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TECHNICAL SPECIFICATION

**5G;
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Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification;
Stage 3
(3GPP TS 29.549 version 16.3.0 Release 16)**

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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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where:

x   the first digit:

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

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

[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".

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
JSON	JavaScript Object Notation
NDS	Network Domain Security
NDS/IP	NDS for IP based protocols
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
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_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
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
NOTE: The service operations of SS_Events API are reused by the SS_LocationInfoEvent, SS_GroupManagementEvent and SS_UserProfileEvent 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

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. Upon receiving the HTTP PUT 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 the resource identified by the Resource URI of the configuration received in the request;

   b. return the updated location reporting configuration information in the response

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.

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.

5.3 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. 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. 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 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 the resource identified by the Resource URI of the group document with group members list and group configuration information received in the request;

    b. return the updated VAL group document in the response

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. 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 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.

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. 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 and on modifications to VAL Group membership and configuration information. The SS_GroupManagementEvent API supports this via the "GM_GROUP_CREATE" and "GM_GROUP_INFO_CHANGE" events of 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.

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

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 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.

5.6   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).

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

5.7 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.

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 3.0.0 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 3.0.0 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 (IETF RFC 5246 [11]) is mandatory and support of HTTP/2 (IETF RFC 7540 [12]) over TLS (IETF RFC 5246 [11]) 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].

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 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

{apiRoot}/ss-lr/<apiVersion>

/trigger-configurations

/{configurationId}
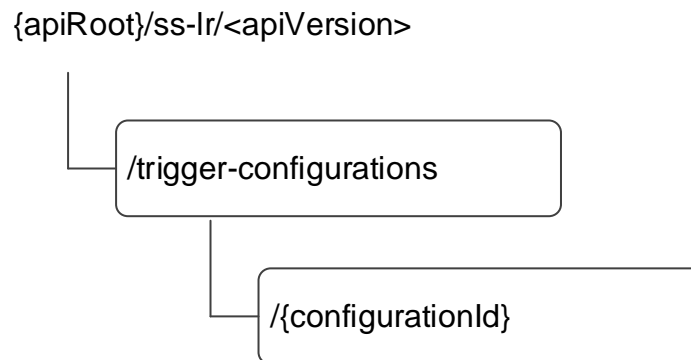
Figure 7.1.1.2.1-1: Resource URI structure of the SS_LocationReporting API

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}.
		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
apiVersion	string	See clause 7.1.1.1

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
LocationReportCo nfiguration	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
apiVersion	string	See clause 7.1.1.1
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.
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.				

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.
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.				

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.
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.				

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		

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	ValTarget Ue	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	DurationS ec	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	Supported Features	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.	

7.1.1.4.3 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

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

{apiRoot}/ss-gm/<apiVersion>

```
                    /group-documents

                           /{groupDocId}
```
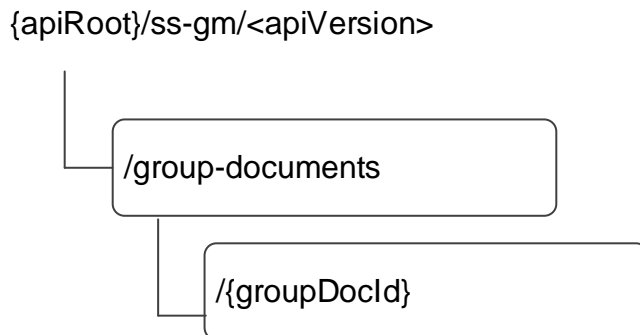
Figure 7.2.1.2.1-1: Resource URI structure of the SS_GroupManagement API

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}.

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
apiVersion	string	See clause 7.2.1.1

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.
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.				

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
apiVersion	string	See clause 7.2.1.1
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.
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.				

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.
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.			

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.
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.			

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.	

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.	

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(ValTrgetUe)	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	Supported Features	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)	
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.	
NOTE: The "resUri" attribute is not modifiable by the VAL server.					

