Application Programming Interface (API) specification; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.549/
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/ss-nrm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 6.5 of 3GPP TS 29.549
paths:
  /subscriptions:
    post:
      summary: Create individual unicast monitoring subscription resource or obtain unicast QoS
monitoring data for VAL UEs, VAL Group, or VAL Streams.
      operationId: SubscribeUnicastMonitoring
      tags:
        - Unicast Monitoring Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MonitoringSubscription'
      responses:
        '201':
          description: >
            The requested individual monitoring subscription resource is successfully created
            and a representation of the created resource is returned in the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MonitoringSubscription'
          headers:
            Location:
              description: Contains the URI of the newly created individual monitoring resource.
              required: true
              schema:
                type: string
        '200':
          description: The requested unicast QoS monitoring data is returned.
          content:
```

```
            application/json:
              schema:
                $ref: '#/components/schemas/MonitoringReport'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      callbacks:
        NotifyUnicastMonitoringData:
          '{$request.body#/notifUri}':
            post:
              summary: Notify on updates of the individual monitoring resorce accoring the requested
reporting settings.
              requestBody:
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/MonitoringReport'
              responses:
                '204':
                  description: The notification is successfully received.
                '307':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/307'
                '308':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/308'
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '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'
  /subscriptions/{subscriptionId}:
    delete:
      summary: Remove an existing individual unicast monitoring subscription resource according to
the subscriptionId.
      operationId: UnsubscribeUnicastMonitoring
      tags:
        - Individual Unicast Monitoring Subscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: >
            Represents the identifier of an individual unicast monitoring subscription resource.
```

```
          required: true
          schema:
            type: string
      responses:
        '204':
          description: >
            The Individual Unicast Monitoring Subscription resource matching the
            subscriptionId is deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    get:
      summary: Read an existing individual unicast monitoring subscription resource according to the
subscriptionId.
      operationId: ReadUnicastMonitoringSubscription
      tags:
        - Individual Unicast Monitoring Subscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: >
            Represents the identifier of an individual unicast monitoring subscription resource.
          required: true
          schema:
            type: string
      responses:
        '200':
          description: The requested individual unicast monitoring subscription returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MonitoringSubscription'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
```

```
        tokenUrl: '{tokenUrl}'
        scopes: {}

  schemas:
    MonitoringReport:
      description: Indicates the monitoring information for VAL UEs list, VAL Group, or VAL Stream.
      type: object
      properties:
        valUeIds:
          type: array
          minItems: 1
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
          description: List of VAL UEs whose QoS monitoring data is requested.
        valGroupId:
          type: string
          description: The VAL Group Id which QoS monitoring data is requested.
        valStreamIds:
          type: array
          minItems: 1
          items:
            type: string
          description: List of VAL streams for which QoS monitoring data is requested.
        measData:
          $ref: '#/components/schemas/MeasurementData'
        failureRep:
          type: array
          items:
            $ref: '#/components/schemas/FailureReport'
          description: >
            The failure report indicating the VAL UE(s) or VAL Stream ID(s) whose measurement
            data is not obtained successfully.
        timestamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      required:
        - measData
        - timestamp
      oneOf:
        - required: [valUeIds]
        - required: [valGroupId]
        - required: [valStreamIds]

    MeasurementData:
      description: Presents the aggregated measurement data.
      type: object
      properties:
        dlDelay:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        ulDelay:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        rtDelay:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        avgPlr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketLossRate'
        avgDataRate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        maxDataRate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        avrDlTrafficVol:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        avrUlTrafficVol:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      anyOf:
        - required: [dlDelay]
        - required: [ulDelay]
        - required: [rtDelay]
        - required: [avgPlr]
        - required: [avgDataRate]
        - required: [maxDataRate]
        - required: [avrDlTrafficVol]
        - required: [avrUlTrafficVol]

    MeasurementPeriod:
      description: >
        Indicates the measurement time period.
      type: object
      properties:
        measStartTime:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      measDuration:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    required:
      - measStartTime
      - measDuration

