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Contents

Foreword

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1 Scope

The present document specifies the stage 3 protocol and data model for Vs interface between the V2X application specific server and VAE server and VAE-E interface between VAE servers. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the VAE server. The Vs, VAE-E interfaces and the related stage 2 functional requirements are defined in 3GPP TS 23.286 [4].

The stage 2 application layer architecture, functional requirements, procedures and information flows necessary for enabling Vehicle-to-Everything (V2X) are specified in 3GPP TS 23.286 [4].

The common protocol and interface aspects for API definition are specified in clause 5.2 of 3GPP TS 29.122 [27].

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 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

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

[4] 3GPP TS 23.286: "Application layer support for Vehicle-to-Everything (V2X) services; Functional architecture and information flows".

[5] IETF RFC 9113: "HTTP/2".

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

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

[8] 3GPP TR 21.900: "Technical Specification Group working methods".

[11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[12] IETF RFC 9112: " HTTP/1.1".

[13] IETF RFC 9110: "HTTP Semantics".

[14] Void.

[15] Void.

[16] IETF RFC 9111: "HTTP: Caching".

[17] Void.

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

[19] 3GPP TS 29.116: "Representational state transfer over xMB reference point between Content Provider and BM-SC".

[20] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

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

[22] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

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

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

[25] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[26] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

[27] 3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

[28] 3GPP TS 24.486: "Vehicle-to-Everything (V2X) Application Enabler (VAE) layer; Protocol aspects; stage 3".

[29] 3GPP TS 29.549: "Service Enabler Architecture Layer for Verticals (SEAL); Application Programming Interface (API) specification; Stage 3".

[30] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[31] 3GPP TS 33.536: "Security aspects of 3GPP support for advanced Vehicle-to-Everything (V2X) services".

[32] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[33] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[34] 3GPP TS 29.522: "Network Exposure Function Northbound APIs; Stage 3".

[35] 3GPP TS 22.186: "Enhancement of 3GPP support for V2X scenarios; Stage 1".

3 Definitions of terms, symbols 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].

For the purpose of the present document, the terms and definitions specified in clause 3.1 of 3GPP TS 23.286 [4] also apply, including the ones referencing other specifications.

3.2 Symbols

Void

3.3 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].

CAPIF	Common API Framework
NRM	Network Resource Management
V2X	Vehicle-to-Everything
VASS	V2X Application Specific Server
VAE	V2X Application Enabler

4 Overview

The Vs interface is between the V2X application specific server and the VAE Server. It specifies RESTful APIs that allow the V2X application specific server to access the services and capabilities provided by VAE Server.

The stage 2 level requirements and signalling flows for the Vs interface are defined in 3GPP TS 23.286 [4].

The Vs interface supports the following APIs:

- VAE_MessageDelivery
- VAE_FileDistribution
- VAE_ApplicationRequirement
- VAE_DynamicGroup
- VAE_HDMapDynamicInfo
- VAE_SessionOrientedService
- VAE_V2VConfigRequirement
- VAE_PC5ProvisioningRequirement
- VAE_ServiceAndQoSControlInfo
- VAE_VRUZoneManagement
- VAE_V2PApplicationRequirement

The VAE-E interface is between VAE Servers. It specifies RESTful APIs that allow the VAE server to access the services and capabilities provided by other VAE Server.

The stage 2 level requirements and signalling flows for the VAE-E interface are defined in 3GPP TS 23.286 [4].

The VAE-E interface supports the following APIs:

- VAE_ServiceContinuity

5 Services offered by the V2X Application Enabler

5.1 Introduction

The table 5.1-1 shows the services provided by the VAE server and corresponding Service Operations:

Table 5.1-1 List of services provided by the VAE Server

Service Name	Service Operations	Operation Semantics	Example Consumer(s)
VAE_MessageDelivery	Deliver_DL_Message	Request/Response	VASS
	Deliver_UL_Message	Subscribe/Notify	VASS
	V2X_MessageDelivery_Subscribe		VASS
	V2X_MessageDelivery_Unsubscribe		VASS
VAE_FileDistribution	Distribute_File	Request/ Response	VASS
VAE_ApplicationRequirement	Reserve_NetworkResource	Subscribe/Notify	VASS
	Notify_NetworkResource		
VAE_DynamicGroup	Configure_DynamicGroup	Subscribe/Notify	VASS
VAE_ServiceContinuity	Query_ServiceContinuity	Request/Response	VAE Server
VAE_HDMapDynamicInfo	Subscribe_HDMapDynamicInfo	Subscribe/Notify	VASS
VAE_SessionOrientedService	Establish_Session	Subscribe/Notify	VASS
	Notify_Establish_Session		
	Update_Session		
	Notify_Update_Session		
	Terminate_Session		
	Notify_Terminate_Session		
VAE_V2VConfigRequirement	Request_V2VConfigRequirement	Request/Response	VASS
VAE_PC5ProvisioningRequirement	Config_PC5ProvisioningRequirement	Subscribe/Notify	VASS
	Notify_PC5ProvisioningRequirement		
VAE_ServiceAndQoSControlInfo	Subscribe_ServiceAndQoSControlInfo	Subscribe/Notify	VASS
VAE_VRUZoneManagement	Subscribe_VRUZoneManagement	Subscribe/Notify	VASS
	Notify_VRUZoneManagement		
VAE_V2PApplicationRequirement	Request_V2PApplicationRequirement	Request/Response	VASS

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

VAE_MessageDelivery	6.1	VAE Message Delivery Service	TS29486_VAE_MessageDelivery.yaml	vae-message-delivery	A.2
VAE_FileDistribution	6.2	VAE File Distribution Service	TS29486_VAE_FileDistribution.yaml	vae-file-distribution	A.3
VAE_ApplicationRequirement	6.3	VAE Application Requirement Provision Service	TS29486_VAE_ApplicationRequirement.yaml	vae-app-req	A.4
VAE_DynamicGroup	6.4	VAE Configure Dynamic Group Information Service	TS29486_VAE_DynamicGroup.yaml	vae-dynamic-group	A.5
VAE_ServiceContinuity	6.5	VAE Service Continuity Service	TS29486_VAE_ServiceContinuity.yaml	vae-service-continuity	A.6
VAE_HDMapDynamicInfo	6.6	VAE_HDMapDynamicInfo Service	TS29486_VAE_HDMapDynamicInfo.yaml	vae-hdmap-dynamic-info	A.7
VAE_SessionOriented Service API	6.7	VAE_SessionOrientedService	TS29486_VAE_SessionOrientedService.yaml	vae-session-oriented-service	A.8
VAE_V2VConfigRequirement	6.8	VAE_SessionOrientedService	TS29486_VAE_V2VConfigRequirement.yaml	vae-v2v-config-req	A.9
VAE_PC5Provisioning Requirement	6.9	VAE_PC5ProvisioningRequirement	TS29486_VAE_PC5ProvisioningRequirement.yaml	vae-pc5-prov-req	A.10
VAE_ServiceAndQoSControlInfo	6.10	VAE Service And QoS Control Information	TS29486_VAE_ServiceAndQoSControlInfo.yaml	vae-sqci	A.11
VAE_VRUZoneManagement	6.11	VAE VRU Zone Management	TS29486_VAE_VRUZoneManagement.yaml	vae-vzm	A.12
VAE_V2PApplicationRequirement	6.12	V2P Application Requirement Service	TS29486_VAE_V2PApplicationRequirement.yaml	vae-v2p-app-req	A.13

5.2 VAE_MessageDelivery Service

5.2.1 Service Description

The VAE_MessageDelivery service enables a service consumer to communicate with the VAE server to exchange V2X messages with the V2X UEs.

5.2.2 Service Operations

5.2.2.1 Introduction

The service operations defined for the VAE_MessageDelivery service are shown in table 5.2.2.1-1.

Table 5.2.2.1-1: VAE_MessageDelivery Service Operations

Service Operation Name	Description	Initiated by
V2X_MessageDelivery_Subscribe	This service operation enables a service consumer to request the creation a Message Delivery Subscription.	e.g., VASS
V2X_MessageDelivery_Unsubscribe	This service operation enables a service consumer to request the deletion of an existing Message Delivery Subscription.	e.g., VASS
Deliver_DL_Message	This service operation enables a service consumer to deliver DL V2X messages.	e.g., VASS
Deliver_UL_Message	This service operation enables a service consumer to receive UL V2X messages.	VAE Server

5.2.2.2 V2X_MessageDelivery_Subscribe

5.2.2.2.1 General

The V2X_MessageDelivery_Subscribe service operation is used by a service consumer to create a subscription for V2X messages delivery at the VAE server.

The following procedures are supported by the "V2X_MessageDelivery_Subscribe" service operation:

- Message Delivery Subscribe.

5.2.2.2.2 Message Delivery Subscribe

Figure 5.2.2.2.2-1: Message delivery subscribe

When the service consumer needs to receive the message from the V2X UE and/or send the message to the V2X UE, the service consumer shall send the POST method as step 1of the figure 5.2.2.2.2-1 to request to create an "Individual Message Delivery Subscription".

The service consumer shall include MessageDeliverySubscriptionData data structure in the content of the HTTP POST to request a creation of representation of the "Individual Message Delivery Subscription" resource. The "Individual Message Delivery Subscription" resource is created as described below.

The service consumer within MessageDeliverySubscriptionData data structure shall include:

- The identity of the VASS within the "appSerId" attribute;
- The V2X service ID within the "serviceId" attribute;
- The notification URI within the "notifUri" attribute; and
- The supported features with the "suppFeat" attribute;

and may include

- The geographical area identifier within the "geoId" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual Message Delivery Subscription", addressed by a URI as defined in clause 6.1.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

If errors occur when processing the HTTP POST request, the VAE server shall apply error handling procedures as specified in clause 6.1.7.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Message Delivery Subscription" resource.

5.2.2.3 V2X_MessageDelivery_Unsubscribe

5.2.2.3.1 General

The V2X_MessageDelivery_Unsubscribe service operation is used by a service consumer to remove the V2X messages delivery subscription.

The following procedures are supported by the "V2X_MessageDelivery_Unsubscribe" service operation:

- Message Delivery Unsubscribe.

5.2.2.3.2 Message Delivery Unsubscribe

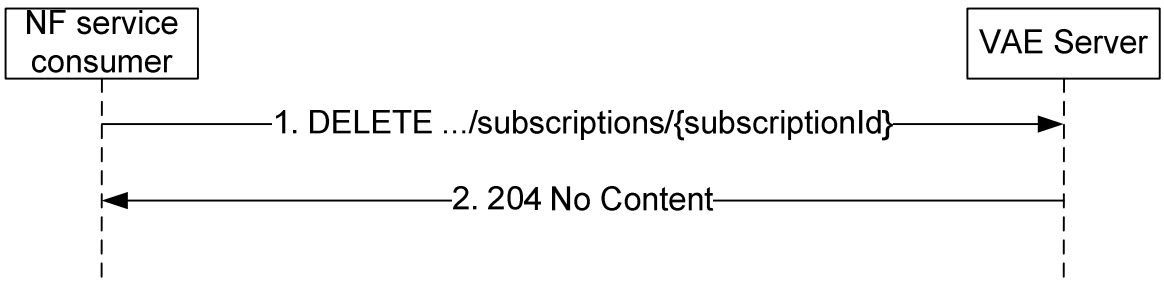

Figure 5.2.2.3.2-1: Message Delivery Unsubscribe procedure

When the service consumer needs to remove an existing subscription for receiving the message from the V2X UE or sending the message to the V2X UE, the service consumer shall send the DELETE method as step 1of the figure 5.2.2.3.2-1 to request to delete an "Individual Message Delivery Subscription".

Upon the reception of the HTTP DELETE request, if the VAE Server successfully processed and accepted the received HTTP DELETE request, the VAE Server shall:

- remove the corresponding subscription; and
- send an HTTP "204 No Content" response.

If errors occur when processing the HTTP POST request, the VAE Server shall send an HTTP error response as specified in clause 6.1.7.

5.2.2.4 Deliver_DL_Message

5.2.2.4.1 General

The Deliver_DL_Message service operation is used to deliver the V2X messages to the V2X UEs.

The following procedures are supported by the "Deliver_DL_Message" service operation:

- Downlink Message Delivery.
- Termination of Downlink Message Delivery.

5.2.2.4.2 Downlink Message Delivery

Figure 5.2.2.4.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a Downlink Message Delivery.

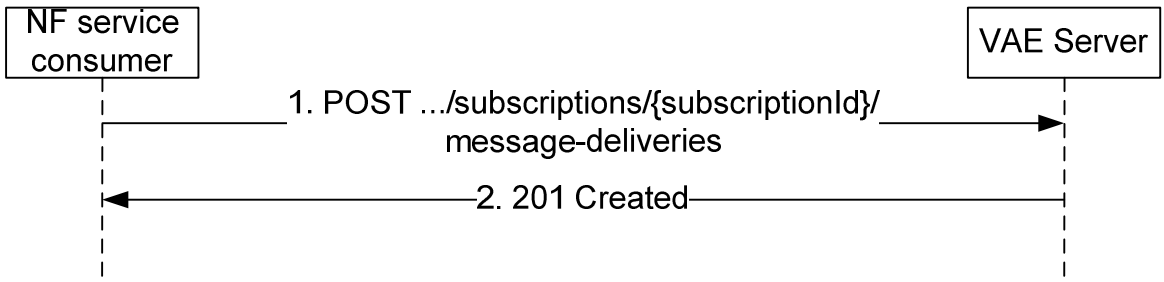

Figure 5.2.2.4.2-1: Downlink Message Delivery

When the service consumer needs to send the message to the V2X UE, the service consumer shall send the HTTP POST method as step 1of the figure 5.2.2.4.2-1 to request to create an "Individual Downlink Message Delivery".

The service consumer shall include DownlinkMessageDeliveryData data structure in the content of the HTTP POST to request a creation of representation of the "Individual Downlink Message Delivery" resource. The "Individual Downlink Message Delivery" resource is created as described below.

The service consumer within the DownlinkMessageDeliveryData data structure shall include:

- either the V2X UE ID within the "ueId" attribute or the V2X Group ID within the "groupId" attribute; and
- V2X message payload carried by the V2X message within the "payload" attribute;

and may include:

- the duration within the "duration" attribute;
- the geographical area identifier within the "geoId" attribute; and
- the V2X service ID within the "serviceId" attribute, if the "V2XService" feature is supported.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual Downlink Message Delivery", addressed by a URI as defined in clause 6.1.3.5.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the

service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Downlink Message Delivery".

If errors occur when processing the HTTP POST request, the VAE Server shall apply error handling procedures as specified in clause 6.1.7.

After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in clause 6.5.2.4 or 6.5.2.5 of 3GPP TS 24.486 [28] to send the message to the VAE Client.

When the VAE Server received the reception report from the VAE Client as defined in clause 6.5.2.2 of 3GPP TS 24.486 [28], the VAE Server shall send an HTTP POST message to the service consumer identified by the notification URI received during the message delivery subscribed if the "ReceptionReport" feature is supported. Upon receipt of the request, the SCS/AS shall acknowledge the notification with an HTTP 204 No Content response.

5.2.2.4.3 Termination of Downlink Message Delivery

Figure 5.2.2.4.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the termination of a Downlink Message Delivery.

Figure 5.2.2.4.3-1: Termination of Downlink Message Delivery

When the service consumer needs to terminate the message delivery to the V2X UE, the service consumer shall send the DELETE method as step 1of the figure 5.2.2.4.3-1 to request to delete the "Individual Downlink Message Delivery" resource.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the Individual Downlink Message Delivery resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message.

When the message delivery duration expires, the VAE server may remove the associated Individual Downlink Message Delivery resource locally.

If errors occur when processing the HTTP DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.1.7.

5.2.2.5 Deliver_UL_Message

5.2.2.5.1 General

The Deliver_UL_Message service operation is used to deliver the uplink message to the service consumer.

The following procedures are supported by the "Deliver_UL_Message" service operation:

- Deliver Uplink Message.

5.2.2.5.2 Deliver Uplink Message

Figure 5.2.2.5.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to deliver an Uplink Message.

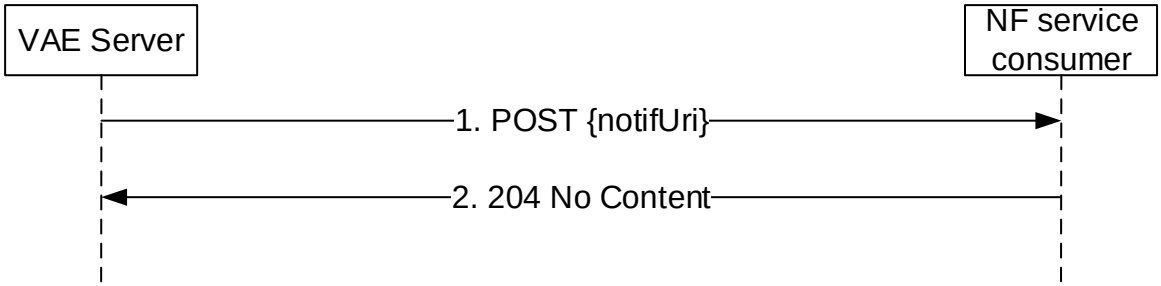

Figure 5.2.2.5.2-1: Deliver Uplink Message

If the VAE Server receives the uplink message for a V2X UE which an service consumer has subscribed to or a V2X UE belongs to a V2X group which the service consumer has subscribed to from the VAE Client as defined in clause 6.5.2.1 of 3GPP TS 24.486 [28], the VAE Server shall send an HTTP POST request with "{notifUri}" as previously provided by the service consumer within the corresponding subscription as URI and UplinkMessageDeliveryData data structure as request body that shall include:

- resource URI of the individual Message Delivery Subscription related to the notification within the "resourceUri" attribute;
- the V2X UE ID within the "ueId" attribute;
- V2X message payload carried by the V2X message within the "payload" attribute; and
- the geographical area identifier within the "geoId" attribute if available;

and may include:

- the V2X service ID within the "serviceId" attribute, if the "V2XService" feature is supported.

Upon the reception of the HTTP POST message, if the service consumer successfully processed and accepted the received HTTP POST request, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the service consumer shall send an HTTP error response as specified in clause 6.1.7.

When the VAE Server receives the response from the service consumer, the VAE Service shall send the response to the VAE Client as defined in clause 6.5.2.4 of 3GPP TS 24.486 [28].

5.3 VAE_FileDistribution Service

5.3.1 Service Description

This API enables the service consumer to communicate with the VAE server to initiate file distribution to the V2X UEs.

5.3.2 Service Operations

5.3.2.1 Introduction

The VAE_FileDistribution service supports following service operations:

- Distribute_File

5.3.2.2 Distribute_File

5.3.2.2.1 General

The Distribute_File service operation is used to distribute files to the V2X UEs.

The following procedures are supported by the "Distribute_File" service operation:

- File Distribution.
- Termination of File Distribution.

5.3.2.2.2 File Distribution

Figure 5.3.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a File Distribution.

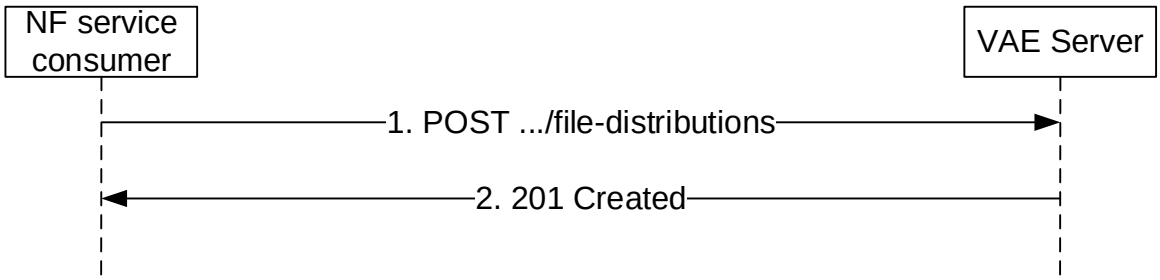

Figure 5.3.2.2.2-1: File Distribution

When the service consumer needs to distribute the file to the V2X UEs, the service consumer shall send the POST method as step 1 of the figure 5.3.2.2.2-1 to request to create an "Individual File Distribution".

The service consumer shall include FileDistributionData data structure in the content of the HTTP POST to request a creation of representation of the "Individual File Distribution" resource. The "Individual File Distribution" resource is created as described below.

The service consumer within the FileDistributionData data structure shall include:

- The file lists within the "fileLists" attribute;
- The geographical area within the "geoArea" attribute;
- maximum bitrate for the V2X application within the "maxBitrate" attribute; and
- maximum delay for the V2X application within the "maxDelay" attribute;

and may include:

- The V2X Group ID within the "groupId" attribute;
- The serving class within the "serviceClass" attribute;
- The duration within the "duration" attribute; and
- The local MBMS information within the "localMbmsInfo" attribute or the "localMbmsActInd" set to true if the "LocalMBMS" feature is supported.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual File Distribution", addressed by a URI as defined in clause 6.2.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The VAE Server shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual File Distribution".

If errors occur when processing the HTTP POST or DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.2.7.

The VAE server makes use of the xMB procedures as defined 3GPP TS 29.116 [19] to create MBMS sessions whose type is set to "files" and to request the delivery of files over these sessions. Before provisioning files to the BM-SC, the VAE server prepares the file for distribution, which may include partition of large files into smaller files or encryption.

The VAE server is responsible for translating the parameters related to the V2X application triggering the file delivery into corresponding xMB parameters. Table 5.3.2.2.2-1 describes the mapping between the VAE_FileDistribution API attribute and the xMB API properties specified in 3GPP TS 29.116 [19].

Table 5.3.2.2.2-1: Mapping between VAE_FileDistribution API and xMB API

V2X parameter	Corresponding xMB API property
serviceClass	service-class
fileLists	file-list
geoArea	geographical-area
maxBitrate	max-bitrate
maxDelay	max-delay
localMbmsInfo or localMbmsActInd	local-mbms-delivery-information

NOTE: The list of V2X parameters needed for file delivery is not exhaustive and can be updated based on the specific V2X application requirements.

5.3.2.2.3 Termination of File Distribution

Figure 5.3.2.2.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of a File Distribution.