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

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

{apiRoot}/ss-upr/<apiVersion>
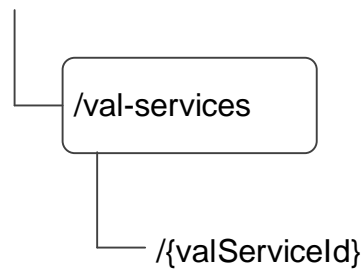
Figure 7.3.1.2.1-1: Resource URI structure of the SS_UserProfileRetrieval API

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
apiVersion	string	See clause 7.3.1.1

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 7.3.1.2.2.3.2-2 and the response data structures and response codes specified in table 7.3.1.2.2.3.2 -3.

Table 7.3.1.2.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.3.1.2.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(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.
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.				

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

{apiRoot}/ss-nra/<apiVersion>

/multicast-subscriptions

/{multiSubId}

/unicast-subscriptions

/{uniSubId}
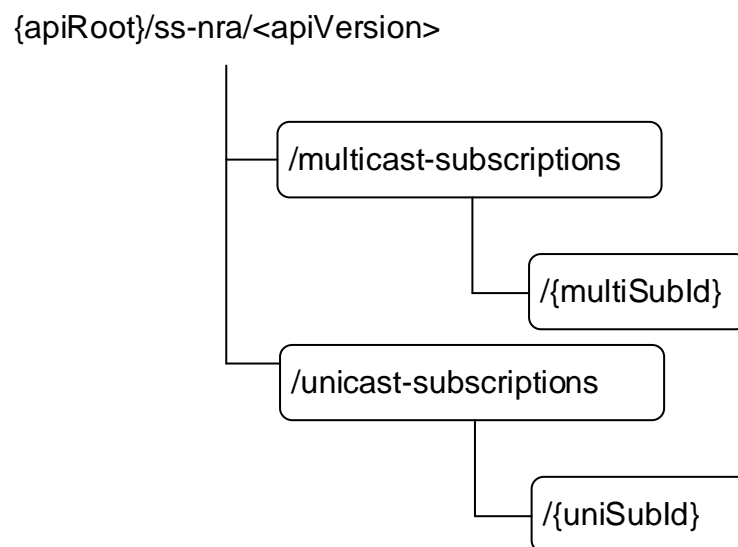
Figure 7.4.1.2.1-1: Resource URI structure of the SS_NetworkResourceAdaptation API

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.

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 7.4.1.1
apiVersion	string	See clause 7.4.1.1

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
MulticastSubscrip tion	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	See clause 7.4.1.1.
apiVersion	string	See clause 7.4.1.1.
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	
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.				

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.
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.				

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 7.4.1.1
apiVersion	string	See clause 7.4.1.1

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 7.4.1.1.
apiVersion	string	See clause 7.4.1.1.
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	
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.				

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.
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.				

7.4.1.2.5.4   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.
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.				

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.

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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		
UserPlaneNotification	7.4.1.4.2.4		
UnicastSubscription	7.4.1.4.2.3		

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]		
MbmsLocArea	3GPP TS 29.122 [3]		
SupportedFeatures	3GPP TS 29.571 [21]		
Uint32	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]		

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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.	
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	Supported Features	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.	

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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.

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

{apiRoot}/ss-events/<apiVersion>
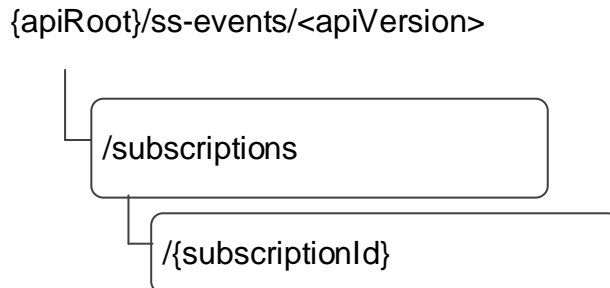
Figure 7.5.1.2.1-1: Resource URI structure of the SS_Events API

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.

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
apiVersion	string	See clause 7.5.1.1

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}

7.5.1.2.2.4   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
apiVersion	string	See clause 7.5.1.1
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.
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.				

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.
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.				

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	
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.	

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	
ValTargetUe	7.3.1.4.2.3	Used to identify a VAL user ID or a VAL UE ID.	

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	Supported Features	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
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

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".	

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.	

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

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.