  ReportingRequirements:
    description: Indicates the requested frequency of reporting.
    type: object
    properties:
      reportingMode:
        $ref: 'TS29508_Nsmf_EventExposure.yaml#/components/schemas/NotificationMethod'
      reportingPeriod:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      reportingThr:
        $ref: '#/components/schemas/MeasurementData'
      immRep:
        type: boolean
      repTerminMode:
        $ref: '#/components/schemas/TerminationMode'
      expirationTimer:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      maxNumRep:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      termThr:
        $ref: '#/components/schemas/MeasurementData'
    required:
      - reportingMode

  FailureReport:
    description: >
      Represents the failure report indicating the VAL UE(s) or VAL Stream ID(s)
      for which the NRM server failed to obtain the requested data.
    type: object
    properties:
      valUeIds:
        type: array
        minItems: 1
        items:
          $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        description: >
          List of VAL UE(s) whose measurement data is not obtained successfully.
      valStreamIds:
        type: array
        minItems: 1
        items:
          type: string
        description: >
          List of VAL stream ID(s) whose measurement data is not obtained successfully.
      failureReason:
        $ref: '#/components/schemas/FailureReason'
      measDataType:
        $ref: '#/components/schemas/MeasurementDataType'
    required:
      - measDataType

  MeasurementRequirements:
    description: Indicates the measurement requirements.
    type: object
    properties:
      measDataTypes:
        type: array
        items:
          $ref: '#/components/schemas/MeasurementDataType'
        minItems: 1
        description: Indicates the required the QoS measurement data types.
      measAggrGranWnd:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AverWindow'
      measPeriod:
        $ref: '#/components/schemas/MeasurementPeriod'
    required:
      - measDataTypes

  MonitoringSubscription:
    description: The unicast monitoring subscription request.
    type: object
    properties:
```

```
        valUeIds:
          description: List of VAL UEs whose QoS monitoring data is requested.
          type: array
          minItems: 1
          items:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        valGroupId:
          type: string
          description: The VAL Group Id which QoS monitoring data is requested.
        valStreamIds:
          type: array
          minItems: 1
          items:
            type: string
          description: List of VAL streams for which QoS monitoring data is requested.
        measReqs:
          $ref: '#/components/schemas/MeasurementRequirements'
        monRep:
          $ref: '#/components/schemas/MonitoringReport'
        reportReqs:
          $ref: '#/components/schemas/ReportingRequirements'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        reqTestNotif:
          type: boolean
        wsNotifCfg:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

# Simple data types and Enumerations
    MeasurementDataType:
      anyOf:
      - type: string
        enum:
           - DL_DELAY
           - UL_DELAY
           - RT_DELAY
           - AVG_PLR
           - AVG_DATA_RATE
           - MAX_DATA_RATE
           - AVG_DL_TRAFFIC_VOLUME
           - AVG_UL_TRAFFIC_VOLUME
      - type: string
        description: >
          Indicates the type of measurement data.
      description: |
        Possible values are:
        - DL_DELAY: Downlink packet delay.
        - UL_DELAY: Uplink packet delay.
        - RT_DELAY: Round trip packet delay.
        - AVG_PLR: Average packet loss rate.
        - AVG_DATA_RATE: Average data rate.
        - MAX_DATA_RATE: Maximum data rate.
        - AVG_DL_TRAFFIC_VOLUME: Average downlink traffic volume.
        - AVG_UL_TRAFFIC_VOLUME: Average uplink traffic volume.

    TerminationMode:
      anyOf:
      - type: string
        enum:
           - TIME_TRIGGERED
           - EVENT_TRIGGERED_NUM_REPORTS_REACHED
           - EVENT_TRIGGERED_MEAS_THR_REACHED
           - USER_TRIGGERED
      - type: string
        description: >
          Indicates the termination mode
      description: |
        Possible values are:
        - TIME_TRIGGERED: Time-triggered termination mode.
        - EVENT_TRIGGERED_NUM_REPORTS_REACHED: Event-triggered termination number of reports reached
mode.
        - EVENT_TRIGGERED_MEAS_THR_REACHED: The event-triggered termination measurement index
threshold reached mode.
        - USER_TRIGGERED: User-triggered termination mode.