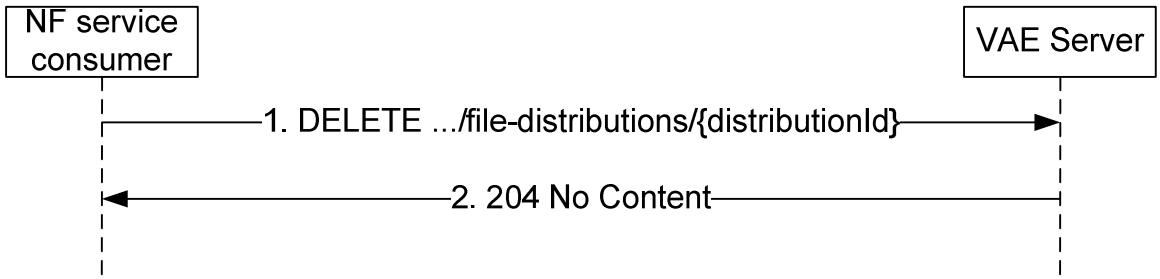

Figure 5.3.2.2.3-1: Termination of File Distribution

When the service consumer needs to terminate the File Distribution to the V2X UE, the service consumer shall send the DELETE method as step 1of the figure 5.3.2.2.3-1 to request to delete the "Individual File Distribution" resource.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the Individual File Distribution resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message.

If errors occur when processing the DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.2.7.

When the message delivery duration expires, the VAE server may remove the associated Individual File Distribution resource locally.

5.4 VAE_ApplicationRequirement Service

5.4.1 Service Description

This API enables the service consumer to communicate with the VAE server to provide V2X application requirement to the underlying 3GPP network.

5.4.2 Service Operations

5.4.2.1 Introduction

The VAE_ApplicationRequirement service supports following service operations:

- Reserve_NetworkResource
- Notify_NetworkResource

5.4.2.2 Reserve_NetworkResource

5.4.2.2.1 General

The Reserve_NetworkResource service operation is used to provide V2X application requirement to underlying 3GPP network.

The following procedures are supported by the "Reserve_NetworkResource" service operation:

- Network Resource Reservation.
- Termination of Network Resource Reservation

5.4.2.2.2 Network Resource Reservation

Figure 5.4.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of an Application Requirement.

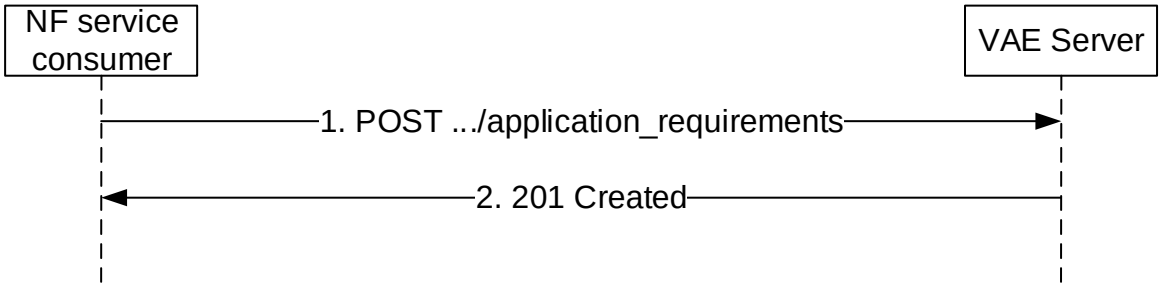

Figure 5.4.2.2.2-1: Network Resource Reservation

When the service consumer needs to provide V2X application requirement to the underlying 3GPP network, the service consumer shall send the POST method as step 1 of the figure 5.4.2.2.2-1 to request to create an "Individual Application Requirement".

The service consumer shall include ApplicationRequirementData data structure in the content of the HTTP POST to request a creation of representation of the "Individual Application Requirement" resource. The "Individual Application Requirement" resource is created as described below.

The service consumer within the ApplicationRequirementData data structure shall include:

- Either the V2X Group ID within the "groupId" attribute or the V2X UE ID within the "ueId" attribute;
- notification URI within the "notifUri" attribute;

- The service Id within the "serviceId" attribute; and
- V2X application requirement within the "appRequirement" attribute;

and may include:

- The duration within the "duration" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual Application Requirement", addressed by a URI as defined in clause 6.3.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource. The VAE Server shall interact with the SEAL NRM server as specified in the 3GPP TS 29.549 [29] for the V2X application requirement received in step 1.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Application Requirement".

If errors occur when processing the HTTP POST or DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.3.7.

5.4.2.2.3 Termination of Network Resource Reservation

Figure 5.4.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of an Application Requirement.

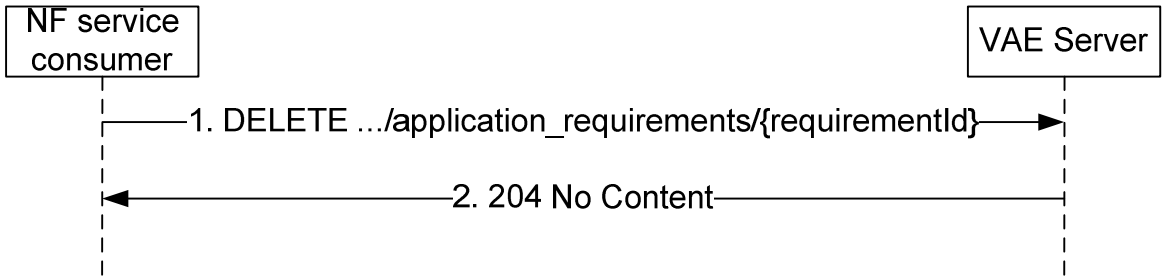

Figure 5.4.2.2.3-1: Termination of Network Resource Reservation

When the service consumer needs to terminate network resource reservation, the service consumer shall send the DELETE method as step 1of the figure 5.4.2.2.3-1 to request to delete the "Individual Application Requirement" resource.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the Individual Application Requirement resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message.

If errors occur when processing the HTTP DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.3.7.

When the message delivery duration expires, the VAE server may remove the associated Individual Application Requirement resource locally.

5.4.2.3 Notify_NetworkResource

5.4.2.3.1 General

The Notify_NetworkResource service operation is used to notify the result of network resource adaptation corresponding to the V2X application requirement.

The following procedures are supported by the "Notify_NetworkResource" service operation:

- Notify Network Resource.

5.4.2.3.2 Notify Network Resource

Figure 5.4.2.3.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to report the result of network resource adaptation.

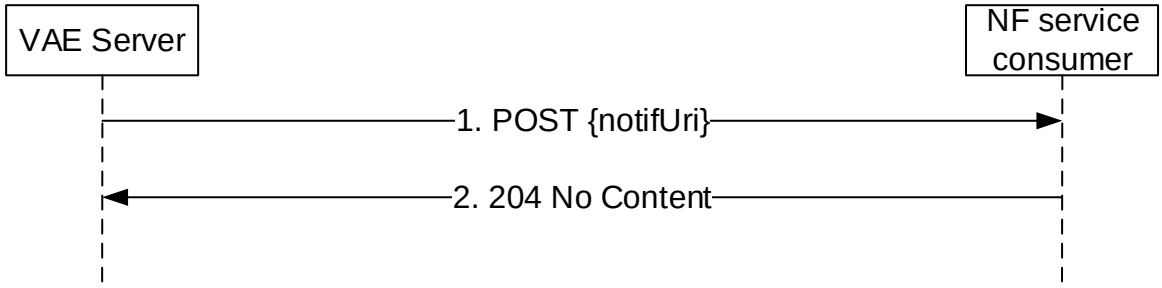

Figure 5.4.2.3.2-1: Notify Network Resource

If the VAE Server receives the result of network resource adaptation corresponding to the V2X application requirement from the SEAL NRM server as specified in the 3GPP TS 29.549 [29], the VAE Server shall send an HTTP POST request with "{notifUri}" as previously provided by the service consumer within the corresponding subscription as URI and AppReqNotification data structure as request body that shall include:

- resource URI of the individual Application Requirement related to the notification within the "resourceUri" attribute;
- the result of the network resource adaptation corresponding to the V2X application requirement within the "result" attribute.

Upon the reception of the HTTP POST message, if the service consumer successfully processed and accepted the received HTTP POST request, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the VAE Server shall send an HTTP error response as specified in clause 6.3.7.

5.5 VAE_DynamicGroup Service

5.5.1 Service Description

This API enables the service consumer to communicate with the VAE server to configure dynamic group information.

5.5.2 Service Operations

5.5.2.1 Introduction

The VAE_DynamicGroup service supports following service operations:

- Configure_DynamicGroup
- Notify_DynamicGroup

5.5.2.2 Configure_DynamicGroup

5.5.2.2.1 General

The Configure_DynamicGroup service operation is used to configures the dynamic group information at the VAE server.

The following procedures are supported by the "Configure_DynamicGroup" service operation:

- Dynamic Group Configuration.
- Termination of Dynamic Group Configuration.

5.5.2.2.2 Dynamic Group Configuration

Figure 5.5.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a Dynamic Group Configuration.

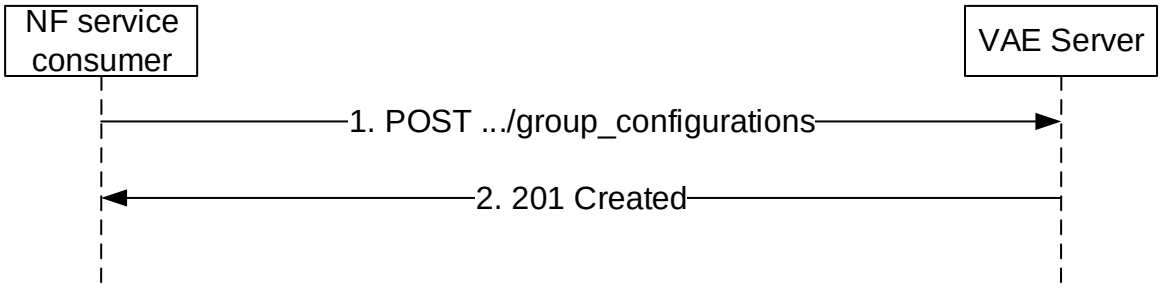

Figure 5.5.2.2.2-1: Dynamic Group Configuration

When the service consumer needs to configures the dynamic group information at the VAE server, the service consumer shall send the POST method as step 1 of the figure 5.5.2.2.2-1 to request to create an "Individual Group Configuration".

The service consumer shall include GroupConfigurationData data structure in the content of the HTTP POST to request a creation of representation of the "Individual Group Configuration" resource. The "Individual Group Configuration" resource is created as described below.

The service consumer within GroupConfigurationData data structure shall include:

- The dynamic Group ID within the "groupId" attribute;
- The group definition within the "definition" attribute;
- The group leader Id within the "leaderId" attribute; and

- The notification URI within the "notifUri" attribute.

and may include:

- The duration within the "duration" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual Group Configuration", addressed by a URI as defined in clause 6.4.3.2.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource. Then the VAE Server shall interact with the VAE Client to notify the dynamic group information as specified in the 3GPP TS 24.486 [28].

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Group Configuration".

If errors occur when processing the HTTP POST or DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.4.7.

5.5.2.2.3 Termination of Dynamic Group Configuration

Figure 5.5.2.2.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of a Dynamic Group Configuration.

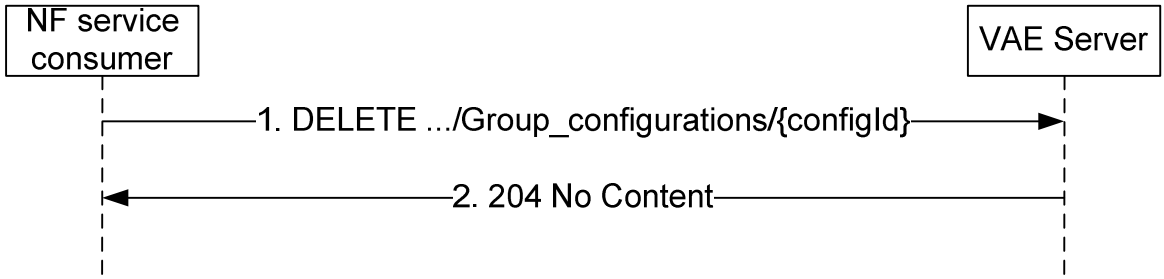

Figure 5.5.2.2.3-1: Termination of Dynamic Group Configuration

When the service consumer needs to terminate the Dynamic Group Configuration at the VAE server, the service consumer shall send the DELETE method as step 1of the figure 5.5.2.2.3-1 to request to delete the "Individual Group Configuration" resource.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the Individual Group Configuration resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message.

If errors occur when processing the HTTP DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.4.7.

When the message delivery duration expires, the VAE server may remove the associated Individual Group Configuration resource locally.

5.5.2.3 Notify_DynamicGroup

5.5.2.3.1 General

The Notify_DynamicGroup service operation is used to notify the dynamic group information (i.e. group member joins or leaves) at the VAE server.

The following procedures are supported by the "Notify_DynamicGroup" service operation:

- Notify Dynamic Group.

5.5.2.3.2 Notify Dynamic Group

Figure 5.4.2.3.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to report dynamic group information.

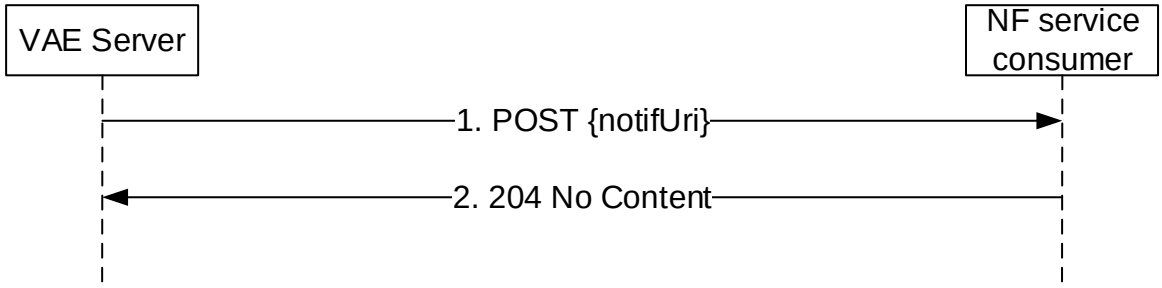

Figure 5.5.2.3.2-1: Notify Dynamic Group

If the VAE Server receives the dynamic group information (i.e. group member joins or leaves) from the VAE Client as specified in the 3GPP TS 24.486 [28], the VAE Server shall send an HTTP POST request with "{notifUri}" as previously provided by the service consumer within the corresponding subscription as URI and DynamicGroupNotification data structure as request body that shall include:

- resource URI of the individual Application Requirement related to the notification within the "resourceUri" attribute;
- one or more joined group member within the "joinedUeIds" attribute if available; and
- one or more left group member within the "leftUeIds" attribute if available.

Upon the reception of the HTTP POST message, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the service consumer shall send an HTTP error response as specified in clause 6.4.7.

5.6 VAE_ServiceContinuity Service

5.6.1 Service Description

This service provided by the VAE server enables exposing information to facilitate the V2X service continuity.

5.6.2 Service Operations

5.6.2.1 Introduction

The VAE_ServiceContinuity service supports following service operations:

- Query_ServiceContinuity

5.6.2.2 Query_ServiceContinuity

5.6.2.2.1 General

The Query_ServiceContinuity service operation is used to query the VAE server whether it can support the desired V2X service in the designated geographical area.

The following procedures are supported by the "Query_ServiceContinuity" service operation:

- Query service continuity.

5.6.2.2.2 Query service continuity

Figure 5.6.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to query service continuity information.

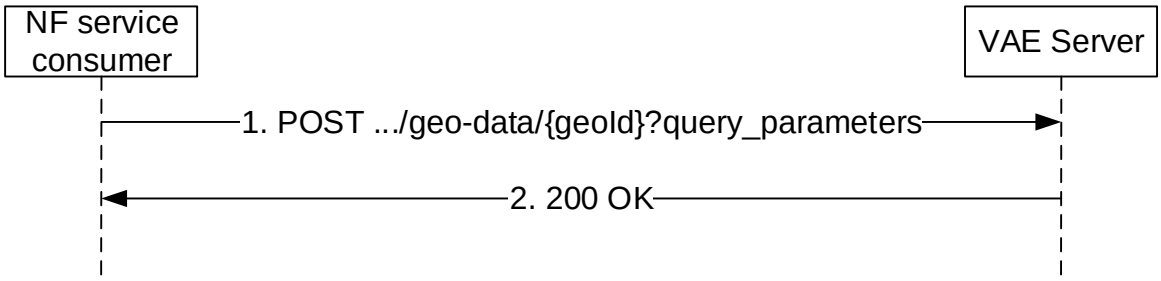

Figure 5.6.2.2.2-1: Query service continuity

When the service consumer (e.g. V2X server) needs to query service continuity information (e.g. receives the local service information request from the VAE Client as specified in the 3GPP TS 24.486 [28]), the service consumer shall send an HTTP GET request as step 1 of the figure 5.6.2.2.2-1 to the "Individual Geographical Area" resource with query parameter V2X service id in "service-id". When the VAE Server receives the HTTP GET request from the service consumer, the VAE Server shall perform the query.

On success, "200 OK" shall be returned as step 2 of the figure 5.6.2.2.2-1 to indicate that the VAE server can support the desired V2X service for the target "Individual Geographical Area" resource. The response body shall contain the "Individual Geographical Area" resource including the requested V2X service id.

If errors occur when processing the HTTP POST request, the VAE Server shall apply error handling procedures as specified in clause 6.5.7.

5.7 VAE_HDMapDynamicInfo Service

5.7.1 Service Description

This API enables the service consumer to communicate with the VAE server to subscribe for the HD map dynamic information.

5.7.2 Service Operations

5.7.2.1 Introduction

The VAE_HDMapDynamicInfo service supports following service operations:

- Subscribe_HDMapDynamicInfo
- Notify_HDMapDynamicInfo

5.7.2.2 Subscribe_HDMapDynamicInfo

5.7.2.2.1 General

The Subscribe_HDMapDynamicInfo service operation is used to subscribe for the HD map dynamic information.

The following procedures are supported by the "Subscribe_HDMapDynamicInfo" service operation:

- Subscribe HD Map Dynamic Information.

5.7.2.2.2 Subscribe HD Map Dynamic Information

Figure 5.7.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of an HdMap Dynamic Info Subscription.

Figure 5.7.2.2.2-1: Subscribe HD Map Dynamic Information

When the service consumer needs to subscribe for the HD map dynamic information, the service consumer shall send the POST method as step 1 of the figure 5.7.2.2.2-1 to request to create an "Individual HdMap DynamicInfo Subscription".

The service consumer shall include HdMapDynamicInfoData data structure in the content of the HTTP POST to request a creation of representation of the "Individual HdMap DynamicInfo Subscription" resource. The "Individual HdMap DynamicInfo Subscription" resource is created as described below.

The service consumer within the HdMapDynamicInfoData data structure shall include:

- notification URI within the "notifUri" attribute;
- the V2X UE ID within the "ueId" attribute; and
- application defined proximity range information within the "range" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual HdMap DynamicInfo_Subscription", addressed by a URI as defined in clause 6.6.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual HdMap DynamicInfo Subscription".

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the Individual HdMap DynamicInfo Subscription resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message.

If errors occur when processing the HTTP POST or DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.6.7.

5.7.2.3 Notify_HDMapDynamicInfo

5.7.2.3.1 General

The Notify_HDMapDynamicInfo service operation is used to notify the HD map dynamic information.

The following procedures are supported by the "Notify_HDMapDynamicInfo" service operation:

- Notify HD Map Dynamic Information.

5.7.2.3.2 Notify HD Map Dynamic Information

Figure 5.7.2.3.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to report HD Map Dynamic Information.

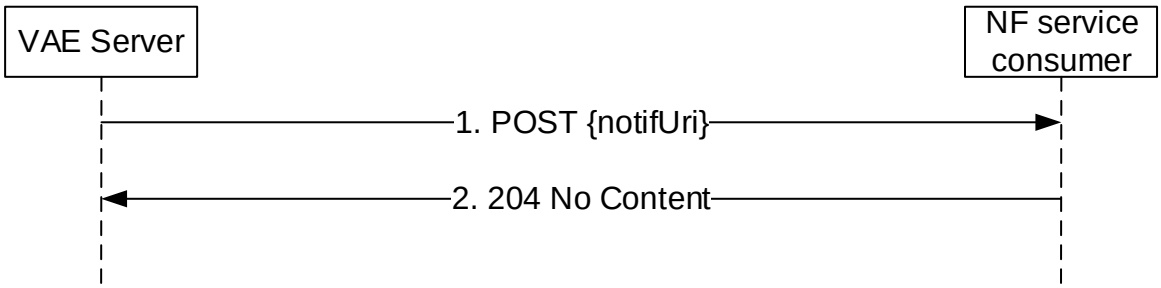

Figure 5.7.2.3.2-1: Notify HD Map Dynamic Information

When the VAE Server prepared the HD map dynamic informaiton including the aggregate information from different VAE Clients, the VAE Server shall send an HTTP POST request with "{notifUri}" as previously provided by the service consumer within the corresponding subscription as URI and HdMapDynamicInfoNotification data structure as request body that shall include:

- resource URI of the Individual HdMap DynamicInfo Subscription related to the notification within the "resourceUri" attribute;

- the HD map dynamic information corresponding within the "hdMapDynaInfo" attribute.

Upon the reception of the HTTP POST message, if the service consumer successfully processed and accepted the received HTTP POST request, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the VAE Server shall send an HTTP error response as specified in clause 6.6.7.

5.8 VAE_SessionOrientedService Service

5.8.1 Service Description

This API enables the service consumer to communicate with the VAE server to trigger establishment, update and termination of session-oriented service.

5.8.2 Service Operations

5.8.2.1 Introduction

The VAE_SessionOrientedService service supports following service operations:

- Establish_Session
- Notify_Establish_Session
- Update_Session
- Notify_Update_Session
- Terminate_Session
- Notify_Terminate_Session

NOTE: Notify_Terminate_Session is implemented by including the result of the termination of session-oriented service received from the VAE client within the response to termination session as defined in clause 5.8.2.6.2.