7.6 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

{apiRoot}/ss-kir/<apiVersion>

/key-records

/{keyRecordId}
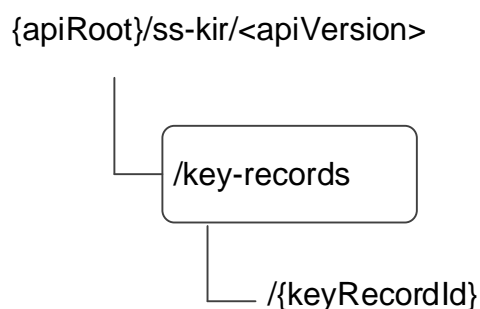
Figure 7.6.1.2.1-1: Resource URI structure of the SS_KeyInfoRetrieval API

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
apiVersion	string	See clause 7.6.1.1

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 7.6.1.2.2.3.2-2 and the response data structures and response codes specified in table 7.6.1.2.2.3.2 -3.

Table 7.6.1.2.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 7.6.1.2.2.3.2-3: 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.
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.			

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

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].

Annex A (normative): OpenAPI specification

A.1 General

This annex is based on the OpenAPI 3.0.0 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.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: 3GPP TS 29.549 V16.0.0 Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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 confirguation 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'
        '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'
        '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.
              '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:
    LocationReportConfiguration:
      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
```

A.3 SS_GroupManagement API

```
openapi: 3.0.0
info:
  title: SS_GroupManagement
  description: |
    API for SEAL Group management.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.1"
externalDocs:
  description: 3GPP TS 29.549 V16.2.0 Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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
            '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'
        '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'
        '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.
        '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:
    VALGroupDocument:
      type: object
      properties:
        valGroupId:
          type: string
          description: The VAL group idenity.
        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
        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'
      required:
        - valGroupId
```

A.4 SS_UserProfileRetrieval API

```
openapi: 3.0.0
info:
  title: SS_UserProfileRetrieval
  description: |
    API for SEAL User Profile Retrieval.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.0"
externalDocs:
  description: 3GPP TS 29.549 V16.0.0 Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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
            '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:
      type: object
      properties:
        profileInformation:
          type: string
          description: Profile information associated with the valUserId or valUeId.
        valTgtUe:
          $ref: '#/components/schemas/ValTargetUe'
      required:
        - profileInformation
        - valTgtUe
    ValTargetUe:
      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: 1.0.1
  title: SS_NetworkResourceAdaptation
  description: |
    SS Network Resource Adaptation Service.
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.549 V16.1.0; Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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
              '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'
        '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
            '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
                          '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'
        '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
          '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:
      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'
        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:
      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:
           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:
           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


# 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.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.1"
externalDocs:
  description: 3GPP TS 29.549 V16.2.0 Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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)
                '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.
        '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:
    SEALEventSubscription:
      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
    SEALEventNotification:
      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:
      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.
      required:
        - eventId
    SEALEventDetail:
      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.
      required:
        - eventId
    VALGroupFilter:
      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:
      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.
    LMInformation:
      type: object
      properties:
        valTgtUe:
            $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
        locInfo:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
      required:
        - locInfo
        - valTgtUe
    SEALEvent:
      anyOf:
      - type: string
        enum:
          - LM_LOCATION_INFO_CHANGE
          - GM_GROUP_INFO_CHANGE
          - CM_USER_PROFILE_CHANGE
          - GM_GROUP_CREATE
      - 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.
```

A.7   SS_KeyInfoRetrieval API

```
openapi: 3.0.0
info:
  title: SS_KeyInfoRetrieval
  description: |
    API for SEAL Key Information Retrieval.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
  version: "1.0.1"
externalDocs:
  description: 3GPP TS 29.549 V16.1.0 Service Enabler Architecture Layer for Verticals (SEAL);
Application Programming Interface (API) specification; Stage 3.
  url: http://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'
        '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:
      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
```

ETSI

Annex B (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
2021-06	CT#92e	CP-211235	0024		F	Notification URI	16.3.0

History

Document history		
V16.0.0	August 2020	Publication
V16.1.0	November 2020	Publication
V16.2.0	January 2021	Publication
V16.3.0	August 2021	Publication