    FailureReason:
```

```
      anyOf:
      - type: string
        enum:
           - USER_NOT_FOUND
           - STREAM_NOT_FOUND
           - DATA_NOT_AVAILABLE
           - OTHER_REASON
      - type: string
        description: >
          Represents the failure reason.
      description: |
        Possible values are:
        - USER_NOT_FOUND: The user is not found.
        - STREAM_NOT_FOUND: The stream is not found.
        - DATA_NOT_AVAILABLE: The requested data is not available.
        - OTHER_REASON: Other reason (unspecified).
```

Annex B (normative): SEAL NRM server support integration with TSN

When the SEAL Network Resource Management (NRM) server act as a TSN AF, the NRM server shall support integration with TSN including 5GS Bridge information reporting as defined in clause 14.3.8.2 of 3GPP TS 23.434 [2] and 5GS Bridge configuration as defined in clause 14.3.8.3 of 3GPP TS 23.434 [2].

The 5GS integration with TSN only support fully-centralized model as defined in IEEE Std 802.1Qcc-2018 [29], the NRM server acts as a TSN AF as defined in clause 14.2.2.2 of 3GPP TS 23.434 [2], shall support the TSN bridge information report as defined in clause 14.3.2.29 of 3GPP TS 23.434 [2], TSN bridge information confirmation as defined in clause 14.3.2.30 of 3GPP TS 23.434 [2], TSN bridge configuration request as defined in clause 14.3.2.31 of 3GPP TS 23.434 [2] and TSN bridge configuration response as defined in clause 14.3.2.32 of 3GPP TS 23.434 [2]. TSN CNC (as defined in IEEE 802.1Qcc [29]) via the NRM-S reference point configures the TSN flows in the 5GS. As a TSN AF, the SEAL NRM server shall interact with the 5GS PCF over the N5 reference point to configure the 5G QoS and TSCAI parameters in 5GS as defined in clause 14.2.2.24 of 3GPP TS 29.514 [30].

Annex C (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-10	CT3#106					TS skeleton for Services Enabler Architecture Layer for Verticals Application Programming Interface specification.	0.0.0
2019-10	CT3#106	C3-194418				Inclusion of TS skeleton document with clauses reflecting SEAL service APIs, agreed in the meeting CT3#106: C3-194418	0.1.0
2019-10	CT3#106	C3-194314				Inclusion of documents agreed in CT3#106: C3-194297, C3-194298, C3-194299, C3-194300	0.2.0
2019-11	CT3#107	C3-195307				Inclusion of documents agreed in CT3#107: C3-195157, C3-195260, C3-195441, C3-195262, C3-195263, C3-195264, C3-195185	0.3.0
2019-12	CT#86	CP-193176				Sent to plenary for Information	1.0.0
2020-03	CT3#108e					Inclusion of documents agreed in CT3#108-e meeting: C3-201346, C3-201347, C3-201348, C3-201349, C3-201350, C3-201456, C3-201457, C3-201351, C3-201352, C3-201271	1.1.0
2020-04	CT3#109e	C3-202444				Inclusion of documents agreed in CT3#109e meeting: C3-202241, C3-202275, C3-202334, C3-202335, C3-202336, C3-202337, C3-202338, C3-202339, C3-202340, C3-202341, C3-202342, C3-202343, C3-202481	1.2.0
2020-06	CT3#110e	C3-203459				Inclusion of documents agreed in CT3#110e meeting: C3-203233, C3-203317, C3-203409, C3-203411, C3-203412, C3-203413, C3-203414, C3-203415, C3-203416, C3-203417, C3-203418, C3-203419, C3-203530, C3-203587, C3-203634	1.3.0
2020-06	CT#88e	CP-201209				TS sent to plenary for approval	2.0.0
2020-06	CT#88e	CP-201334				Implementation errors fixed. TS sent to plenary for approval	2.0.1
2020-06	CT#88e	CP-201334				TS approved by plenary	16.0.0
2020-09	CT#89e	CP-202074	0001		F	Correct apiVersion notation	16.1.0
2020-09	CT#89e	CP-202074	0002	1	F	Corrections to API and Event names	16.1.0