5.8.2.2 Establish_Session

5.8.2.2.1 General

The Establish_Session service operation is used to trigger the establishment of the session-oriented service by the VAE server.

The following procedures are supported by the "Establish_Session" service operation:

- Establish Session.

5.8.2.2.2 Establish Session

Figure 5.8.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a Session Oriented Service Subscription.

Figure 5.8.2.2.2-1: Establish Session

When the service consumer needs to trigger the establishment of the session-oriented service by the VAE server, the service consumer shall send the POST method as step 1 of the figure 5.8.2.2.2-1 to request to create an "Individual Session Oriented Service Subscription".

The service consumer shall include SessionOrientedData data structure in the content of the HTTP POST to request a creation of representation of the "Individual Session Oriented Service Subscription" resource. The "Individual Session Oriented Service Subscription" resource is created as described below.

The service consumer within the SessionOrientedData data structure shall include:

- notification URI within the "notifUri" attribute;
- the remote V2X UE ID within the "ueId" attribute;
- the V2X service ID within the "serviceId" attribute;
- the identity of the VASS within the "appSerId" attribute; and
- application QoS requirements for the session within the "appQosReq" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual Session Oriented Service Subscription", addressed by a URI as defined in clause 6.7.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Session Oriented Service Subscription".

After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to establish a session-oriented service with VAE client.

If errors occur when processing the HTTP POST request, the VAE Server shall apply error handling procedures as specified in clause 6.7.7.

5.8.2.3 Notify_Establish_Session

5.8.2.3.1 General

The Notify_Establish_Session service operation is used to notify the establishment of the session-oriented service by the VAE server.

The following procedures are supported by the "Notify_Establish_Session" service operation:

- Notify Establish Session.

5.8.2.3.2 Notify Establish Session

Figure 5.7.2.3.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to report the result of session establishment.

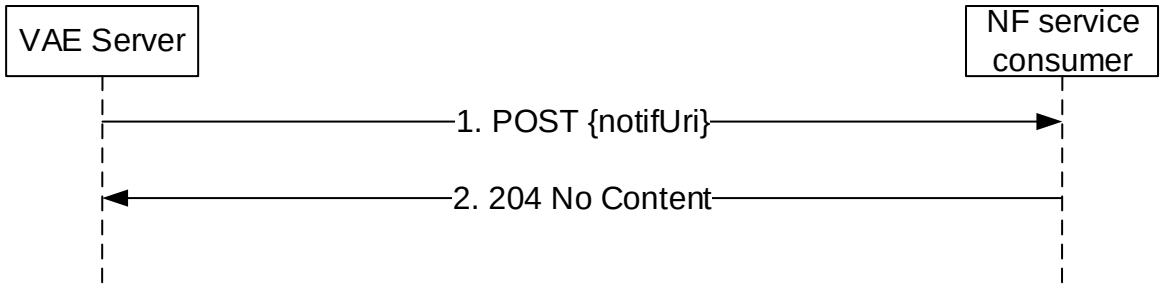

Figure 5.8.2.3.2-1: Notify Establish Session

When the VAE Server response from the VAE client indicating the result of session establishment requested by the VAE server as defined in 3GPP TS 24.486 [28], the VAE Server shall send an HTTP POST request with "{notifUri}"

as previously provided by the service consumer within the corresponding subscription as URI and Notification data structure as request body that shall include:

- resource URI of the Individual Session Oriented Service Subscription related to the notification within the "resourceUri" attribute;
- the value "ESTABLISHMENT" with the "action" attribute; and
- the result of session establishment within the "result" attribute.

Upon the reception of the HTTP POST message, if the service consumer successfully processed and accepted the received HTTP POST request, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the VAE Server shall send an HTTP error response as specified in clause 6.7.7.

5.8.2.4 Update_Session

5.8.2.4.1 General

The Update_Session service operation is used to trigger the update to the session-oriented service by the VAE server.

The following procedures are supported by the "Update_Session" service operation:

- Update Session.

5.8.2.4.2 Update Session

Figure 5.8.2.4.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the update of a Session Oriented Service Subscription.

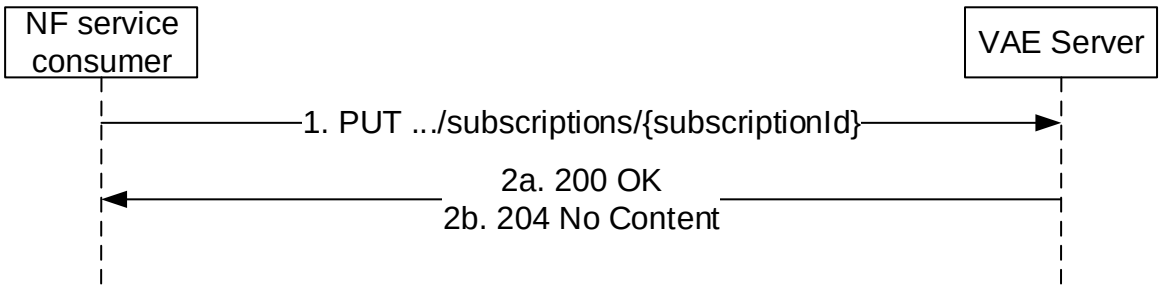

Figure 5.8.2.4.2-1: Update Session

When the service consumer needs to trigger the update to the session-oriented service by the VAE server, the service consumer shall send the PUT method as step 1 of the figure 5.8.2.4.2-1 to request to update the "Individual Session Oriented Service Subscription".

The service consumer shall include SessionOrientedData data structure in the content of the HTTP PUT to update the "Individual Session Oriented Service Subscription" resource. The remote V2X UE ID, the V2X service ID and the identity of the service consumer shall remain unchanged from previous values.

When the VAE Server receives the HTTP PUT request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall update the "Individual Session Oriented Service Subscription" and respond to the service consumer with a 200 OK or 204 No Content status code.

After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to update the session-oriented service with VAE client.

If errors occur when processing the HTTP PUT request, the VAE Server shall apply error handling procedures as specified in clause 6.7.7.

5.8.2.5 Notify_Establish_Session

5.8.2.5.1 General

The Notify_Update_Session service operation is used to notify the update to the session-oriented service by the VAE server.

The following procedures are supported by the "Notify_Update_Session" service operation:

- Notify Update Session.

5.8.2.5.2 Notify Update Session

When the VAE Server response from the VAE client indicating the result of session update requested by the VAE server, the VAE Server invoke the procedure defined in clause 5.8.2.3 with the difference that the VAE Server includes the value "UPDATE" within the "action" attribute.

5.8.2.6 Terminate_Session

5.8.2.6.1 General

The Terminate_Session service operation is used to trigger the termination of the session-oriented service by the VAE server.

The following procedures are supported by the "Terminate_Session" service operation:

- Terminate Session.

5.8.2.6.2 Terminate Session

Figure 5.8.2.6.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of a Session Oriented Service Subscription.

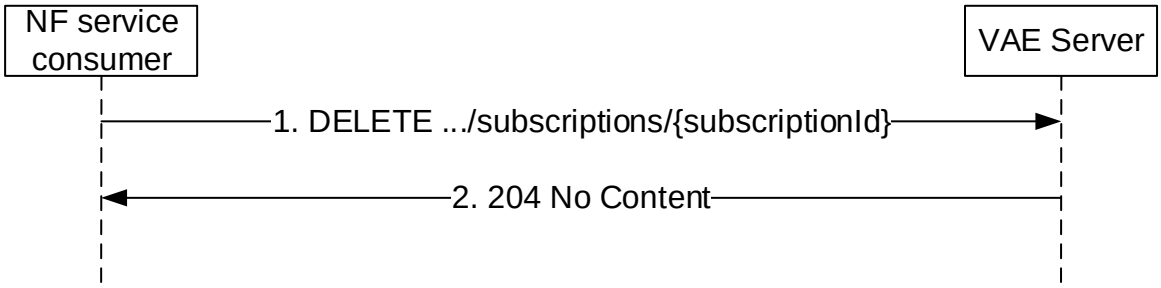

Figure 5.8.2.6.2-1: Terminate Session

When the service consumer needs to trigger the termination of the session-oriented service by the VAE server, the service consumer shall send the DELETE method as step 1 of the figure 5.8.2.6.2-1 to request to delete the "Individual Session Oriented Service Subscription".

When the VAE Server receives the HTTP DELETE request from the service consumer, the VAE server shall authorize the request from the service consumer. If the authorization is successful, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to delete the session-oriented service with VAE client. If the VAE server receives the successful response from the VAE client, the VAE Server shall delete the "Individual Session Oriented Service Subscription" and respond to the service consumer with a 204 No Content status code.

If errors occur when processing the DELTE request, the VAE Server shall apply error handling procedures as specified in clause 6.7.7.

5.9 VAE_V2VConfigRequirement Service

5.9.1 Service Description

This API enables the service consumer to provide a V2V configuration requirement to the VAE server to manage the UE-to-UE broadcast/groupcast communication.

5.9.2 Service Operations

5.9.2.1 Introduction

The VAE_V2VConfigRequirement service supports following service operations:

- Request_V2VConfigRequirement operation

5.9.2.2 Request_V2VConfigRequirement

5.9.2.2.1 General

The Request_V2VConfigRequirement service operation is used to provide a V2V configuration requirement request to the VAE server to manage the UE-to-UE broadcast/groupcast communication by the service consumer.

The following procedures are supported by the "Request_V2VConfigRequirement" service operation:

- Request V2V Configuration Requirement.

5.9.2.2.2 Request V2V Configuration Requirement

Figure 5.9.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a V2V Configuration.

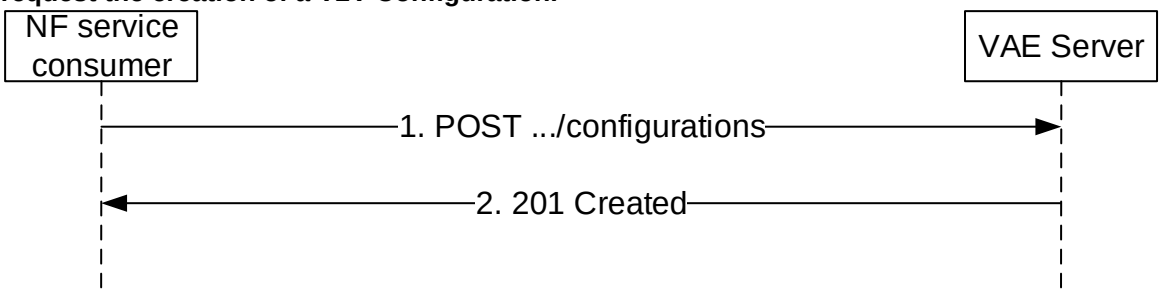

Figure 5.9.2.2.2-1: Request_V2VConfigRequirement

When the service consumer needs to provide a V2V configuration requirement, the service consumer shall send the POST method as step 1 of the figure 5.9.2.2.2-1 to request to create an "Individual V2V Configuration".

The service consumer shall include V2vConfigurationData data structure in the content of the HTTP POST to request a creation of representation of the "Individual V2V Configuration" resource. The "Individual V2V Configuration" resource is created as described below.

The service consumer within the V2vConfigurationData data structure shall include:

- either the V2X group ID within the "groupId" attribute or the V2X service ID within the "serviceId" attribute;

and may include:

- candidate Relay V2X-UE ID list within the "canUeIds" attribute; and
- application QoS requirements for the session within the "appQosReq" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE

Server shall create a new resource, which represents "Individual V2V Configuration" resource, addressed by a URI as defined in clause 6.8.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual Session Oriented Service Subscription".

After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to provide the V2V configuration infomation to the VAE client. The VAE server may also provide the list of V2X-UEs to serve as application layer relays based on the candidate list of relay V2X-UEs received form the service consumer.

The service consumer may include the V2vConfigurationData data structure in the content of the HTTP PUT to update the "Individual V2V Configuration" resource. The V2X group ID and the V2X service ID shall remain unchanged from previous values. When the VAE Server receives the HTTP PUT request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall update the "Individual V2V Configuration" and respond to the service consumer with a 200 OK or 204 No Content status code. After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to provide the upated infomation to the VAE client.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the "Individual V2V Configuration" resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message. After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to delete the V2V configuration information from the VAE client.

If errors occur when processing the HTTP POST, HTTP PUT or HTTP DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.8.7.

5.10 VAE_PC5ProvisioningRequirement Service

5.10.1 Service Description

This API enables the service consumer to communicate with the VAE server to request from VAE server the PC5 provisioning service in multi-operator V2X scenarios.

5.10.2 Service Operations

5.10.2.1 Introduction

The VAE_PC5ProvisioningRequirement service supports following service operations:

- Config_PC5ProvisioningRequirement
- Notify_PC5ProvisioningRequirement

5.10.2.2 Config_PC5ProvisioningRequirement

5.10.2.2.1 General

The Config_PC5ProvisioningRequirement service operation is used by the service consumer to provide a V2X PC5 provisioning requirement to the VAE server.

The following procedures are supported by the "Config_PC5ProvisioningRequirement" service operation:

- Config_PC5ProvisioningRequirement.

5.10.2.2.2 Config_PC5ProvisioningRequirement

Figure 5.10.2.2.2-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the creation of a PC5 Provisioning Requirement Subscription.

Figure 5.10.2.2.2-1: Config_PC5ProvisioningRequirement

When the service consumer needs to provide a V2X PC5 provisioning requirement to the VAE server, the service consumer shall send the POST method as step 1 of the figure 5.10.2.2.2-1 to request to create an "Individual PC5 Provisioning Requirement Subscription".

The service consumer shall include ProvisioningRequirement data structure in the content of the HTTP POST to request a creation of representation of the "Individual PC5 Provisioning Requirement Subscription" resource. The "Individual PC5 Provisioning Requirement Subscription" resource is created as described below.

The service consumer within the ProvisioningRequirement data structure shall include:

- notification URI within the "notifUri" attribute;
- either the remote V2X UE ID within the "ueId" attribute or the V2X group ID within the "groupId" attribute;
- the V2X service ID within the "serviceId" attribute;

- application QoS requirements for the session within the "appQosReq" attribute;

and may include:

- the PLMN ID list within the "plmnList" attribute.

When the VAE Server receives the HTTP POST request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall create a new resource, which represents "Individual PC5 Provisioning Requirement Subscription", addressed by a URI as defined in clause 6.9.3.3.2 and contains a VAE Server created resource identifier. The VAE Server shall respond to the service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The service consumer shall use the URI received in the Location header in subsequent requests to the VAE Server to refer to the "Individual PC5 Provisioning Requirement Subscription".

After the VAE Server responded to the service consumer, the VAE Server may invoke the procedure defined in 3GPP TS 24.486 [28] to send a PC5 provisioning status request to VAE client(within the multi-operator V2X service) to receive up-to-date information on the per PLMN provisioning policies/ parameters.

The service consumer may include the ProvisioningRequirement data structure in the content of the HTTP PUT to update the "Individual PC5 Provisioning Requirement Subscription" resource. The remote V2X UE ID, the V2X service ID and the V2X service ID shall remain unchanged from previous values When the VAE Server receives the HTTP PUT request from the service consumer, the VAE server shall make an authorization based on the information received from the service consumer. If the authorization is successful, the VAE Server shall update the "Individual PC5 Provisioning Requirement Subscription" and respond to the service consumer with a 200 OK or 204 No Content status code. After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to provide the upated infomation to the VAE client.

Upon receipt of the HTTP DELETE message from the service consumer, the VAE Server shall check if the "Individual PC5 Provisioning Requirement Subscription" resource identified by the URI already exists. If the resource exists, the VAE Server shall delete the resource and respond to the service consumer with a 204 No Content success message. After the VAE Server responded to the service consumer, the VAE Server shall invoke the procedure defined in 3GPP TS 24.486 [28] to delete the PC5 provisioning status request from the VAE client.

If errors occur when processing the HTTP POST, HTTP PUT or HTTP DELETE request, the VAE Server shall apply error handling procedures as specified in clause 6.9.7.

5.10.2.3 Notify_PC5ProvisioningRequirement

5.10.2.3.1 General

The Notify_PC5ProvisioningRequirement service operation is used to notify the result of multi operation PC5 provisioning requirement to the V2X UEs by the VAE server.

The following procedures are supported by the "Config_PC5ProvisioningRequirement" service operation:

- Notify_PC5ProvisioningRequirement.

5.10.2.3.2 Notify_PC5ProvisioningRequirement

Figure 5.10.2.3.2-1 depicts a scenario where a VAE Server sends a notification request to the service consumer to report the result of multi operation PC5 provisioning requirements.

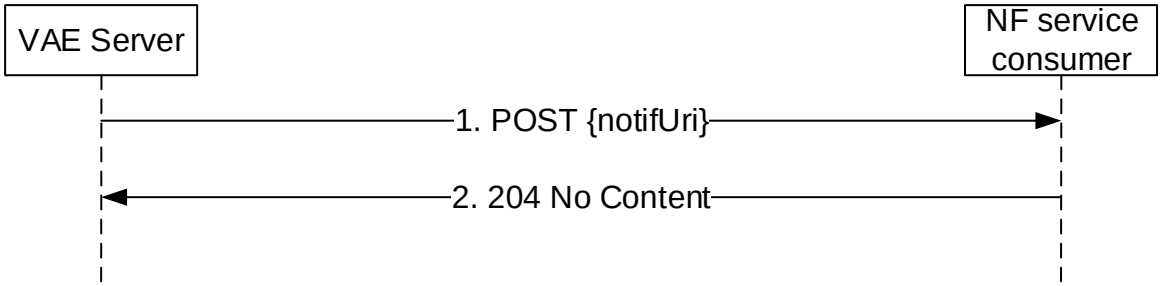

Figure 5.10.2.3.2-1: Notify_PC5ProvisioningRequirement

After the VAE Server determines the updated PC5 provisioning policies/parameters to be jointly used across the V2X-UEs within the multi-operator V2X service, the VAE Server shall send an HTTP POST request with "{notifUri}" as previously provided by the service consumer within the corresponding subscription as URI and Notification data structure as request body that shall include:

- resource URI of the Individual PC5 Provisioning Requirement Subscription related to the notification within the "resourceUri" attribute;
- the result of V2X PC5 provisioning requirement within the "result" attribute.

Upon the reception of the HTTP POST message, if the service consumer successfully processed and accepted the received HTTP POST request, the service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the VAE Server shall send an HTTP error response as specified in clause 6.9.7.

5.11 VAE_ServiceAndQoSControlInfo Service

5.11.1 Service Description

The VAE_ServiceAndQoSControlInfo service exposed by the VAE Server enables a service consumer to:

- create/update/delete a Service Adaptation And QoS Control Subscription; and
- receive Service Requirements And QoS Adaptation Notifications.

5.11.2 Service Operations

5.11.2.1 Introduction

The service operations defined for the VAE_ServiceAndQoSControlInfo service are shown in table 5.11.2.1-1.

Table 5.11.2.1-1: VAE_ServiceAndQoSControlInfo Service Operations

Service Operation Name	Description	Initiated by
Subscribe_ServiceAndQoSControlInfo	This service operation enables a service consumer to create/update/delete a Service Adaptation And QoS Control Subscription.	e.g., VASS
Notify_ServiceAndQoSControlInfo	This service operation enables a service consumer to receive Service Requirements And QoS Adaptation Notifications.	VAE Server

5.11.2.2 Subscribe_ServiceAndQoSControlInfo

5.11.2.2.1 General

This service operation is used by a service consumer to request the creation/update/deletion of a Service Adaptation And QoS Control Subscription at the VAE Server.

The following procedures are supported by the "Subscribe_ServiceAndQoSControlInfo" service operation:

- Service Adaptation And QoS Control Subscription Creation.
- Service Adaptation And QoS Control Subscription Update.
- Service Adaptation And QoS Control Subscription Deletion.

5.11.2.2.2 Service Adaptation And QoS Control Subscription Creation

Figure 5.11.2.2.2-1 depicts a scenario where a a service consumer sends a request to the VAE Server to request the creation of a Service Adaptation And QoS Control Subscription (see also clause 9.20 of 3GPP°TS°23.286°[4]).

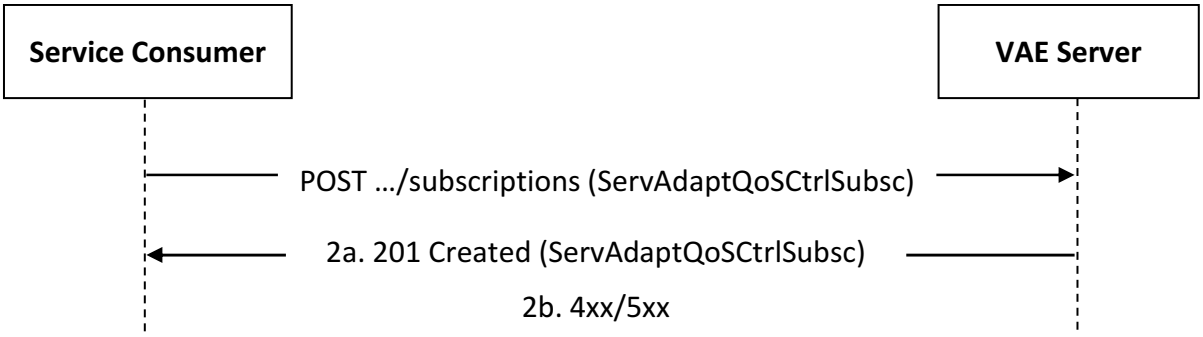

Figure 5.11.2.2.2-1: Procedure for Service Adaptation And QoS Control Subscription Creation

1. In order to subscribe to Service Adaptation And QoS Control reporting, the service consumer shall send an HTTP POST request to the VAE Server targeting the URI of the "Service Adaptation And QoS Control Subscriptions" collection resource, with the request body including the ServAdaptQoSCtrlSubsc data structure.

2a. Upon success, the VAE Server shall respond with an HTTP "201 Created" status code with the response body containing a representation of the created "Individual Service Adaptation And QoS Control Subscription" resource within the ServAdaptQoSCtrlSubsc data structure.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.10.7.