2020-09	CT#89e	CP-202074	0003		F	Correct Identity filter in Events API	16.1.0
2020-09	CT#89e	CP-202087	0004	1	F	SS_KeyInfoRetrieval API correction	16.1.0
2020-09	CT#89e	CP-202074	0005		F	Key Management API description	16.1.0
2020-09	CT#89e	CP-202074	0006	1	F	UnicastSubscription attribute presence correction	16.1.0
2020-09	CT#89e	CP-202084	0009		F	Update of OpenAPI version and TS version in externalDocs field	16.1.0
2020-12	CT#90e	CP-203139	0010	1	F	Essential corrections and alignments	16.2.0
2020-12	CT#90e	CP-203142	0011	1	F	Immediate reporting	16.2.0
2020-12	CT#90e	CP-203139	0012	1	F	Storage of YAML files in 3GPP Forge	16.2.0
2020-12	CT#90e	CP-203142	0013	1	F	SEAL Group configuration corrections	16.2.0
2020-12	CT#90e	CP-203152	0014		F	Update of OpenAPI version and TS version in externalDocs field	16.2.0
2021-03	CT#91e	CP-210221	0015	1	F	Adding some missing description fields to data type definitions in OpenAPI specification files	17.0.0
2021-03	CT#91e	CP-210221	0016	1	F	Corrections to HTTP custom headers handling for Northbound APIs	17.0.0
2021-03	CT#91e	CP-210220	0017		F	OpenAPI reference	17.0.0
2021-03	CT#91e	CP-210240	0018		F	Update of OpenAPI version and TS version in externalDocs field	17.0.0
2021-06	CT#92e	CP-211238	0019	1	F	Correction of invalid characters in OpenAPI specification files	17.1.0
2021-06	CT#92e	CP-211241	0022	1	F	204 No Content during modification procedure on SS_GroupManagement API	17.1.0
2021-06	CT#92e	CP-211241	0023	1	F	Support redirection for SEAL APIs	17.1.0
2021-06	CT#92e	CP-211235	0025		A	Notifcation URI	17.1.0
2021-06	CT#92e	CP-211240	0026		F	204 No Conent for resource modification in SS_LocationReporting API	17.1.0
2021-06	CT#92e	CP-211265	0027		F	Update of OpenAPI version and TS version in externalDocs field	17.1.0
2021-09	CT#93e	CP-212214	0028		F	Resource URI correction on SEAL APIs	17.2.0
2021-09	CT#93e	CP-212207	0029	1	B	Support 5G CN external group information for SEAL groups	17.2.0
2021-09	CT#93e	CP-212207	0030	1	B	Message filters for SEAL groups	17.2.0
2021-09	CT#93e	CP-212223	0031		F	Update of OpenAPI version and TS version in externalDocs field	17.2.0
2021-12	CT#94e	CP-213232	0032	1	B	Support local MBMS	17.3.0
2021-12	CT#94e	CP-213232	0033	1	B	Support Tracking UE and obtaining dynamic UE information	17.3.0
2021-12	CT#94e	CP-213231	0034	1	B	Group Management enhancement for 5G-VN groups	17.3.0
2021-12	CT#94e	CP-213250	0035	4	B	eSEAL Events Monitoring service	17.3.0
2021-12	CT#94e	CP-213220	0036		B	Alignment with SA3 supported TLS profiles	17.3.0
2021-12	CT#94e	CP-213254	0037	2	B	Network slice capability management API for SEAL	17.3.0
2021-12	CT#94e	CP-213231	0038	1	B	eSEAL location deviation service	17.3.0
2021-12	CT#94e	CP-213231	0039	1	B	Introduce TSC related service operations	17.3.0
2021-12	CT#94e	CP-213231	0041	1	B	Support Create_TSC_Stream service operation	17.3.0
2021-12	CT#94e	CP-213231	0042	1	B	Support Delete_TSC_Stream service operation	17.3.0
2021-12	CT#94e	CP-213231	0045	2	B	Create_TSC_Stream data model and OpenAPI	17.3.0
2021-12	CT#94e	CP-213231	0046		B	Delete_TSC_Stream OpenAPI definition	17.3.0
2021-12	CT#94e	CP-213236	0052	1	D	Editorial corrections for tables, figures, clauses, headers and refernces	17.3.0
2021-12	CT#94e	CP-213246	0054		F	Update of OpenAPI version and TS version in externalDocs field	17.3.0
2022-03	CT#95e	CP-220205	0040	4	B	Support Discover_TSC_Stream_Availability service operation	17.4.0