5.11.2.2.3 Service Adaptation And QoS Control Subscription Update

Figure 5.11.2.2.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the update of an existing Service Adaptation And QoS Control Subscription (see also clause 9.20 of 3GPP°TS°23.286°[4]).

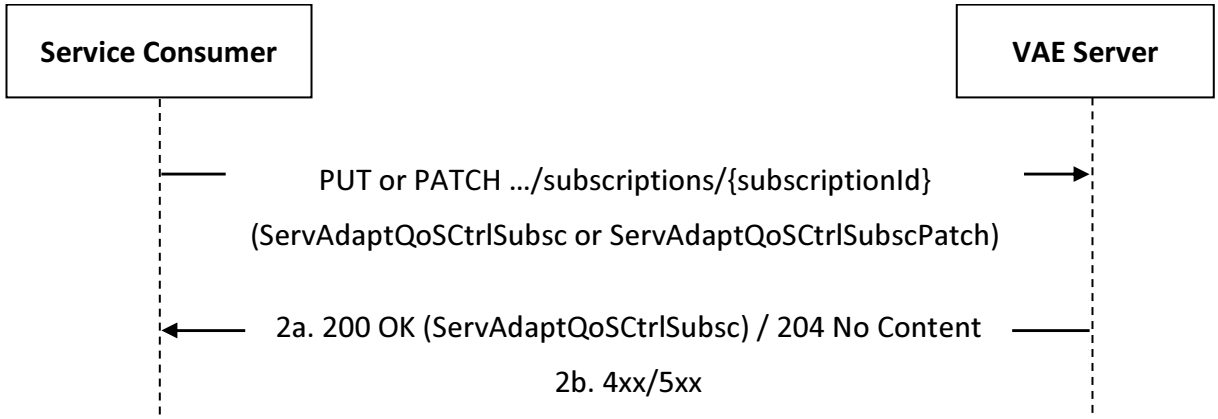

Figure 5.11.2.2.3-1: Procedure for Service Adaptation And QoS Control Subscription Update

1. In order to update an existing Service Adaptation And QoS Control subscription, the service consumer shall send an HTTP PUT/PATCH request to the VAE Server, targeting the URI of the corresponding "Individual Service Adaptation And QoS Control Subscription" resource, with the request body including either:

   - the updated representation of the resource within the ServAdaptQoSCtrlSubsc data structure, in case the HTTP PUT method is used; or

   - the requested modifications to the resource within the ServAdaptQoSCtrlSubscPatch data structure, in case the HTTP PATCH method is used.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall update the targeted "Individual Service Adaptation And QoS Control Subscription" resource accordingly and respond with either:

   - an HTTP "200 OK" status code with the response body containing a representation of the updated "Individual Service Adaptation And QoS Control Subscription" resource within the ServAdaptQoSCtrlSubsc data structure; or

   - an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP PUT/PATCH response body, as specified in clause 6.10.7.

5.11.2.2.4 Service Adaptation And QoS Control Subscription Deletion

Figure 5.11.2.2.4-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of an existing Service Adaptation And QoS Control Subscription (see also clause 9.20 of 3GPP°TS°23.286°[4]).

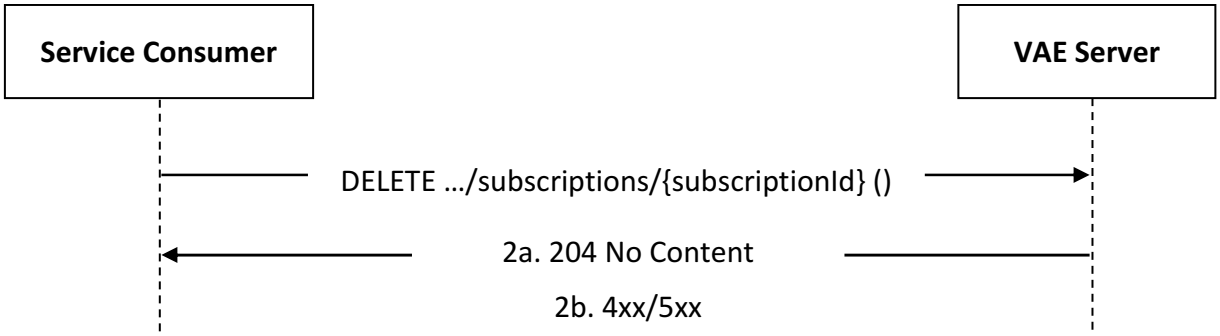

Figure 5.11.2.2.4-1: Procedure for Service Adaptation And QoS Control Subscription Deletion

1. In order to request the deletion of an existing Service Adaptation And QoS Control subscription, the service consumer shall send an HTTP DELETE request to the VAE Server targeting the corresponding "Individual Service Adaptation And QoS Control Subscription" resource.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation/update of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall respond with an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP DELETE response body, as specified in clause 6.10.7.

5.11.2.3 Notify_ServiceAndQoSControlInfo

5.11.2.3.1 General

This service operation is used by a VAE Server to notify a previously subscribed service consumer on:

- Service Requirements And QoS Adaptation event(s).

The following procedures are supported by the "Notify_ServiceAndQoSControlInfo" service operation:

- Service Requirements And QoS Adaptation Notification.
- QoS Change Notification.

5.11.2.3.2 Service Requirements And QoS Adaptation Notification

Figure 5.11.2.3.2-1 depicts a scenario where the VAE Server sends a request to notify a previously subscribed service consumer on Service Requirements And QoS Adaptation event(s) (see also clause 9.20 of 3GPP°TS°23.286°[4]).

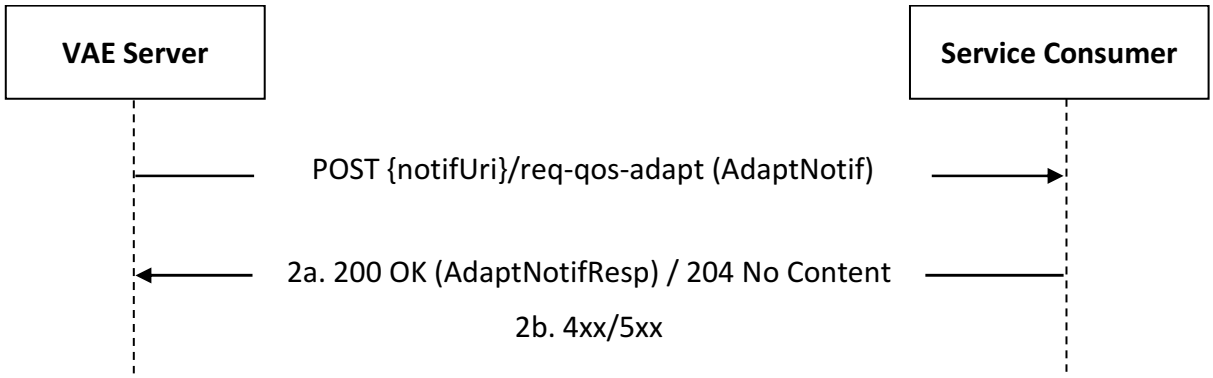

Figure 5.11.2.3.2-1: Procedure for Service Requirements And QoS Adaptation Notification

1. In order to notify a previously subscribed service consumer on Service Requirements And QoS Adaptation event(s), the VAE Server shall send an HTTP POST request to the service consumer with the request URI set to "{notifUri}/req-qos-adapt", where the "notifUri" variable shall be set to the value received from the service

consumer during the creation/update of the corresponding Service Adaptation And QoS Control Subscription using the procedures defined in clause 5.11.2.2, and the request body including the AdaptNotif data structure.

2a. Upon success, the service consumer shall respond with either:

- an HTTP "200 OK" status code with the response body containing acknowledgment related information within the AdaptNotifResp data structure; or
- an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.10.7.

5.11.2.3.3 QoS Change Notification

Figure 5.11.2.3.3-1 depicts a scenario where the VAE Server sends a request to notify a previously subscribed service consumer on QoS Change related event(s) (see also clause 9.20 of 3GPP°TS°23.286°[4]).

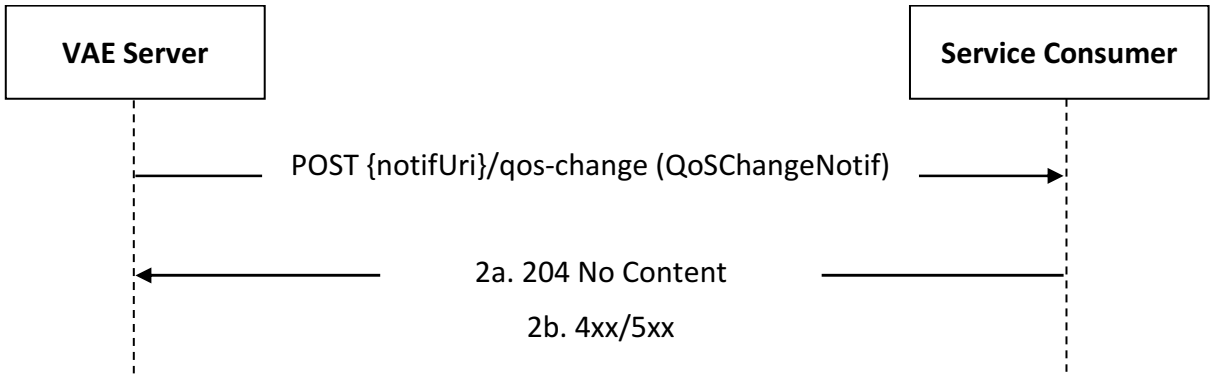

Figure 5.11.2.3.3-1: Procedure for Service Requirements And QoS Adaptation Notification

1. In order to notify a previously subscribed service consumer on QoS Change related event(s), the VAE Server shall send an HTTP POST request to the service consumer with the request URI set to "{notifUri}/qos-change", where the "notifUri" variable shall be set to the value received from the service consumer during the creation/update of the corresponding Service Adaptation And QoS Control Subscription using the procedures defined in clause 5.11.2.2, and the request body including the QoSChangeNotif data structure.

2a. Upon success, the service consumer shall respond with an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.10.7.

5.12 VAE_VRUZoneManagement Service

5.12.1 Service Description

The VAE_VRUZoneManagement service exposed by the VAE Server enables a service consumer to:

- create/update/delete a VRU Zone Management Subscription; and
- receive VRU Zone Management Enter/Leave notifications.

5.12.2 Service Operations

5.12.2.1 Introduction

The service operations defined for the VAE_VRUZoneManagement service are shown in table 5.12.2.1-1.

Table 5.12.2.1-1: VAE_VRUZoneManagement Service Operations

Service Operation Name	Description	Initiated by
Subscribe_VRUZoneManagement	This service operation enables a service consumer to create/update/delete a VRU Zone Management Subscription.	e.g., VASS
Notify_VRUZoneManagement	This service operation enables a service consumer to receive VRU Zone Management Enter/Leave notifications.	VAE Server

5.12.2.2 Subscribe_VRUZoneManagement

5.12.2.2.1 General

This service operation is used by a service consumer to request the creation/update/deletion of a VRU Zone Management Subscription at the VAE Server.

The following procedures are supported by the "Subscribe_VRUZoneManagement" service operation:

- VRU Zone Management Subscription Creation.
- VRU Zone Management Subscription Update.
- VRU Zone Management Subscription Deletion.

5.12.2.2.2 VRU Zone Management Subscription Creation

Figure 5.12.2.2.2-1 depicts a scenario where a a service consumer sends a request to the VAE Server to request the creation of a VRU Zone Management Subscription (see also clause 9.21 of 3GPP°TS°23.286°[4]).

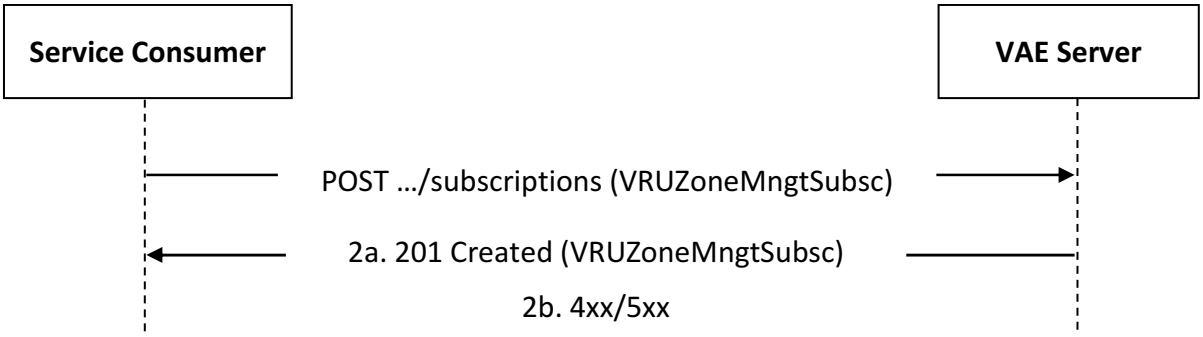

Figure 5.12.2.2.2-1: Procedure for VRU Zone Management Subscription Creation

1. In order to subscribe to VRU Zone Management event(s) reporting, the service consumer shall send an HTTP POST request to the VAE Server targeting the URI of the "VRU Zone Management Subscriptions" collection resource, with the request body including the VRUZoneMngtSubsc data structure.

2a. Upon success, the VAE Server shall respond with an HTTP "201 Created" status code with the response body containing a representation of the created "Individual VRU Zone Management Subscription" resource within the VRUZoneMngtSubsc data structure.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.11.7.

5.12.2.2.3 VRU Zone Management Subscription Update

Figure 5.12.2.2.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the update of an existing VRU Zone Management Subscription (see also clause 9.21 of 3GPP°TS°23.286°[4]).

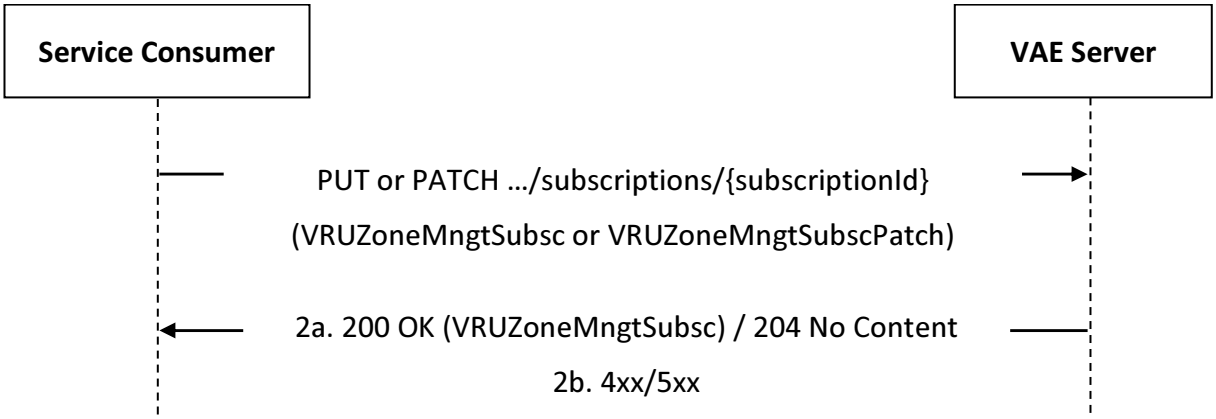

Figure 5.12.2.2.3-1: Procedure for VRU Zone Management Subscription Update

1. In order to update an existing VRU Zone Management subscription, the service consumer shall send an HTTP PUT/PATCH request to the VAE Server, targeting the URI of the corresponding "Individual VRU Zone Management Subscription" resource, with the request body including either:

   - the updated representation of the resource within the VRUZoneMngtSubsc data structure, in case the HTTP PUT method is used; or

   - the requested modifications to the resource within the VRUZoneMngtSubscPatch data structure, in case the HTTP PATCH method is used.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall update the targeted "Individual VRU Zone Management Subscription" resource accordingly and respond with either:

   - an HTTP "200 OK" status code with the response body containing a representation of the updated "Individual VRU Zone Management Subscription" resource within the VRUZoneMngtSubsc data structure; or

   - an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP PUT/PATCH response body, as specified in clause 6.11.7.

5.12.2.2.4 VRU Zone Management Subscription Deletion

Figure 5.12.2.2.4-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of an existing VRU Zone Management Subscription (see also clause 9.21 of 3GPP°TS°23.286°[4]).

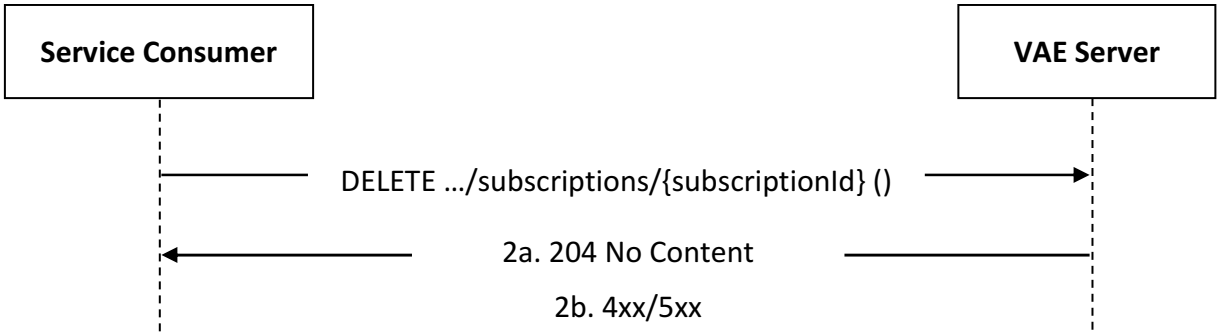

Figure 5.12.2.2.4-1: Procedure for VRU Zone Management Subscription Deletion

1. In order to request the deletion of an existing VRU Zone Management subscription, the service consumer shall send an HTTP DELETE request to the VAE Server targeting the corresponding "Individual VRU Zone Management Subscription" resource.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation/update of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall respond with an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP DELETE response body, as specified in clause 6.11.7.

5.12.2.3 Notify_VRUZoneManagement

5.12.2.3.1 General

This service operation is used by a VAE Server to notify a previously subscribed service consumer on:

- VRU Zone Management Enter/Leave event(s).

The following procedures are supported by the "Notify_VRUZoneManagement" service operation:

- VRU Zone Management Enter/Leave Notification.

5.12.2.3.2 VRU Zone Management Enter/Leave Notification

Figure 5.12.2.3.2-1 depicts a scenario where the VAE Server sends a request to notify a previously subscribed service consumer on VRU Zone Management Enter/Leave event(s) (see also clause 9.21 of 3GPP°TS°23.286°[4]).

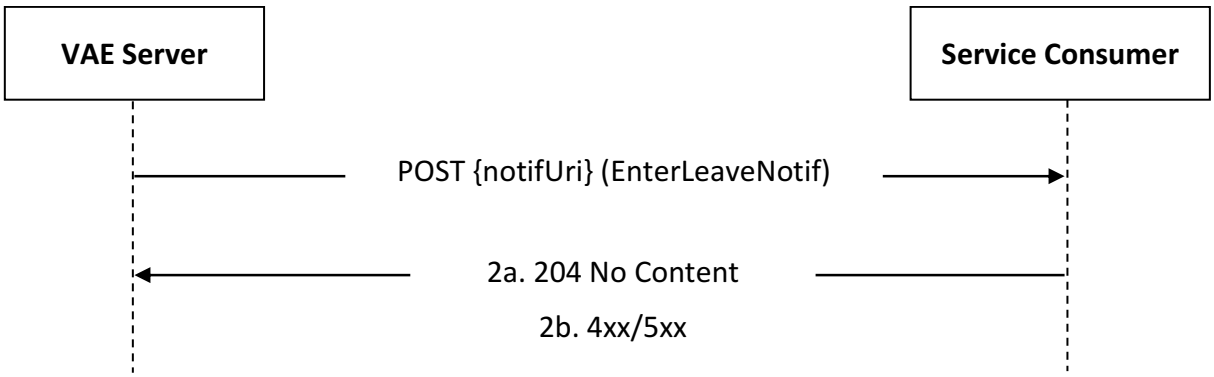

Figure 5.12.2.3.2-1: Procedure for VRU Zone Management Enter/Leave Notification

1. In order to notify a previously subscribed service consumer on VRU Zone Management Enter/Leave event(s), the VAE Server shall send an HTTP POST request to the service consumer with the request URI set to "{notifUri}", where the "notifUri" variable shall be set to the value received from the service consumer during the creation/update of the corresponding VRU Zone Management Subscription using the procedures defined in clause 5.12.2.2, and the request body including the EnterLeaveNotif data structure.

2a. Upon success, the service consumer shall respond with an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.11.7.

5.13 VAE_V2PApplicationRequirement Service

5.13.1 Service Description

The VAE_V2PApplicationRequirement service exposed by the VAE Server enables a service consumer to:

- create/update/delete a V2P Application Requirements Provisioning.

5.13.2 Service Operations

5.13.2.1 Introduction

The service operations defined for the VAE_V2PApplicationRequirement service are shown in table 5.13.2.1-1.

Table 5.13.2.1-1: VAE_V2PApplicationRequirement Service Operations

Service Operation Name	Description	Initiated by
Request_V2PapplicationRequirement	This service operation enables a service consumer to request the creation/update/deletion of a V2P Application Requirements Provisioning for enabling V2P applications.	e.g., VASS

5.13.2.2 Request_V2PApplicationRequirement

5.13.2.2.1 General

This service operation is used by a service consumer request the creation/update/deletion of a V2P Application Requirements Provisioning at the VAE Server.

The following procedures are supported by the "Request_V2PApplicationRequirement" service operation:

- V2P Application Requirements Provisioning Creation.
- V2P Application Requirements Provisioning Update.
- V2P Application Requirements Provisioning Deletion.

5.13.2.2.2 V2P Application Requirement Creation

Figure 5.13.2.2.2-1 depicts a scenario where a a service consumer sends a request to the VAE Server to request the creation of a V2P Application Requirements Provisioning (see also clause 9.22 of 3GPP°TS°23.286°[4]).

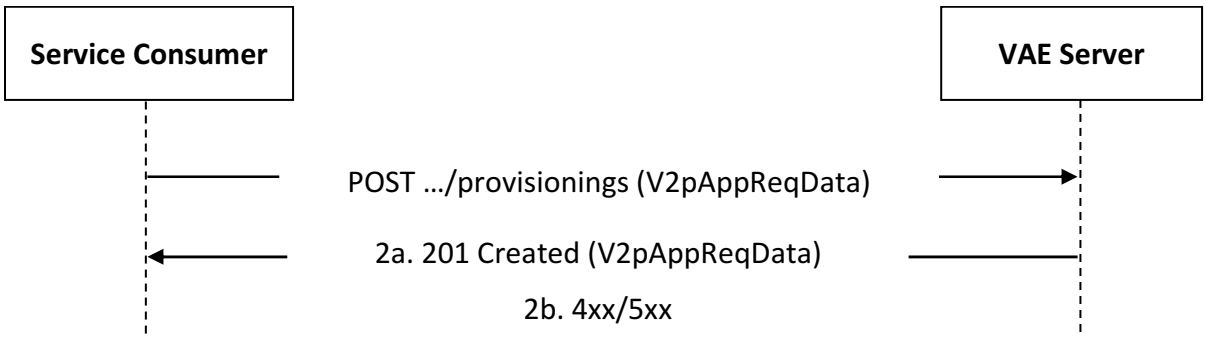

Figure 5.13.2.2.2-1: Procedure for V2P Application Requirement Creation

1. In order to request the creation of a V2P Application Requirements Provisioning, the service consumer shall send an HTTP POST request to the VAE Server targeting the URI of the "V2P Application Requirements Provisionings" collection resource, with the request body including the V2pAppReqData data structure.

2a. Upon success, the VAE Server shall respond with an HTTP "201 Created" status code with the response body containing a representation of the created "Individual V2P Application Requirements Provisioning" resource within the V2pAppReqData data structure.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 6.12.7.

5.13.2.2.3 V2P Application Requirements Provisioning Update

Figure 5.13.2.2.3-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the update of an existing V2P Application Requirements Provisioning (see also clause 9.22 of 3GPP°TS°23.286°[4]).

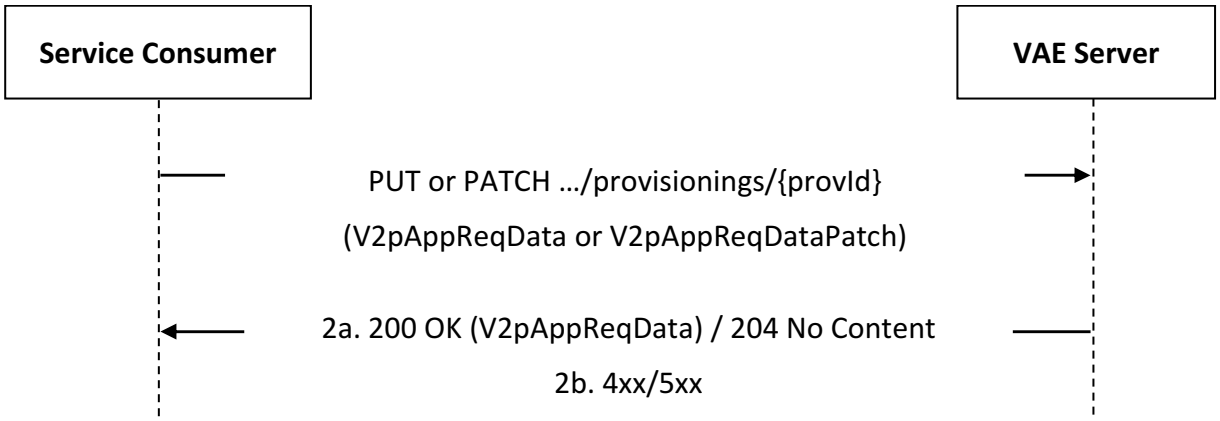

Figure 5.13.2.2.3-1: Procedure for V2P Application Requirements Provisioning Update

1. In order to update an existing V2P Application Requirements Provisioning, the service consumer shall send an HTTP PUT/PATCH request to the VAE Server, targeting the URI of the corresponding "Individual V2P Application Requirements Provisioning" resource, with the request body including either:

   - the updated representation of the resource within the V2pAppReqData data structure, in case the HTTP PUT method is used; or

   - the requested modifications to the resource within the V2pAppReqDataPatch data structure, in case the HTTP PATCH method is used.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall update the targeted "Individual V2P Application Requirements Provisioning" resource accordingly and respond with either:

   - an HTTP "200 OK" status code with the response body containing a representation of the updated "Individual V2P Application Requirements Provisioning" resource within the V2pAppReqData data structure; or

   - an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP PUT/PATCH response body, as specified in clause 6.12.7.

5.13.2.2.4 V2P Application Requirements Provisioning Deletion

Figure 5.13.2.2.4-1 depicts a scenario where a service consumer sends a request to the VAE Server to request the deletion of an existing V2P Application Requirements Provisioning (see also clause 9.22 of 3GPP°TS°23.286°[4]).

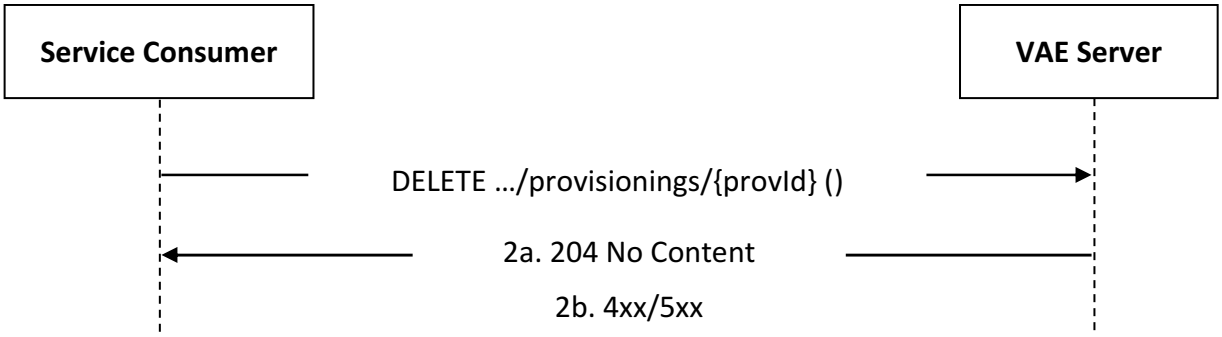

Figure 5.13.2.2.4-1: Procedure for V2P Application Requirements Provisioning Deletion

1. In order to request the deletion of an existing V2P Application Requirements Provisioning, the service consumer shall send an HTTP DELETE request to the VAE Server targeting the corresponding "Individual V2P Application Requirements Provisioning" resource.

NOTE: An alternative service consumer (i.e., other than the one that requested the creation/update of the targeted resource) can initiate this request.

2a. Upon success, the VAE Server shall respond with an HTTP "204 No Content" status code.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP DELETE response body, as specified in clause 6.12.7.

6 API Definitions

6.1 VAE_MessageDelivery Service API

6.1.1 Introduction

The VAE_MessageDelivery shall use the VAE_MessageDelivery API.

The API URI of the VAE_MessageDelivery shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-message-delivery".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

6.1.2 Usage of HTTP

6.1.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_MessageDelivery is contained in Annex A.2.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.1.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.1.2.3 HTTP custom headers

6.1.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.1.3 Resources

6.1.3.1 Overview

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

Figure 6.1.3.1-1 depicts the resource URIs structure for the VAE_MessageDelivery API.

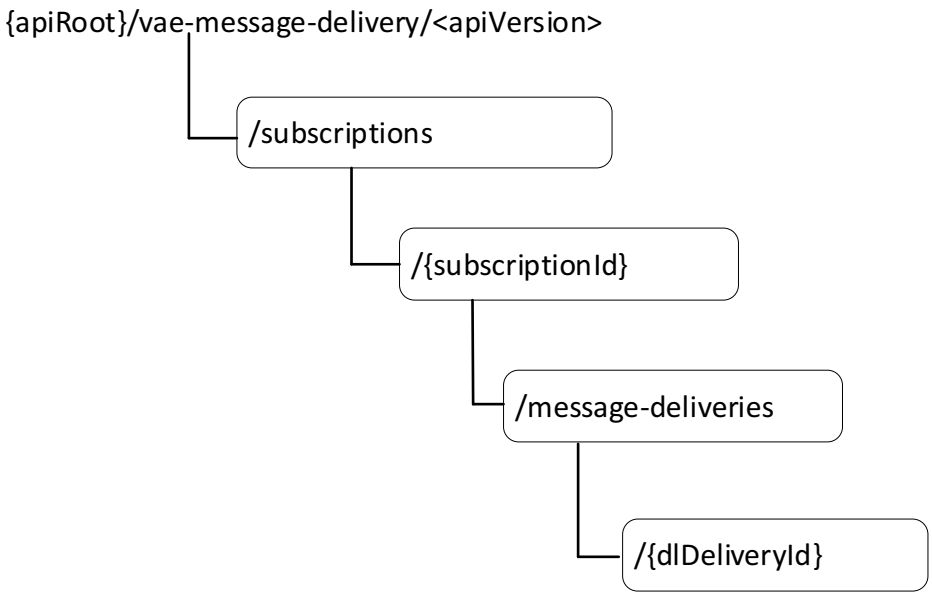

Figure 6.1.3.1-1: Resource URI structure of the VAE_MessageDelivery API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Message Delivery Subscriptions	/subscriptions	POST	Create a new Individual Message Delivery Subscription resource.
Individual Message Delivery Subscription	/subscriptions/{subscriptionId}	GET	Read an Individual Message Delivery Subscription resource.
		DELETE	Delete an Individual Message Delivery Subscription resource.
Downlink Message Deliveries	/subscriptions/{subscriptionId}/message-deliveries	POST	Create a new Individual Downlink Message Delivery resource for a V2X UE ID or V2X group ID.
Individual Downlink Message Delivery	/subscriptions/{subscriptionId}/message-deliveries/{dlDeliveryId}	GET	Read the Individual Downlink Message Delivery resource.
		DELETE	Delete the Individual Downlink Message Delivery resource.

6.1.3.2 Resource: Message Delivery Subscriptions

6.1.3.2.1 Description

This resource represents the collection of the Individual Message Delivery Subscription resources created in the VAE Server.

6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-message-delivery/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause 6.1.1

6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
MessageDelivery SubscriptionData	M	1	Parameters to create an Individual Message Delivery Subscription resources.

Table 6.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MessageDelivery SubscriptionData	O	0..1	201 Created	An Individual Message Delivery Subscription resource for the V2X UE ID or V2X group ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.1.3.2.3.1-4: 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}/vae-message-delivery/<apiVersion>/subscriptions/{subscriptionId}

6.1.3.2.4 Resource Custom Operations

None.

6.1.3.3 Resource: Individual Message Delivery Subscription

6.1.3.3.1 Description

The Individual Message Subscription resource represents an Individual Message Delivery Subscription created in the VAE Server and associated with the V2X UE ID or V2X group ID.

6.1.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-message-delivery/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
subscriptionId	string	Unique identifier of the individual Message Delivery Subscription resource for the V2X UE ID or V2X group ID.

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: 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 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
MessageDeliverySubscriptionData	M	1	200 OK	An individual Message Delivery Subscription resource for the V2X UE ID or V2X group ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Message Delivery Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Message Delivery Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.1.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: 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 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual Message Delivery Subscription was successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Message Delivery Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Message Delivery Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.1.3.3.4 Resource Custom Operations

None.

6.1.3.4 Resource: Downlink Message Deliveries

6.1.3.4.1 Description

This resource represents the collection of the individual Downlink Message Delivery resources created in the VAE Server.

6.1.3.4.2 Resource Definition

Resource URI: **{apiRoot}/vae-message-delivery/<apiVersion>/subscriptions/{subscriptionId}/message-deliveries**

This resource shall support the resource URI variables defined in table 6.1.3.4.2-1.

Table 6.1.3.4.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
subscriptionId	string	Unique identifier of the individual Message Delivery Subscription resource for the V2X UE ID or V2X group ID.

6.1.3.4.3 Resource Standard Methods

6.1.3.4.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.4.3.1-1.

Table 6.1.3.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.1.3.4.3.1-2 and the response data structures and response codes specified in table 6.1.3.4.3.1-3.

Table 6.1.3.4.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
DownlinkMessage DeliveryData	M	1	Parameters to create an Individual Downlink Message Delivery resource.

Table 6.1.3.4.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DownlinkMessag eDeliveryData	O	0..1	201 Created	An Individual Downlink Message Delivery resource for the V2X UE ID **or** V2X group ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.1.3.4.3.1-4: 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}/vae-message-delivery/<apiVersion>/subscriptions/{subscriptionId}/message-deliveries/{dlDeliveryId}

6.1.3.4.4 Resource Custom Operations

None.

6.1.3.5 Resource: Individual Downlink Message Delivery

6.1.3.3.1 Description

The Individual Downlink Message Delivery resource represents an Individual Downlink Message Delivery created in the VAE Server and associated with the V2X UE ID or V2X group ID.

6.1.3.5.2 Resource definition

Resource URI: **{apiRoot}/vae-message-delivery/<apiVersion>/subscriptions/{subscriptionId}/message-deliveries/{dlDeliveryId}**

This resource shall support the resource URI variables defined in table 6.1.3.5.2-1.

Table 6.1.3.5.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
subscriptionId	string	Unique identifier of the individual Message Delivery Subscription resource for the V2X UE ID or V2X group ID.
dlDeliveryId	string	Unique identifier of the Individual Downlink Message Delivery resource for the V2X UE ID or V2X group ID.

6.1.3.5.3 Resource Standard Methods

6.1.3.5.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.5.3.1-1.

Table 6.1.3.5.3.1-1: 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 5.1.3.5.3.1-2 and the response data structures and response codes specified in table 5.1.3.5.3.1-3.

Table 6.1.3.5.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.5.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DownlinkMessageDeliveryData	M	1	200 OK	An individual Downlink Message Delivery resource for the V2X UE ID **or** V2X group ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Downlink Message Delivery retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Downlink Message Delivery retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.1.3.5.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.1.3.5.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.1.3.5.3.2 DELETE

This method shall support the URI query parameters specified in table 6.1.3.5.3.2-1.

Table 6.1.3.5.3.2-1: 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 6.1.3.5.3.2-2 and the response data structures and response codes specified in table 6.1.3.5.3.2-3.

Table 6.1.3.5.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.5.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual Downlink Message Delivery resource was successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Downlink Message Delivery deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Downlink Message Delivery deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.1.3.5.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.1.3.5.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.1.3.3.4 Resource Custom Operations

None.

6.1.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_MessageDelivery.

6.1.5 Notifications

6.1.5.1 General

The VAE server and service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.1.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.1.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.1.5.4.

6.1.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.1.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.1.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.1.5.5 Methods

The notifications provided by the VAE_MessageDelivery Service are specified in this clause.

Table 6.1.5.5-1: Notifications

	Callback URI	HTTP method or custom operation	Description (service operation)
Uplink Message Delivery	{notifUri}	POST	Uplink Message Delivery.
Reception Report of Downlink Message Delivery	{notifUri}	POST	Send notifications about the result of the downlink Message delivery

6.1.5.6 Uplink Message Delivery

6.1.5.6.1 Description

This notification is used by the VAE Server to deliver the uplink message to the update the policy.

6.1.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.5.6.2-1 and the response data structure and response codes specified in table 6.1.5.6.2-2.

Table 6.1.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
UplinkMessageDeliveryData	M	1	Contains the uplink message delivery data

Table 6.1.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The uplink message is delivery successfully.
n/a			307 Temporary Redirect	Temporary redirection, during uplink message delivery. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the uplink message should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during uplink message delivery. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the uplink message should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.1.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the uplink message should be redirected.

Table 6.1.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the uplink message should be redirected.

6.1.5.7 Reception Report of Downlink Message Delivery

6.1.5.7.1 Description

This notification is used by the VAE Server to report the result of downlink message delivery to service consumer.

6.1.5.7.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.5.7.2-1 and the response data structure and response codes specified in table 6.1.5.7.2-2.

Table 6.1.5.7.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
Result	M	1	Contains the result of downlink messagege delivery.

Table 6.1.5.7.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The reception report is successfully.
n/a			307 Temporary Redirect	Temporary redirection, during reception report of downlink data delivery. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the uplink message should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during reception report of downlink data delivery. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the uplink message should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.1.5.7.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the uplink message should be redirected.

Table 6.1.5.7.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the uplink message should be redirected.

6.1.6 Data Model

6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the VAE_MessageDelivery API.

Table 6.1.6.1-1: VAE_MessageDelivery specific Data Types

Data type	Section defined	Description	Applicability
AppServerId	6.1.6.3.2	Identity of the V2X application specific server.	
DownlinkMessageDeliveryData	6.1.6.2.2	Contains the downlink V2X message delivery data	
GeoId	6.1.6.3.2	Geographical area identifier	
MessageDeliverySubscriptionData	6.1.6.2.3	Contains the V2X message delivery subscription data	
Result	6.1.6.3.4	Contains the result of the downlink message delivery	ReceptionReport
UplinkMessageDeliveryData	6.1.6.2.4	Contains the uplink V2X message delivery data	
V2xGroupId	6.1.6.3.2	The group ID for which the V2X message is addressed	
V2xServiceID	6.1.6.3.2	The V2X service ID to which the V2X message belongs to	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
V2xMessagePayload	6.1.6.3.2	V2X message payload carried by the V2X message	

Table 6.1.6.1-2 specifies data types re-used by the VAE_MessageDelivery service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_MessageDelivery service based interface.

Table 6.1.6.1-2: VAE_MessageDelivery re-used Data Types

Data type	Reference	Comments	Applicability
Bytes	3GPP TS 29.571 [11]	String with format "byte" as defined in OpenAPI Specification [6], i.e, base64-encoded characters	
DateTime	3GPP TS 29.571 [11]	String with format "date-time" as defined in OpenAPI Specification [6].	
SupportedFeatures	3GPP TS 29.571 [11]		
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uri	3GPP TS 29.571 [11]		
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

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

6.1.6.2.2 Type: DownlinkMessageDeliveryData

Table 6.1.6.2.2-1: Definition of type DownlinkMessageDeliveryData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueId	V2xUeId	C	0..1	Indicates an identifier of the V2X UE. (NOTE)	
groupId	V2xGroupId	C	0..1	Indicates a group ID for which the V2X message is addressed. (NOTE)	
serviceId	V2xServiceId	O	0..1	Contains the identifier of the V2X service to which the V2X message is related.	V2XService
geoId	GeoId	O	0..1	Indicates a geographical area identifier.	
payload	V2xMessagePayload	M	1	Constains the V2X message payload carried by the V2X message	
duration	DateTime	O	0..1	Identifies the absolute time at which the related Individual Downlink Message Delivery resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the service consumer. When omitted in the response, it indicates the resource is set to valid forever by the VAE server	
NOTE: Either "ueId" attribute or "groupId" attribute shall be included.					

6.1.6.2.3 Type: MessageDeliverySubscriptionData

Table 6.1.6.2.3-1: Definition of type MessageDeliverySubscriptionData

Attribute name	Data type	P	Cardinality	Description	Applicability
appSerId	AppServerId	M	1	Identity of the VASS service consumer.	
serviceId	V2xServiceId	M	1	Indicates a V2X service ID to which the V2X message belongs to.	
geoId	GeoId	O	0..1	Indicates a geographical area identifier.	
notifUri	Uri	M	1	Contains the notification URI。	
requestTestNotification	boolean	O	0..1	Set to true by the service consumer to request the VAE server to send a test notification as defined in clause 6.1.5.3. 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 6.1.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer and VAE server. It shall be included in the request and response of the creation of individual Message Delivery Subscription resource.	

6.1.6.2.4 Type: UplinkMessageDeliveryData

Table 6.1.6.2.4-1: Definition of type UplinkMessageDeliveryData

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the individual Uplink Message Delivery Subscription related to the notification.	
ueId	V2xUeId	M	1	Indicates an identifier of the V2X UE.	
serviceId	V2xServiceId	O	0..1	Contains the identifier of the V2X service to which the V2X message is related.	V2XService
geoId	GeoId	O	0..1	Indicates a geographical area identifier.	
payload	V2xMessagePayload	M	1	Contains the V2X message payload carried by the V2X message	

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

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

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
AppServerId	string	Identity of the V2X application specific server	
GeoId	string	Defines a geographical area identifier.	
V2xGroupId	string	Defines a group ID for which the V2X message is addressed.	
V2xServiceId	string	Defines a V2X service ID to which the V2X message belongs to	
V2xUeId	string	Identifier of the V2X UE	
V2xMessagePayload	Bytes	V2X message payload carried by the V2X message.	

6.2.6.3.3 Enumeration: Result

Table 6.2.6.3.3-1: Enumeration Result

Enumeration value	Description	Applicability
SUCCESS	Indicates that the downlink message delivery is successful.	
FAIL	Indicates that the downlink message delivery is failed.	

6.1.7 Error Handling

6.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_MessageDelivery Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_MessageDelivery Service API.

6.1.7.2 Protocol Errors

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

6.1.7.3 Application Errors

The application errors defined for the VAE_MessageDelivery service are listed in Table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description

6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the VAE_MessageDelivery API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.1.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.1.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.1.5.4. This feature requires that the Notification_test_event feature is also supported.
3	V2XService	Indicates the support of provisioning the V2X service ID within the uplink/downlink message delivery procedures.

6.2 VAE_FileDistribution Service API

6.2.1 Introduction

The VAE_FileDistribution shall use the VAE_FileDistribution API.

The API URI of the VAE_FileDistribution shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-file-distribution".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.2.3.

6.2.2 Usage of HTTP

6.2.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 7234 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 911 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_FileDistribution is contained in Annex A.3.

6.2.2.2 HTTP standard headers

6.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.2.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.2.2.3 HTTP custom headers

6.2.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.2.3 Resources

6.2.3.1 Overview

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

Figure 6.2.3.1-1 depicts the resource URIs structure for the VAE_FileDistribution API.