2022-03	CT#95e	CP-220205	0043	4	B	Resource structure to support TSC related service operations	17.4.0
2022-03	CT#95e	CP-220205	0044	4	B	Discover_TSC_Stream_Availability data model and OpenAPI	17.4.0
2022-03	CT#95e	CP-220205	0055	2	B	Obtain service operation in SS_NetworkResourceMonitoring	17.4.0
2022-03	CT#95e	CP-220205	0056	2	B	SS_NetworkResourceMonitoring API support	17.4.0
2022-03	CT#95e	CP-220205	0057	2	B	SS_NetworkResourceMonitoring OpenAPI implementation	17.4.0
2022-03	CT#95e	CP-220205	0058	1	B	Support integration with TSN	17.4.0
2022-03	CT#95e	CP-220205	0059		F	Terminology replacement of NSCM with NSCE	17.4.0
2022-03	CT#95e	CP-220205	0060	1	B	Location deviation service and Open API	17.4.0
2022-03	CT#95e	CP-220205	0061	2	B	SS_LocationAreaMonitoring API	17.4.0
2022-03	CT#95e	CP-220205	0062		B	Location report timestamp support	17.4.0
2022-03	CT#95e	CP-220205	0063		B	Add VAL service specific information	17.4.0
2022-03	CT#95e	CP-220205	0065	1	B	SS_NetworkResourceMonitoring API definition and Subscribe/Unsubscribe/Notify service operations	17.4.0
2022-03	CT#95e	CP-220205	0066		B	Supporting temporary group formation within a VAL system	17.4.0
2022-03	CT#95e	CP-220205	0067	1	B	Subscription update for SS_Events API	17.4.0
2022-03	CT#95e	CP-220205	0068	1	B	Clarification on location based group for SS_GroupManagement API	17.4.0
2022-03	CT#95e	CP-220204	0070	1	B	Support PATCH for update of Individual SEAL Location Reporting Configuration resource	17.4.0
2022-03	CT#95e	CP-220204	0071		B	Support PATCH for update of Individual VAL group document resource	17.4.0
2022-03	CT#95e	CP-220194	0072		F	Update of info and externalDocs fields	17.4.0
2022-06	CT#96	CP-221140	0073	1	F	Tags and OperationId support in the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0074	1	F	Dimension of QoS parameters in the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0075	2	F	Clarifications of reporting, reporting termination, and subscription termination in SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0076	1	F	The "Requestor identity" attributes removal in Release 17 APIs	17.5.0
2022-06	CT#96	CP-221140	0077	1	F	Resolving EN for the Subscribe service operation in the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0078		F	The corrections of naming in the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0079	1	F	NO-REF_SIBLINGS error correction	17.5.0
2022-06	CT#96	CP-221140	0080	2	F	SEAL-S security update for Release-17	17.5.0
2022-06	CT#96	CP-221140	0082	3	F	Partial success support in the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221140	0083	1	B	Supplementary location information to verticals	17.5.0
2022-06	CT#96	CP-221140	0084		F	Resolution of the Editor’s note for Network slice capability Enablement API.	17.5.0
2022-06	CT#96	CP-221140	0085	1	F	Correction of arrays cardinality in the SS_NetworkResourceMonitoring OpenAPI file	17.5.0
2022-06	CT#96	CP-221156	0087		A	SEAL-S security update	17.5.0
2022-06	CT#96	CP-221148	0088	1	F	Resource URI overview and apiVersion placeholder	17.5.0
2022-06	CT#96	CP-221148	0089	1	F	OpenAPI long descriptions	17.5.0
2022-06	CT#96	CP-221156	0091		A	Correcting the ValTargetUe data type name in two occurrences	17.5.0
2022-06	CT#96	CP-221260	0092	2	F	Organizing and correcting the data model of the SS_NetworkResourceMonitoring API	17.5.0
2022-06	CT#96	CP-221151	0093		F	Update of info and externalDocs fields	17.5.0

History

Document history		
V17.4.0	May 2022	Publication
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