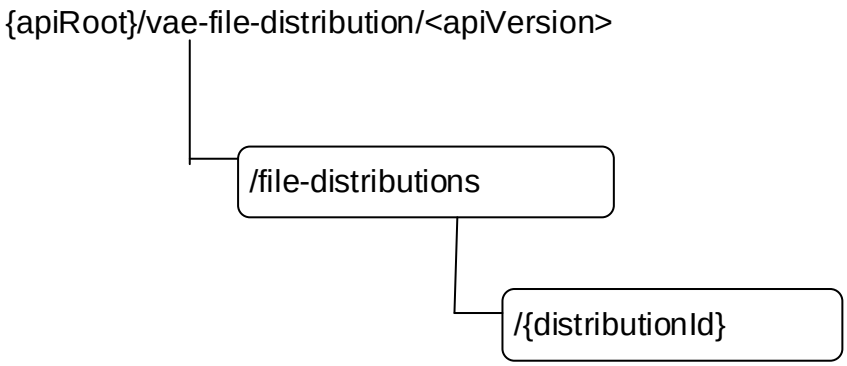

Figure 6.2.3.1-1: Resource URI structure of the VAE_FileDistribution API

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
File Distributions	/file-distributions	POST	Create a new Individual File Distribution resource for a V2X group ID.
Individual File Distribution	/file-distributions/{distributionId}	GET	Read an Individual File Distribution resource.
		DELETE	Delete an Individual File Distribution resource.

6.2.3.2 Resource: File Distributions

6.2.3.2.1 Description

This resource represents the collection of the individual File Distribution resources created in the VAE Server.

6.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-file-distribution/<apiVersion>/file-distributions**

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

Table 6.2.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.2.1

6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

Table 6.2.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
FileDistributionData	M	1	Parameters to create an individual File Distribution resource.

Table 6.2.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
FileDistributionData	O	0..1	201 Created	An individual File Distribution resource for the V2X group ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.2.3.2.3.1-4: 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}/vae-file-distribution/<apiVersion>/file-distributions/{distributionId}

6.2.3.2.4 Resource Custom Operations

None.

6.2.3.3 Resource: Individual File Distribution

6.2.3.3.1 Description

The individual File Distribution resource represents an individual File Distribution created in the VAE Server and associated with the V2X group ID.

6.2.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-file-distribution/<apiVersion>/file-distributions/{distributionId}**

This resource shall support the resource URI variables defined in table 6.2.3.3-1.

Table 6.2.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.2.1
distributionId	string	Unique identifier of the individual File Distribution resource for the V2X group ID.

6.2.3.3.3 Resource Standard Methods

6.2.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

Table 6.2.3.3.3.1-1: 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 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

Table 6.2.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.2.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
FileDistributionData	M	1	200 OK	An individual File Distribution resource for the V2X group ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual File Distribution retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual File Distribution retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.2.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.2.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.3.3.2-1.

Table 6.2.3.3.3.2-1: 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 6.2.3.3.3.2-2 and the response data structures and response codes specified in table 6.2.3.3.3.2-3.

Table 6.2.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.2.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual File Distribution resource was successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection, during Individual File Distribution deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual File Distribution deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] also apply.				

Table 6.2.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.2.3.4 Resource Custom Operations

None.

6.2.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_FileDistribution.

6.2.5 Notifications

N/A

6.2.6 Data Model

6.2.6.1 General

This clause specifies the application data model supported by the API.

Table 6.2.6.1-1 specifies the data types defined for the VAE_FileDistribution API.

Table 6.2.6.1-1: VAE_FileDistribution specific Data Types

Data type	Section defined	Description	Applicability
FileDistributionData	6.2.6.2.2	Represents an individual File Distribution resource for a V2X group ID.	
Filelist	6.2.6.2.3	Represents a file list.	
FileStatus	6.2.6.3.3	Represents a file status.	
LocalMbmsInfo	6.2.6.2.4	Contains the local MBMS information.	LocalMBMS

Table 6.1.6.1-2 specifies data types re-used by the VAE_FileDistribution service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_FileDistribution service based interface.

Table 6.2.6.1-2: VAE_FileDistribution re-used Data Types

Data type	Reference	Comments	Applicability
BitRate	3GPP TS 29.571 [11]		
DateTime	3GPP TS 29.571 [11]		
DurationSec	3GPP TS 29.571 [11]		
GeographicArea	3GPP TS 29.572 [20]		
SupportedFeatures	3GPP TS 29.571 [11]		
Uinteger	3GPP TS 29.571 [11]		
V2xGroupId	6.1.6.3.2		

6.2.6.2 Structured data types

6.2.6.2.1 Introduction

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

6.2.6.2.2 Type: FileDistributionData

Table 6.2.6.2.2-1: Definition of type FileDistributionData

Attribute name	Data type	P	Cardinality	Description	Applicability
groupId	V2xGroupId	O	0..1	Indicates a group ID for which the V2X message is addressed.	
fileLists	array(FileList)	M	1..N	File lists.	
serviceClass	string	O	0..1	Information about the V2X application (e.g., software update, HD map download)	
geoArea	GeographicArea	M	1	Target geographical area for the V2X Ues	
maxBitrate	BitRate	M	1	Maximum bitrate for the V2X application.	
maxDelay	Uinteger	M	1	Unsigned integer identifying a maximum delay in units of milliseconds for the V2X application.	
duration	DateTime	O	0..1	Identifies the absolute time at which the related Individual File Distribution Data resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the service consumer. When omitted in the response, it indicates the resource is set to valid forever by the VAE server	
localMbmsInfo	LocalMbmsInfo	O	0..1	Contains the local MBMS inforamtion. The information only can be provided by the service consumer in the trust domain.	LocalMBMS
localMbmsActInd	boolean		0..1	When this attribute is included and set to true, it indicates that the local MBMS is activated. The default value "FALSE" shall apply, if the attribute is not present.	LocalMBMS
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer and VAE server. It shall be included in the request and response of the Creation of Individual File Distribution Data resource..	

6.2.6.2.3 Type: FileList

Table 6.2.6.2.4-1: Definition of type FileList

Attribute name	Data type	P	Cardinality	Description	Applicability
fileUri	Uri	M	1		
fileDisplayUri	Uri	M	1		
fileEarFetchTime	DateTime	M	1		
fileLatFetchTime	DateTime	M	1		
fileSize	Uinteger	O	0..1		
fileStatus	FileStatus	M	1		
completionTime	DateTime	M	1		
keepUpdateInterval	DurationSec	M	1		
uniAvailability	Boolean	O	0..1		
fileRepetition	Uinteger	O	0..1		

6.2.6.2.4 Type: LocalMbmsInfo

Table 6.2.6.2.4-1: Definition of type LocalMbmsInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
mbmsEnbIpv4MulAddr	Ipv4Addr	O	0..1	Contains the M1 (transport) plane IPv4 destination multicast address used by MBMS-GW for IP multicast encapsulation of application IP multicast datagrams.	
mbmsEnbIpv6MulAddr	Ipv6Prefix	O	0..1	Contains the M1 (transport) plane IPv6 prefix of destination multicast address used by MBMS-GW for IP multicast encapsulation of application IP multicast datagrams.	
mbmsGwIpv4SsmAddr	Ipv4Addr	O	0..1	Contains the value of MBMS-GW's IPv4 address for Source Specific Multicasting.	
mbmsGwIpv6SsmAddr	Ipv6Addr	O	0..1	Contains the value of MBMS-GW's IPv6 address for Source Specific Multicasting.	
cteid	string	O	0..1	Indicates the common tunnel endpoint identifier of MBMS GW for user plane.	
bmscIpv4Addr	Ipv4Addr	O	0..1	Indicates the destination IPv4 address of the BM-SC for the reception of user plane data via the MB2-U or xMB-U interface.	
bmscIpv6Addr	Ipv6Addr	O	0..1	Indicates the destination IPv6 address of the BM-SC for the reception of user plane data via the MB2-U or xMB-U interface.	
bmscPort	Uinteger	O	0..1	Indicates the destination UDP port of the BM-SC for the reception of user plane data via the MB2-U or xMB-U interface.	

6.2.6.3 Simple data types and enumerations

6.2.6.3.1 Introduction

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

6.2.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.2.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.2.6.3.3 Enumeration: FileStatus

Table 6.2.6.3.3-1: Enumeration FileStatus

Enumeration value	Description	Applicability
PENDING	The file is pending.	
FETCHED	The file is fetched	
PREPARED	The file is prepared	
TRANSMITTING	The file is transmitting	
SENT	The file is sent.	

6.2.6.3.4 Enumeration: Result

Table 6.2.6.3.4-1: Enumeration Result

Enumeration value	Description	Applicability
SUCCESS	Indicates that the downlink message delivery is successful.	
FAIL	Indicates that the downlink message delivery is failed.	

6.2.7 Error Handling

6.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_FileDistribution Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_FileDistribution Service API.

6.2.7.2 Protocol Errors

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

6.2.7.3 Application Errors

The application errors defined for the VAE_FileDistribution service are listed in table 6.2.7.3-1.

Table 6.2.7.3-1: Application errors

Application Error	HTTP status code	Description

6.2.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the VAE_FileDistribution API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.1.8-1: Supported Features

Feature number	Feature Name	Description
x	LocalMBMS	Indicate the support of local MBMS transmission.

6.3 VAE_ApplicationRequirement API

6.3.1 Introduction

The VAE_ApplicationRequirement Service shall use the VAE_ApplicationRequirement API.

The API URI of the VAE_ApplicationRequirement API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-app-req".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.3.3.

6.3.2 Usage of HTTP

6.3.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_ApplicationRequirement is contained in Annex A.4.

6.3.2.2 HTTP standard headers

6.3.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.3.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.3.2.3 HTTP custom headers

6.3.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.3.3 Resources

6.3.3.1 Overview

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

Figure 6.3.3.1-1 depicts the resource URIs structure for the VAE_ApplicationRequirement API.

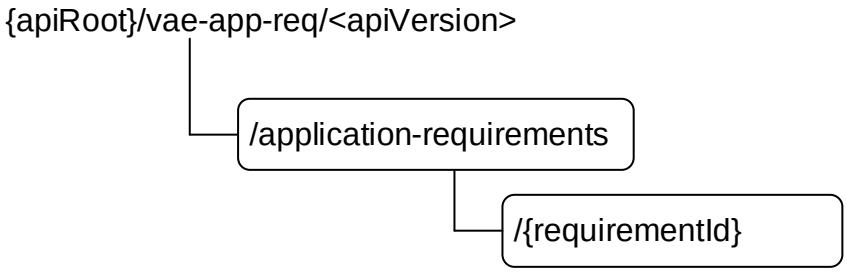

Figure 6.3.3.1-1: Resource URI structure of the VAE_ApplicationRequirement API

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.3.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Application Requirements	/application-requirements	POST	Create a new Individual Application Requirement resource for a V2X UE or V2X group ID.
Individual Application Requirement	/application-requirements /{requirementId}	GET	Read an Individual Application Requirement resource.
		DELETE	Delete an Individual Application Requirement resource.

6.3.3.2 Resource: Application Requirements

6.3.3.2.1 Description

This resource represents the collection of the individual Application Requirement resources created in the VAE Server.

6.3.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-app-req/<apiVersion>/application-requirements**

This resource shall support the resource URI variables defined in table 6.3.3.2.2-1.

Table 6.3.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.3.1

6.3.3.2.3 Resource Standard Methods

6.3.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.3.3.2.3.1-1.

Table 6.3.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.3.3.2.3.1-2 and the response data structures and response codes specified in table 6.3.3.2.3.1-3.

Table 6.3.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ApplicationRequirementData	M	1	Parameters to create an individual Application Requirement resource.

Table 6.3.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ApplicationRequirementData	O	0..1	201 Created	An individual Application Requirement resource for the V2X UE ID or the V2X group ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.3.3.2.3.1-4: 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}/vae-app-req/<apiVersion>/application-requirements/{requirementId}

6.3.3.2.4 Resource Custom Operations

None.

6.3.3.3 Resource: Individual Application Requirement

6.3.3.3.1 Description

The individual Application Requirement resource represents an individual Application Requirement created in the VAE Server and associated with the V2X UE ID or V2X group ID.

6.3.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-app-req/<apiVersion>/application-requirements/{requirementId}**

This resource shall support the resource URI variables defined in table 6.2.3.3-1.

Table 6.3.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.3.1
requirementId	string	Unique identifier of the individual Application Requirement resource for the V2X UE ID or the V2X group ID.

6.3.3.3.3 Resource Standard Methods

6.3.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.3.3.3.3.1-1.

Table 6.3.3.3.3.1-1: 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 6.3.3.3.3.1-2 and the response data structures and response codes specified in table 6.3.3.3.3.1-3.

Table 6.3.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.3.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ApplicationRequirementData	M	1	200 OK	An individual Application Requirement resource for the V2X UE ID or V2X group ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Application Requirement retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Application Requirement retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.3.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.3.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.3.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.3.3.3.3.2-1.

Table 6.3.3.3.3.2-1: 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 6.3.3.3.3.2-2 and the response data structures and response codes specified in table 6.3.3.3.3.2-3.

Table 6.3.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.3.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual Application Requirement resource was successfully deleted
n/a			307 Temporary Redirect	Temporary redirection, during Individual Application Requirement deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Application Requirement deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.3.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.3.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.3.3.4 Resource Custom Operations

None.

6.3.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_ApplicationRequirement.

6.3.5 Notifications

6.3.5.1 General

The VAE server and service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.3.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.3.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.1.5.4.

6.3.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.3.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.3.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.3.5.5 Methods

Table 6.3.5.5-1: Methods

Callback URI	HTTP method or custom operation	Description (service operation)
{notifUri}	POST	Notify the result of the network resource adaptation corresponding to the V2X application requirement.

6.3.5.6 Notify Network Resource

6.3.5.6.1 Description

This notification is used by the VAE Server to notify the result of the network resource adaptation corresponding to the V2X application requirement.

6.3.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.3.5.6.2-1 and the response data structure and response codes specified in table 6.3.5.6.2-2.

Table 6.3.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AppReqNotification	M	1	Notify the result of the network resource adaptation corresponding to the V2X application requirement.

Table 6.3.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	.
n/a			307 Temporary Redirect	Temporary redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.3.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

Table 6.3.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

6.3.6 Data Model

6.3.6.1 General

This clause specifies the application data model supported by the API.

Table 6.3.6.1-1 specifies the data types defined for the VAE_ApplicationRequirement API.

Table 6.3.6.1-1: VAE_ApplicationRequirement specific Data Types

Data type	Section defined	Description	Applicability
ApplicationRequirement	6.3.6.2.3	Represents the requirements for application change.	
ApplicationRequirementData	6.3.6.2.2	Represents an individual Application Requirement resource for a V2X UE ID or a V2X group ID.	
AppReqNotification	6.3.6.2.4	Represents a notificaton of the result of the network resource adaptation corresponding to the V2X application requirement.	
ReservationResult	6.3.6.3.4	Represents the result of the network resource adaptation corresponding to the V2X application requirement.	
ServiceLevel	6.3.6.3.3	Indicates a service level for application service.	

Table 6.3.6.1-2 specifies data types re-used by the VAE_ApplicationRequirement service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_ApplicationRequirement service based interface.

Table 6.3.6.1-2: VAE_ApplicationRequirement re-used Data Types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.571 [11]	Used to indicate a duration.	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
V2xGroupId	6.1.6.3.2	Used to indicate an identifier of a V2X group.	
V2xServiceID	6.1.6.3.2	The V2X service ID to which the V2X message belongs to	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.3.6.2 Structured data types

6.3.6.2.1 Introduction

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

6.3.6.2.2 Type: ApplicationRequirementData

Table 6.3.6.2.2-1: Definition of type ApplicationRequirementData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueId	V2xUeId	C	0..1	Indicates a UE ID for which the V2X message is addressed. (NOTE)	
groupId	V2xGroupId	C	0..1	Indicates a group ID for which the V2X message is addressed. (NOTE)	
serviceId	V2xServiceId	M	1	The V2X service ID for which application requirement corresponds to.	
appRequirement	ApplicationRequirement	M	1	The requirement for application change. E.g. service levels for application service.	
notifUri	Uri	M	1	Identifies the recipient of V2X application requirement notification sent by the VAE server.	
duration	DateTime	O	0..1	Identifies the absolute time at which the related Individual Application Requirement resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the service consumer. When omitted in the response, it indicates the resource is set to valid forever by the VAE server	
requestTestNotification	boolean	O	0..1	Set to true by the 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
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer. It shall be included in the first interaction.	
NOTE: Either the "ueId" attribute or "groupId" attribute shall be included.					

6.3.6.2.3 Type: ApplicationRequirement

Table 6.3.6.2.3-1: Definition of type ApplicationRequirement

Attribute name	Data type	P	Cardinality	Description	Applicability
serviceLevel	ServiceLevel	O	0..1	Indicates a service level for application service.	

6.3.6.2.4 Type: AppReqNotification

Table 6.3.6.2.4-1: Definition of type AppReqNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the individual Application Requirement related to the notification.	
result	ReservationResult	M	1	The result of the network resource adaptation corresponding to the V2X application requirement.	

6.3.6.3 Simple data types and enumerations

6.3.6.3.1 Introduction

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

6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

Table 6.3.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.3.6.3.3 Enumeration: ServiceLevel

Table 6.3.6.3.3-1: Enumeration ServiceLevel

Enumeration value	Description	Applicability
HIGH	Service level is high.	
MEDIUM	Service level is medium.	
LOW	Service level is low.	

6.3.6.3.4 Enumeration: ReservationResult

Table 6.3.6.3.4-1: Enumeration ReservationResult

Enumeration value	Description	Applicability
SUCCESSFUL	The resource reservation is successful.	
FAILURE	The resource reservation is failure.	

6.3.7 Error Handling

6.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_ApplicationRequirement Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_ApplicationRequirement Service API.

6.3.7.2 Protocol Errors

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

6.3.7.3 Application Errors

The application errors defined for the VAE_ApplicationRequirement service are listed in table 6.3.7.3-1.

Table 6.3.7.3-1: Application errors

Application Error	HTTP status code	Description

6.3.8 Feature negotiation

The optional features in table 6.3.8-1 are defined for the VAE_ApplicationRequirement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.3.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.3.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.3.5.4. This feature requires that the Notification_test_event feature is also supported.

6.4 VAE_DynamicGroup API

6.4.1 Introduction

The VAE_DynamicGroup service shall use the VAE_DynamicGroup API.

The API URI of the VAE_DynamicGroup API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-dynamic-group".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.4.3.

6.4.2 Usage of HTTP

6.4.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_DynamicGroup is contained in Annex A.5.

6.4.2.2 HTTP standard headers

6.4.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.4.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.4.2.3 HTTP custom headers

6.4.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.4.3 Resources

6.4.3.1 Overview

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

Figure 6.4.3.1-1 depicts the resource URIs structure for the VAE_DynamicGroup API.

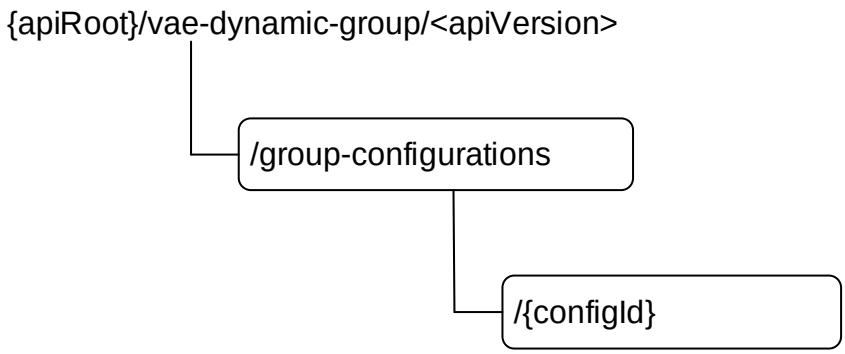

Figure 6.4.3.1-1: Resource URI structure of the VAE_DynamicGroup API

Table 6.4.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.4.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Group Configurations	/group-configurations	POST	Create a new Individual Group Configuration resource for a V2X group ID.
Individual Group Configuration	/group-configurations/{configId}	GET	Read an Individual Group Configuration resource.
		DELETE	Delete an Individual Group Configuration resource.

6.4.3.2 Resource: Group Configurations

6.4.3.2.1 Description

This resource represents the collection of the individual Application Requirement resources created in the VAE Server.

6.4.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-dynamic-group/<apiVersion>/group-configuration**s

This resource shall support the resource URI variables defined in table 6.4.3.2.2-1.

Table 6.4.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.4.1

6.4.3.2.3 Resource Standard Methods

6.4.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.4.3.2.3.1-1.

Table 6.4.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.4.3.2.3.1-2 and the response data structures and response codes specified in table 6.4.3.2.3.1-3.

Table 6.4.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
GroupConfigurationData	M	1	Parameters to create an individual Group Configuration resource.

Table 6.3.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
GroupConfigurationData	O	0..1	201 Created	An individual Group Configuration resource for the V2X group ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.4.3.2.3.1-4: 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}/vae-dynamic-group/<apiVersion>/group-configurations/{configId}

6.4.3.2.4 Resource Custom Operations

None.

6.4.3.3 Resource: Individual Group Configuration

6.4.3.3.1 Description

The individual Group Configuration resource represents an individual Group Configuration created in the VAE Server and associated with the V2X group ID.

6.4.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-dynamic-group/<apiVersion>/group-configurations/{configId}**

This resource shall support the resource URI variables defined in table 6.2.3.3-1.

Table 6.4.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.4.1.
configId	string	Unique identifier of the individual group configuration resource for the V2X group ID.

6.4.3.3.3 Resource Standard Methods

6.4.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.4.3.3.3.1-1.

Table 6.4.3.3.3.1-1: 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 6.4.3.3.3.1-2 and the response data structures and response codes specified in table 6.4.3.3.3.1-3.

Table 6.4.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.4.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
GroupConfigurationData	M	1	200 OK	An individual Group Configuration resource for the V2X group ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Group Configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Group Configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.4.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.4.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.4.3.3.3.2-1.

Table 6.4.3.3.3.2-1: 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 6.4.3.3.3.2-2 and the response data structures and response codes specified in table 6.4.3.3.3.2-3.

Table 6.4.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.4.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	
n/a			307 Temporary Redirect	Temporary redirection, during Individual Group Configuration deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Group Configuration deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.4.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.4.3.4 Resource Custom Operations

None.

6.4.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_DynamicGroup API.

6.4.5 Notifications

6.4.5.1 General

The VAE server and service consumer shall support the on-network dynamic group notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.4.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.4.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.4.5.4.

6.4.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.4.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.4.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.4.5.5 Methods

Table 6.4.5.5-1: Methods

Callback URI	HTTP method or custom operation	Description (service operation)
{notifUri}	POST	Notify the dynamic group information (i.e. group member joins or leaves).

6.4.5.6 Notify Dynamic Group

6.4.5.6.1 Description

This notification is used by the VAE Server to notify the dynamic group information (i.e. group member joins or leaves).

6.4.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.4.5.6.2-1 and the response data structure and response codes specified in table 6.4.5.6.2-2.

Table 6.4.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
DynamicGroupNotification	M	1	Notify the dynamic group information (i.e. group member joins or leaves).

Table 6.4.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	.
n/a			307 Temporary Redirect	Temporary redirection, during dynamic group notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during dynamic group notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.4.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

Table 6.4.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

6.4.6 Data Model

6.4.6.1 General

This clause specifies the application data model supported by the API.

Table 6.4.6.1-1 specifies the data types defined for the VAE_DynamicGroup API.

Table 6.4.6.1-1: VAE_DynamicGroup specific Data Types

Data type	Section defined	Description	Applicability
DynamicGroupNotification	6.3.6.2.3	Represents a notification on the dynamic group information (i.e. group member joins or leaves).	
GroupConfigurationData	6.3.6.2.2	Represents an individual Group Configuration resource for a V2X group ID.	

Table 6.4.6.1-2 specifies data types re-used by the VAE_DynamicGroup service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_DynamicGroup service based interface.

Table 6.4.6.1-2: VAE_DynamicGroup re-used Data Types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.571 [11]	String with format "date-time" as defined in OpenAPI Specification [6].	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
V2xGroupId	6.1.6.3.2	Used to indicate an identifier of a V2X group.	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.4.6.2 Structured data types

6.4.6.2.1 Introduction

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

6.4.6.2.2 Type: GroupConfigurationData

Table 6.4.6.2.2-1: Definition of type GroupConfigurationData

Attribute name	Data type	P	Cardinality	Description	Applicability
groupId	V2xGroupId	M	1	Indicates a group ID to be used for the V2X group.	
definition	string	M	1	Information about the V2X group.	
leaderId	V2xUeId	M	1	Indicates a UE ID to be used for user controlled group join.	
duration	DateTime	O	0..1	Identifies the absolute time at which the related Individual Group Configuration resource is considered to expire. When omitted in the request, it indicates the resource is requested to be valid forever by the service consumer. When omitted in the response, it indicates the resource is set to valid forever by the VAE server	
notifUri	Uri	M	1	Identifies the recipient of V2X dynamic group notification sent by the VAE server.	
requestTestNotification	boolean	O	0..1	Set to true by the service consumer to request the VAE server to send a test notification as defined in clause 6.1.5.3. 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 6.1.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer and VAE server. It shall be included in the request and response of the Creation of Individual Group Configuration resource.	

6.4.6.2.3 Type: DynamicGroupNotification

Table 6.4.6.2.2-1: Definition of type DynamicGroupNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the individual Group Configuration related to the notification.	
joinedUeIds	array(V2xUeId)	O	1..N	The joined group member(s).	
leftUeIds	array(V2xUeId)	O	1..N	The left group member(s).	

6.4.6.3 Simple data types and enumerations

6.4.6.3.1 Introduction

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

6.4.6.3.2 Simple data types

The simple data types defined in table 6.4.6.3.2-1 shall be supported.

Table 6.4.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.4.7 Error Handling

6.4.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_DynamicGroup Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

If the "Redirect3XX" feature is supported, an HTTP redirect response, i.e. 307 Temporary Redirect or 308 Permanent Redirect, shall be supported.

In addition, the requirements in the following clauses are applicable for the VAE_DynamicGroup Service API.

6.4.7.2 Protocol Errors

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

6.4.7.3 Application Errors

The application errors defined for the VAE_DynamicGroup service are listed in Table 6.4.7.3-1.

Table 6.4.7.3-1: Application errors

Application Error	HTTP status code	Description

6.4.8 Feature negotiation

The optional features in table 6.4.8-1 are defined for the VAE_DynamicGroup API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.4.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.4.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.4.5.4. This feature requires that the Notification_test_event feature is also supported.

6.5 VAE_ServiceContinuity Service API

6.5.1 Introduction

The VAE_ServiceContinuity shall use the VAE_ServiceContinuity API.

The API URI of the VAE_ServiceContinuity API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-service-continuity".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.5.3.

6.5.2 Usage of HTTP

6.5.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_ServiceContinuity is contained in Annex A.6.

6.5.2.2 HTTP standard headers

6.5.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.5.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.5.2.3 HTTP custom headers

6.5.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.5.3 Resources

6.5.3.1 Overview

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

Figure 6.5.3.1-1 depicts the resource URIs structure for the VAE_ServiceContinuity API.

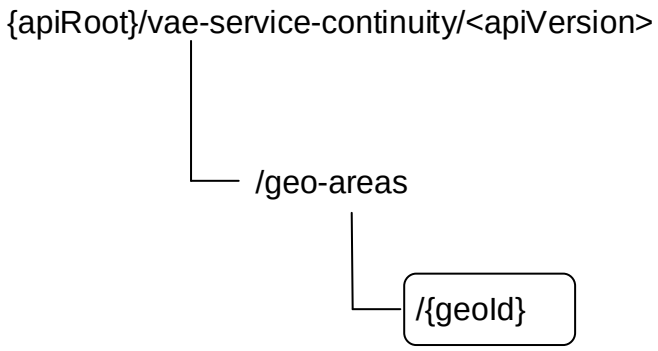

Figure 6.5.3.1-1: Resource URI structure of the VAE_ServiceContinuity API

Table 6.5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Individual Geographical Area	/geo-areas/{geoId}	GET	Query the Individual Geographical Area resource.

6.5.3.2 Resource: Individual Geographical Area

6.5.3.2.1 Description

This resource represents the individual geographical area resource in the VAE Server.

6.5.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-service-continuity/<apiVersion>/geo-areas/{geoId}**

This resource shall support the resource URI variables defined in table 6.5.3.2.2-1.

Table 6.5.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.5.1
geoId	string	Geographical area id.

6.5.3.2.3 Resource Standard Methods

6.5.3.2.3.1 GET

This method shall support the URI query parameters specified in table 6.5.3.2.3.1-1.

Table 6.5.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
service-id	V2xServiceId	M	1	V2X service id	
supp-feat	SupportedFeatures	O	0..1	To filter irrelevant responses related to unsupported features.	

This method shall support the request data structures specified in table 6.5.3.2.3.1-2 and the response data structures and response codes specified in table 6.5.3.2.3.1-3.

Table 6.5.3.2.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.5.3.2.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2xServiceInfo	M	1	200 OK	An individual geographical area resource including the designated V2X service id is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual geographical area resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual geographical area resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.5.3.2.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.5.3.2.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.5.3.2.4 Resource Custom Operations

None.

6.5.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_ServiceContinuity.

6.5.5 Notifications

Notifications are not applicable for the current Release.

6.5.6 Data Model

6.5.6.1 General

This clause specifies the application data model supported by the API.

Table 6.5.6.1-1 specifies the data types defined for the VAE_ServiceContinuity API.

Table 6.5.6.1-1: VAE_ServiceContinuity specific Data Types

Data type	Section defined	Description	Applicability
V2xServiceInfo	6.5.6.2.2	Represents an individual geographical area resource including the designated V2X service identifier.	

Table 6.5.6.1-2 specifies data types re-used by the VAE_ServiceContinuity service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_ServiceContinuity service based interface.

Table 6.5.6.1-2: VAE_ServiceContinuity re-used Data Types

Data type	Reference	Comments	Applicability
V2xServiceId	6.1.6.3.2	Defines a V2X service ID.	

6.5.6.2 Structured data types

6.5.6.2.1 Introduction

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

6.5.6.2.2 Type: V2xServiceInfo

Table 6.5.6.2.2-1: Definition of type V2xServiceInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
serviceIds	array(V2xServiceId)	M	1..N	Indicates a list of supported V2X service identifiers.	
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer and VAE server. It shall be included if the query request includes supported features.	

6.5.6.3 Simple data types and enumerations

6.5.6.3.1 Introduction

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

6.5.6.3.2 Simple data types

The simple data types defined in table 6.5.6.3.2-1 shall be supported.

Table 6.5.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.5.7 Error Handling

6.5.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_ServiceContinuity Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_ServiceContinuity Service API.

6.5.7.2 Protocol Errors

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

6.5.7.3 Application Errors

The application errors defined for the VAE_ServiceContinuity service are listed in Table 6.5.7.3-1.

Table 6.5.7.3-1: Application errors

Application Error	HTTP status code	Description

6.5.8 Feature negotiation

The optional features in table 6.5.8-1 are defined for the VAE_ServiceContinuity API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.5.8-1: Supported Features

Feature number	Feature Name	Description

6.6 VAE_HDMapDynamicInfo API

6.6.1 Introduction

The VAE_HDMapDynamicInfo Service shall use the VAE_HDMapDynamicInfo API.

The API URI of the VAE_HDMapDynamicInfo API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-hdmap-dynamic-info".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.6.3.

6.6.2 Usage of HTTP

6.6.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. TLS shall be used as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_HDMapDynamicInfo is contained in Annex A.4.

6.6.2.2 HTTP standard headers

6.6.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.6.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.6.2.3 HTTP custom headers

6.6.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.6.3 Resources

6.6.3.1 Overview

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

Figure 6.6.3.1-1 depicts the resource URIs structure for the VAE_HDMapDynamicInfo API.

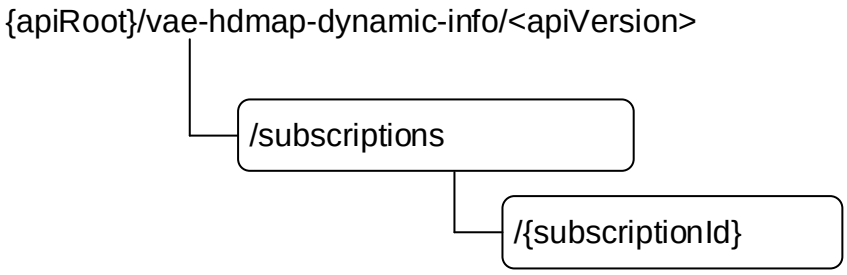

Figure 6.6.3.1-1: Resource URI structure of the VAE_HDMapDynamicInfo API

Table 6.6.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.6.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
HdMap DynamicInfo Subscription	/subscriptions	POST	Create a new Individual HdMap DynamicInfo Subscription resource for a V2X UE.
Individual HdMap DynamicInfo Subscription	/subscriptions/{subscriptionId}	GET	Read an HdMap DynamicInfo Subscription resource.
		DELETE	Delete an HdMap DynamicInfo Subscription.

6.6.3.2 Resource: Subscriptions

6.6.3.2.1 Description

This resource represents the collection of the individual HdMap DynamicInfo Subscription resources created in the VAE Server.

6.6.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-hdmap-dynamic-info/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.6.3.2.2-1.

Table 6.6.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.6.1

6.6.3.2.3 Resource Standard Methods

6.6.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.6.3.2.3.1-1.

Table 6.6.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.6.3.2.3.1-2 and the response data structures and response codes specified in table 6.6.3.2.3.1-3.

Table 6.6.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
HdMapDynamicInfoData	M	1	Parameters to create an individual HdMap DynamicInfo Subscription resource.

Table 6.6.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
HdMapDynamicInfoData	O	0..1	201 Created	An individual HdMap DynamicInfo Subscription resource for the V2X UE ID is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.6.3.2.3.1-4: 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}/vae-hdmap-dynamic-info/<apiVersion>/subscriptions/{subscriptionId}

6.6.3.2.4 Resource Custom Operations

None.

6.6.3.3 Resource: Individual HdMap DynamicInfo Subscription

6.6.3.3.1 Description

The individual HdMap DynamicInfo Subscription resource represents an individual Application Requirement created in the VAE Server and associated with the V2X UE ID.

6.6.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-hdmap-dynamic-info/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.6.3.3-1.

Table 6.6.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.6.1
subscriptionId	string	Unique identifier of the individual HdMap DynamicInfo Subscription resource for the V2X UE ID.

6.6.3.3.3 Resource Standard Methods

6.6.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.6.3.3.3.1-1.

Table 6.6.3.3.3.1-1: 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 6.6.3.3.3.1-2 and the response data structures and response codes specified in table 6.6.3.3.3.1-3.

Table 6.6.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.6.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
HdMapDynamicInfoData	M	1	200 OK	An individual HdMap DynamicInfo Subscription resource for the V2X UE ID is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual HdMap DynamicInfo Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual HdMap DynamicInfo Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.6.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.6.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.6.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.6.3.3.3.2-1.

Table 6.6.3.3.3.2-1: 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 6.6.3.3.3.2-2 and the response data structures and response codes specified in table 6.6.3.3.3.2-3.

Table 6.6.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.6.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual HdMap DynamicInfo Subscription resource was successfully deleted
n/a			307 Temporary Redirect	Temporary redirection, during Individual HdMap DynamicInfo Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during HdMap DynamicInfo Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.6.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.6.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.6.3.4 Resource Custom Operations

None.

6.6.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_HDMapDynamicInfo.

6.6.5 Notifications

6.6.5.1 General

The VAE server and service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.6.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.6.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.6.5.4.

6.6.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.6.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.6.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.6.5.5 Methods

Table 6.6.5.5-1: Methods

Callback URI	HTTP method or custom operation	Description (service operation)
{notifUri}	POST	Notify the HD map dynamic information corresponding to the subscription.

6.6.5.6 Notify HD Map Dynamic Information

6.6.5.6.1 Description

This notification is used by the VAE Server to notify the HD Map Dynamic Information corresponding to the subscription.

6.6.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.6.5.6.2-1 and the response data structure and response codes specified in table 6.6.5.6.2-2.

Table 6.6.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
HdMapDynamicInfoNotification	M	1	Notify the HD Map dynamic information corresponding to the subscription.

Table 6.6.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	.
n/a			307 Temporary Redirect	Temporary redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.6.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

Table 6.6.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

6.6.6 Data Model

6.6.6.1 General

This clause specifies the application data model supported by the API.

Table 6.6.6.1-1 specifies the data types defined for the VAE_HDMapDynamicInfo API.

Table 6.6.6.1-1: VAE_HDMapDynamicInfo specific Data Types

Data type	Section defined	Description	Applicability
HdMapDynamicInfoData	6.6.6.2.2	Represents an individual HdMap DynamicInfo Subscription resource for a V2X UE ID.	
HdMapDynamicInfoNotification	6.6.6.2.3	Represents a notificaton of HD map dynamic info corresponding to the subscription.	
NearbyUeInfo	6.6.6.2.4	Represents the informaiotn of nearby UEs.	

Table 6.6.6.1-2 specifies data types re-used by the VAE_HDMapDynamicInfo service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_HDMapDynamicInfo service based interface.

Table 6.6.6.1-2: VAE_HDMapDynamicInfo re-used Data Types

Data type	Reference	Comments	Applicability
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
Uinteger	3GPP TS 29.571 [11]	Used to identify a range or distance in meters.	
UserLocation	3GPP TS 29.571 [11]	Used to indicate a V2X user location.	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.6.6.2 Structured data types

6.6.6.2.1 Introduction

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

6.6.6.2.2 Type: HdMapDynamicInfoData

Table 6.6.6.2.2-1: Definition of type HdMapDynamicInfoData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueId	V2xUeId	M	1	V2X UE ID of the host vehicle	
notifUri	Uri	M	1	Identifies the recipient of HD Map dynamice info notification sent by the VAE server.	
range	Uinteger	M	1	Identifies the range in units of meters.	
requestTestNotification	boolean	O	0..1	Set to true by the 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
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer. It shall be included in the first interaction.	

6.6.6.2.3 Type: HdMapDynamicInfoNotification

Table 6.6.6.2.3-1: Definition of type HdMapDynamicInfoNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the individual HdMap DynamicInfo Subscription related to the notification.	
nearbyUeInfo	array(NearbyUeInfo)	M	1..N	Contains the informaiotn of nearby UEs.	

6.6.6.2.4 Type: NearbyUeInfo

Table 6.6.6.2.4-1: Definition of type NearbyUeInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
nearbyUeId	V2xUeId	M	1	The identifier of nearby V2X UE	
location	UserLocation	M	1	Location information of the nearby V2X UE within the application defined proximity range	
distance	Uinteger	M	1	Distance information of the nearby V2X UE in the units of meters.	

6.6.6.3 Simple data types and enumerations

6.6.6.3.1 Introduction

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

6.6.6.3.2 Simple data types

The simple data types defined in table 6.6.6.3.2-1 shall be supported.

Table 6.6.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.6.7 Error Handling

6.6.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_HDMapDynamicInfo Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_HDMapDynamicInfo Service API.

6.6.7.2 Protocol Errors

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

6.6.7.3 Application Errors

The application errors defined for the VAE_HDMapDynamicInfo service are listed in table 6.6.7.3-1.

Table 6.6.7.3-1: Application errors

Application Error	HTTP status code	Description

6.6.8 Feature negotiation

The optional features in table 6.6.8-1 are defined for the VAE_HDMapDynamicInfo API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.6.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.6.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.6.5.4. This feature requires that the Notification_test_event feature is also supported.

6.7 VAE_SessionOrientedService API

6.7.1 Introduction

The VAE_SessionOrientedService Service shall use the VAE_SessionOrientedService API.

The API URI of the VAE_SessionOrientedService API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-session-oriented-service".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.7.3.

6.7.2 Usage of HTTP

6.7.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS (IETF RFC 5246 [18]) is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_SessionOrientedService is contained in Annex A.8.

6.7.2.2 HTTP standard headers

6.7.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.7.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.7.2.3 HTTP custom headers

6.7.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.7.3 Resources

6.7.3.1 Overview

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

Figure 6.7.3.1-1 depicts the resource URIs structure for the VAE_SessionOrientedService API.

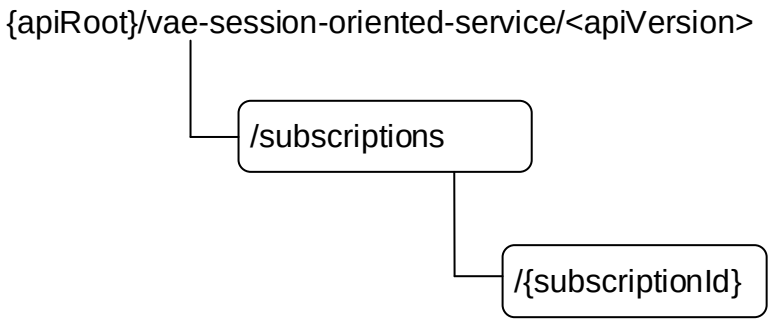

Figure 6.7.3.1-1: Resource URI structure of the VAE_SessionOrientedService API

Table 6.7.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.7.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Session Oriented Service Subscriptions	/subscriptions	POST	Create a new Individual Session Oriented Service Subscription.
Individual Session Oriented Service Subscription	/subscriptions/{subscriptionId}	GET	Read an Individual Session Oriented Service Subscription.
		PUT	Update an Individual Session Oriented Service Subscription.
		DELETE	Delete an Individual Session Oriented Service Subscription

6.7.3.2 Resource: Session Oriented Service Subscriptions

6.7.3.2.1 Description

This resource represents the collection of the Individual Session Oriented Service Subscription resources created in the VAE Server.

6.7.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-session-oriented-service/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.7.3.2.2-1.

Table 6.7.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.7.1

6.7.3.2.3 Resource Standard Methods

6.7.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.7.3.2.3.1-1.

Table 6.7.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.7.3.2.3.1-2 and the response data structures and response codes specified in table 6.7.3.2.3.1-3.

Table 6.7.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SessionOrientedData	M	1	Parameters to create an Individual Session Oriented Service Subscription resource.

Table 6.7.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SessionOrientedData	O	0..1	201 Created	An individual Session Oriented Service Subscription resource is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.7.3.2.3.1-4: 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}/vae-session-oriented-service/<apiVersion>/subscriptions/{subscriptionId}

6.7.3.2.4 Resource Custom Operations

None.

6.7.3.3 Resource: Individual Session Oriented Service Subscription

6.7.3.3.1 Description

The Individual Session Oriented Service Subscription resource represents Individual Session Oriented Service Subscription created in the VAE Server.

6.7.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-session-oriented-service/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.7.3.3.2-1.

Table 6.7.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.7.1
subscriptionId	string	Unique identifier of the Individual Session Oriented Service Subscription resource.

6.7.3.3.3 Resource Standard Methods

6.7.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.7.3.3.3.1-1.

Table 6.7.3.3.3.1-1: 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 6.7.3.3.3.1-2 and the response data structures and response codes specified in table 6.7.3.3.3.1-3.

Table 6.7.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.7.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SessionOrientedData	M	1	200 OK	An Individual Session Oriented Service Subscription resource is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual Session Oriented Service Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual Session Oriented Service Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.7.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.7.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.7.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.7.3.3.3.2-1.

Table 6.7.3.3.3.2-1: 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 6.7.3.3.3.2-2 and the response data structures and response codes specified in table 6.7.3.3.3.2-3.

Table 6.7.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
SessionOrientedData	M	1	Parameters to update an Individual Session Oriented Service Subscription resource.

Table 6.7.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SessionOrientedData	M	1	200 OK	The Individual Session Oriented Service Subscription resource was successfully updated.
n/a			204 No Content	The Individual Session Oriented Service Subscription resource was successfully updated.
n/a			307 Temporary Redirect	Temporary redirection, during the Individual Session Oriented Service Subscription update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual Session Oriented Service Subscription update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.7.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.7.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.7.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 6.7.3.3.3.3-1.

Table 6.7.3.3.3.3-1: 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 6.7.3.3.3.3-2 and the response data structures and response codes specified in table 6.7.3.3.3.3-3.

Table 6.7.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.7.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual Session Oriented Service Subscription resource was successfully deleted
n/a			307 Temporary Redirect	Temporary redirection, during the Individual Session Oriented Service Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual Session Oriented Service Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.7.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 6.7.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

6.7.3.4 Resource Custom Operations

None.

6.7.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_SessionOrientedService.

6.7.5 Notifications

6.7.5.1 General

The VAE server and service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.7.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.7.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.7.5.4.

6.7.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.7.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.7.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.7.5.5 Methods

Table 6.7.5.5-1: Methods

Callback URI	HTTP method or custom operation	Description (service operation)
{notifUri}	POST	Notify the result of the establishment or update of the session-oriented service corresponding to the subscription.

6.7.5.6 Notify Session Establishment or Update

6.7.5.6.1 Description

This notification is used by the VAE Server to notify the result of establishment or update of the session-oriented service by the VAE server.

6.7.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.7.5.6.2-1 and the response data structure and response codes specified in table 6.7.5.6.2-2.

Table 6.7.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
Notification	M	1	Notify the result of establishment or update of the session-oriented service to the subscription.

Table 6.7.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	.
n/a			307 Temporary Redirect	Temporary redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.7.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

Table 6.7.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

6.7.6 Data Model

6.7.6.1 General

This clause specifies the application data model supported by the API.

Table 6.7.6.1-1 specifies the data types defined for the VAE_SessionOrientedService API.

Table 6.7.6.1-1: VAE_SessionOrientedService specific Data Types

Data type	Section defined	Description	Applicability
Action	6.7.6.3.3	Indicates the action of the session-oriented service, i.e. establishment and update.	
AppplicationQosRequirement	6.7.6.2.4	Represents the application layer QoS requirement.	
Notification	6.7.6.2.3	Represents the result of the establishment or update of the session-oriented service.	
SessionOrientedData	6.7.6.2.2	Represents the data to trigger establishment or update of ession-oriented service.	

Table 6.7.6.1-2 specifies data types re-used by the VAE_SessionOrientedService service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_SessionOrientedService service based interface.

Table 6.7.6.1-2: VAE_SessionOrientedService re-used Data Types

Data type	Reference	Comments	Applicability
5Qi	3GPP TS 29.571 [11]	Used to indicate a PQI.	
AverWindow	3GPP TS 29.571 [11]	Used to represent aggregation window.	
ExtMaxDataBurstVol	3GPP TS 29.571 [11]	Used to indicate the maximum data burst volume for an application requirement.	
PacketDelBudget	3GPP TS 29.571 [11]	Used to indicate the packet delay bugget for an application requirement.	
PacketErrRate	3GPP TS 29.571 [11]	Used to indicate the packet error rate for an application requirement.	
QosResourceType	3GPP TS 29.571 [11]	Used to indicate a QoS bearer type, i.e., GBR, delay critical GBR, or non-GBR.	
Result	6.1.6.3.3	Used to indicate a success or failure.	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uinteger	3GPP TS 29.571 [11]	Used to represent integer values.	
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.7.6.2 Structured data types

6.7.6.2.1 Introduction

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

6.7.6.2.2 Type: SessionOrientedData

Table 6.7.6.2.2-1: Definition of type SessionOrientedData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueId	V2xUeId	M	1	V2X UE ID of the host vehicle	
notifUri	Uri	M	1	Identifies the recipient of notification sent by the VAE server.	
serviceId	V2xServiceId	M	1	The V2X service ID for which application requirement corresponds to.	
appSerId	AppServerId	M	1	Identity of the VASS service consumer.	
appQosReq	AppplicationQosRequirement	O	0..1	The application QoS requirements for the session-oriented service.	
requestTestNotification	boolean	O	0..1	Set to true by the 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
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer. It shall be included in the first interaction.	

6.7.6.2.3 Type: Notification

Table 6.7.6.2.3-1: Definition of type Notification

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the individual Session Oriented Service Subscription related to the notification.	
action	Action	M	1	Indicate the action to the session-oriented service.	
result	Result	M	1	The result indicating success or failure to establish or update session-oriented service.	

6.7.6.2.4 Type: AppplicationQosRequirement

Table 6.7.6.2.4-1: Definition of type AppplicationQosRequirement

Attribute name	Data type	P	Cardinality	Description	Applicability
pqi	5Qi	C	0..1	Identifies the PQI, which is a special 5QI (see clause 5.4.2.1 of 3GPP TS 23.287 [30]). (NOTE)	
resourceType	QosResourceType	C	0..1	Indicates whether the resource type is GBR, delay critical GBR, or non-GBR. (NOTE)	
priorityLevel	Uinteger	C	0..1	Contains an unsigned integer indicating the Priority value of the ProSe Per-Packet Priority, within a range of 1 to 8 and the lower number means the higher priority. (NOTE)	
packetDelayBudget	PacketDelBudget	C	0..1	Contains an unsigned integer indicates the packet delay budget. Packet Delay Budget expressed in milliseconds. (NOTE)	
packetErrorRate	PacketErrRate	C	0..1	Contains the packet error rate. Examples: - Packer Error Rate $4x10^{-6}$ shall be encoded as "4E-6". - Packer Error Rate 10^{-2} shall be encoded as"1E-2". (NOTE)	
averagingWindow	AverWindow	C	0..1	Indicates the averaging window. This attribute shall be present only for a GBR QoS flow or a Delay Critical GBR QoS flow.	
maxDataBurstVol	ExtMaxDataBurstVol	C	0..1	Contains an unsigned Integer indicating the maximum data burst volume. This attribute shall be present only for a Delay Critical GBR QoS flow.	
NOTE: Either the "pqi" attribute or the "resourceType", "priorityLevel", "packetDelayBudget" and "packetErrorRate" attributes shall be present.					

6.7.6.3 Simple data types and enumerations

6.7.6.3.1 Introduction

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

6.7.6.3.2 Simple data types

The simple data types defined in table 6.7.6.3.2-1 shall be supported.

Table 6.7.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.7.6.3.3 Enumeration: Action

Table 6.7.6.3.3-1: Enumeration Action

Enumeration value	Description	Applicability
ESTABLISHMENT	Indicates the establishment of session-oriented service.	
UPDATE	Indicates the update of session-oriented service.	

6.7.7 Error Handling

6.7.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_SessionOrientedServic Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_SessionOrientedServic Service API.

6.7.7.2 Protocol Errors

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

6.7.7.3 Application Errors

The application errors defined for the VAE_SessionOrientedServic service are listed in table 6.7.7.3-1.

Table 6.7.7.3-1: Application errors

Application Error	HTTP status code	Description

6.7.8 Feature negotiation

The optional features in table 6.7.8-1 are defined for the VAE_SessionOrientedServic API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.7.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.7.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.7.5.4. This feature requires that the Notification_test_event feature is also supported.

6.8 VAE_V2VConfigRequirement API

6.8.1 Introduction

The VAE_V2VConfigRequirement Service shall use the VAE_V2VConfigRequirement API.

The API URI of the VAE_V2VConfigRequirement API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-v2v-config-req".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.8.3.

6.8.2 Usage of HTTP

6.8.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13] and IETF RFC 9111 [16]) over TLS (IETF RFC 5246 [18]) is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_V2VConfigRequirement is contained in Annex A.9.

6.8.2.2 HTTP standard headers

6.8.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.8.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.8.2.3 HTTP custom headers

6.8.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.8.3 Resources

6.8.3.1 Overview

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

Figure 6.8.3.1-1 depicts the resource URIs structure for the VAE_V2VConfigRequirement API.

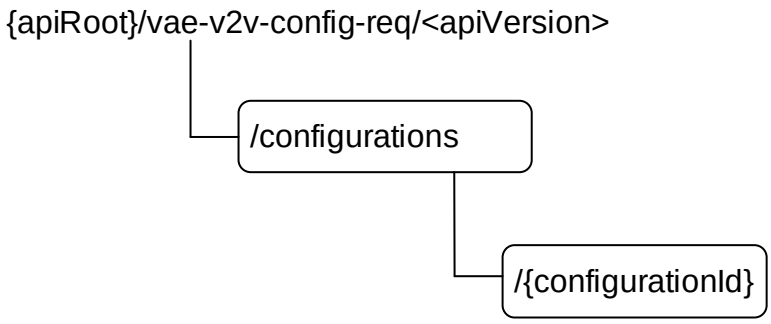

Figure 6.8.3.1-1: Resource URI structure of the VAE_V2VConfigRequirement API

Table 6.8.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.8.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
V2V Configurations	/configurations	POST	Create a new Individual V2V Configuration.
Individual V2V Configuration	/configurations/{configurationId}	GET	Read an Individual V2V Configuration.
		PUT	Update an Individual V2V Configuration.
		DELETE	Delete an Individual V2V Configuration.

6.8.3.2 Resource: V2V Configurations

6.8.3.2.1 Description

This resource represents the collection of the Individual V2V Configuration resources created in the VAE Server.

6.8.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-v2v-config-req/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.8.3.2.2-1.

Table 6.8.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.8.1

6.8.3.2.3 Resource Standard Methods

6.8.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.8.3.2.3.1-1.

Table 6.8.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.8.3.2.3.1-2 and the response data structures and response codes specified in table 6.8.3.2.3.1-3.

Table 6.8.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
V2vConfiguration Data	M	1	Parameters to create an Individual V2V Configuration resource.

Table 6.8.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2vConfiguration Data	O	0..1	201 Created	An Individual V2V Configuration resource is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.8.3.2.3.1-4: 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}/vae-pc5-prov-req/<apiVersion>/configurations/{configurationId}

6.8.3.2.4 Resource Custom Operations

None.

6.8.3.3 Resource: Individual V2V Configuration

6.8.3.3.1 Description

The Individual V2V Configuration resource represents Individual V2V Configuration created in the VAE Server.

6.8.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-pc5-prov-req/<apiVersion>/ configurations/{configurationId}**

This resource shall support the resource URI variables defined in table 6.8.2.3.3-1.

Table 6.8.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.8.1
configurationId	string	Unique identifier of the Individual V2V Configuration resource.

6.8.3.3.3 Resource Standard Methods

6.8.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.8.3.3.3.1-1.

Table 6.8.3.3.3.1-1: 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 6.8.3.3.3.1-2 and the response data structures and response codes specified in table 6.8.3.3.3.1-3.

Table 6.8.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.8.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2vConfigurationData	M	1	200 OK	An Individual V2V Configuration resource is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual V2V Configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual V2V Configuration retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.8.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.8.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.8.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.8.3.3.3.2-1.

Table 6.8.3.3.3.2-1: 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 6.8.3.3.3.2-2 and the response data structures and response codes specified in table 6.8.3.3.3.2-3.

Table 6.8.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
V2vConfigurationData	M	1	Parameters to update an Individual V2V Configuration resource.

Table 6.8.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2vConfigurationData	M	1	200 OK	The Individual V2V Configuration resource was successfully updated.
n/a			204 No Content	The Individual V2V Configuration resource was successfully updated.
n/a			307 Temporary Redirect	Temporary redirection, during the Individual V2V Configuration update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual V2V Configuration update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.8.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.8.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.8.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 6.8.3.3.3.3-1.

Table 6.8.3.3.3.3-1: 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 6.8.3.3.3.3-2 and the response data structures and response codes specified in table 6.8.3.3.3.3-3.

Table 6.8.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.8.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual V2V Configuration resource was successfully deleted
n/a			307 Temporary Redirect	Temporary redirection, during the Individual V2V Configuration resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual V2V Configuration resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.8.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 6.8.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

6.8.3.4 Resource Custom Operations

None.

6.8.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on V2V Configuration Requirement.

6.8.5 Notifications

None.

6.8.6 Data Model

6.8.6.1 General

This clause specifies the application data model supported by the API.

Table 6.8.6.1-1 specifies the data types defined for the VAE_V2VConfigRequirement API.

Table 6.8.6.1-1: VAE_V2VConfigRequirement specific Data Types

Data type	Section defined	Description	Applicability
V2vConfigurationData	6.8.6.2.2	Contains the V2V configuration data.	

Table 6.8.6.1-2 specifies data types re-used by the VAE_V2VConfigRequirement service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_V2VConfigRequirement service based interface.

Table 6.8.6.1-2: VAE_V2VConfigRequirement re-used Data Types

Data type	Reference	Comments	Applicability
AppplicationQosRequirement	6.7.6.2.4	Used to indicate an application layer QoS requirement.	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
V2xGroupId	6.1.6.3.2	The group ID	
V2xServiceId	6.1.6.3.2	The V2X service ID.	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	

6.8.6.2 Structured data types

6.8.6.2.1 Introduction

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

6.8.6.2.2 Type: V2vConfigurationData

Table 6.8.6.2.2-1: Definition of type V2vConfigurationData

Attribute name	Data type	P	Cardinality	Description	Applicability
groupId	V2xGroupId	C	0..1	Identity of the V2X group for which the V2X application requirement is initiated. (NOTE)	
serviceId	V2xServiceId	C	1	The V2X service ID for which application requirement corresponds to. (NOTE)	
canUeIds	array(V2xUeId)	O	1..N	List of identities of the V2X UEs, which are candidate to serve as application layer relays.	
appQosReq	ApplicationQos Requirement	O	0..1	The application QoS requirements for the V2X service.	
suppFeat	SupportedFeatu res	C	0..1	Indicates the features supported by the service consumer. It shall be included in the first interaction.	
NOTE: Either "groupId" attribute or "serviceId" attribute shall be present.					

6.8.6.3 Simple data types and enumerations

6.8.6.3.1 Introduction

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

6.8.6.3.2 Simple data types

The simple data types defined in table 6.8.6.3.2-1 shall be supported.

Table 6.8.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.8.7 Error Handling

6.8.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_V2VConfigRequirement Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_V2VConfigRequirement Service API.

6.8.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the VAE_V2VConfigRequirement API.

6.8.7.3 Application Errors

The application errors defined for the VAE_V2VConfigRequirement service are listed in Table 6.3.7.3-1.

Table 6.8.7.3-1: Application errors

Application Error	HTTP status code	Description

6.8.8 Feature negotiation

The optional features in table 6.8.8-1 are defined for the VAE_V2VConfigRequirement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.8.8-1: Supported Features

Feature number	Feature Name	Description

6.9 VAE_PC5ProvisioningRequirement API

6.9.1 Introduction

The VAE_PC5ProvisioningRequirement Service shall use the VAE_PC5ProvisioningRequirement API.

The API URI of the VAE_PC5ProvisioningRequirement API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the service consumer towards the VAE Server shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [3], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [3].
- The <apiName> shall be "vae-pc5-prov-req".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.9.3.

6.9.2 Usage of HTTP

6.9.2.1 General

Support of HTTP/1.1 (IETF RFC 9112 [12], IETF RFC 9110 [13], IETF RFC 9111 [16]) over TLS (IETF RFC 5246 [18]) is mandatory and support of HTTP/2 as specified in clause 5 of 3GPP TS 29.500 [2] is recommended. A V2X application specific server desiring to use HTTP/2 shall use the HTTP upgrade mechanism to negotiate applicable HTTP version as described in IETF RFC 9113 [5].

HTTP/2, shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [2].

An OpenAPI [6] specification of HTTP messages and content bodies for the VAE_PC5ProvisioningRequirement is contained in Annex A.10.

6.9.2.2 HTTP standard headers

6.9.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [2] for the usage of HTTP standard headers.

6.9.2.2.2 Content type

JSON, IETF RFC 8259 [7], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [2]. The use of the JSON format shall be signalled by the content type "application/json".

6.9.2.3 HTTP custom headers

6.9.2.3.1 General

The HTTP custom header fields specified in clause 5.2.8 of 3GPP TS 29.122 [22] may be applicable.

6.9.3 Resources

6.9.3.1 Overview

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

Figure 6.9.3.1-1 depicts the resource URIs structure for the VAE_PC5ProvisioningRequirement API.

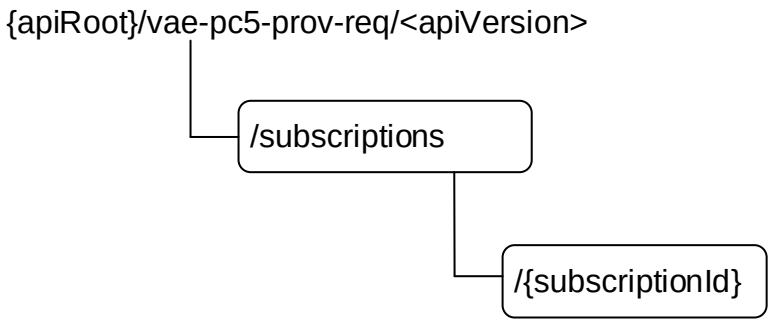

Figure 6.9.3.1-1: Resource URI structure of the VAE_PC5ProvisioningRequirement API

Table 6.9.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.9.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
PC5 Provisioning Requirement Subscriptions	/subscriptions	POST	Create a new Individual PC5 Provisioning Requirement Subscription.
Individual PC5 Provisioning Requirement Subscription	/subscriptions/{subscriptionId}	GET	Read an Individual PC5 Provisioning Requirement Subscription.
		PUT	Update an Individual PC5 Provisioning Requirement Subscription.
		DELETE	Delete an Individual PC5 Provisioning Requirement Subscription.

6.9.3.2 Resource: PC5 Provisioning Requirement Subscriptions

6.9.3.2.1 Description

This resource represents the collection of the Individual PC5 Provisioning Requirement Subscription resources created in the VAE Server.

6.9.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-pc5-prov-req/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.9.3.2.2-1.

Table 6.9.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.9.1

6.9.3.2.3 Resource Standard Methods

6.9.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.9.3.2.3.1-1.

Table 6.9.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.9.3.2.3.1-2 and the response data structures and response codes specified in table 6.9.3.2.3.1-3.

Table 6.9.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ProvisioningRequirement	M	1	Parameters to create an Individual PC5 Provisioning Requirement Subscription resource.

Table 6.9.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ProvisioningRequirement	O	0..1	201 Created	An individual PC5 Provisioning Requirement Subscription resource is created successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.9.3.2.3.1-4: 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}/vae-pc5-prov-req/<apiVersion>/subscriptions/{subscriptionId}

6.9.3.2.4 Resource Custom Operations

None.

6.9.3.3 Resource: Individual PC5 Provisioning Requirement Subscription

6.9.3.3.1 Description

The Individual PC5 Provisioning Requirement Subscription resource represents Individual PC5 Provisioning Requirement Subscription created in the VAE Server.

6.9.3.3.2 Resource definition

Resource URI: **{apiRoot}/vae-pc5-prov-req/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.92.3.3-1.

Table 6.9.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.9.1
subscriptionId	string	Unique identifier of the Individual PC5 Provisioning Requirement Subscription resource.

6.9.3.3.3 Resource Standard Methods

6.9.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.9.3.3.3.1-1.

Table 6.9.3.3.3.1-1: 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 6.9.3.3.3.1-2 and the response data structures and response codes specified in table 6.9.3.3.3.1-3.

Table 6.9.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.9.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ProvisioningRequirement	M	1	200 OK	An Individual PC5 Provisioning Requirement Subscription resource is returned successfully.
n/a			307 Temporary Redirect	Temporary redirection, during Individual PC5 Provisioning Requirement Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during Individual PC5 Provisioning Requirement Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [2] shall also apply.				

Table 6.9.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.9.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.9.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.9.3.3.3.2-1.

Table 6.9.3.3.3.2-1: 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 6.9.3.3.3.2-2 and the response data structures and response codes specified in table 6.9.3.3.3.2-3.

Table 6.9.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
ProvisioningRequirement	M	1	Parameters to update an Individual PC5 Provisioning Requirement Subscription resource.

Table 6.9.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ProvisioningRequirement	M	1	200 OK	The Individual PC5 Provisioning Requirement Subscription resource was successfully updated.
n/a			204 No Content	The Individual PC5 Provisioning Requirement Subscription resource was successfully updated.
n/a			307 Temporary Redirect	Temporary redirection, during the Individual PC5 Provisioning Requirement Subscription update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual PC5 Provisioning Requirement Subscription update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.9.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.9.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.9.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 6.9.3.3.3.3-1.

Table 6.9.3.3.3.3-1: 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 6.9.3.3.3.3-2 and the response data structures and response codes specified in table 6.9.3.3.3.3-3.

Table 6.9.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.9.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Individual PC5 Provisioning Requirement Subscription resource was successfully deleted
n/a			307 Temporary Redirect	Temporary redirection, during the Individual PC5 Provisioning Requirement Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the Individual PC5 Provisioning Requirement Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [5] also apply.				

Table 6.9.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

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

Table 6.9.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

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

6.9.3.4 Resource Custom Operations

None.

6.9.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on VAE_PC5ProvisioningRequirement.

6.9.5 Notifications

6.9.5.1 General

The VAE server and service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the service consumer described in clause 6.9.5.2.

A VAE server and service consumer may support testing a notification connection as described in clause 6.9.5.3. A VAE server and service consumer may support the delivery of Notification using Websocket (IETF RFC 6455 [21]) as described in clause 6.9.5.4.

6.9.5.2 Notification Delivery using a separate HTTP connection

The descriptions in clause 5.2.5.2 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer;
- description of SCEF applies to the VAE server; and
- "notificationDestination" attribute is replaced by the "notifUri" attribute.

6.9.5.3 Notification Test Event

The descriptions in clause 5.2.5.3 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.9.5.4 Notification Delivery using Websocket

The descriptions in clause 5.2.5.4 of 3GPP TS 29.122 [22] apply with following differences:

- description of SCS/AS applies to the service consumer; and
- description of SCEF applies to the VAE server.

6.9.5.5 Methods

Table 6.9.5.5-1: Methods

Callback URI	HTTP method or custom operation	Description (service operation)
{notifUri}	POST	Notify the result of multi operation PC5 provisioning requirement.

6.9.5.6 Notify PC5 Provisioning Requirement

6.9.5.6.1 Description

This notification is used by the VAE Server to notify the result of multi operation PC5 provisioning requirement.

6.9.5.6.2 Operation Definition

This operation shall support the request data structures specified in table 6.9.5.6.2-1 and the response data structure and response codes specified in table 6.9.5.6.2-2.

Table 6.9.5.6.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
Notification	M	1	Notify the result of multi operation PC5 provisioning requirement.

Table 6.9.5.6.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	.
n/a			307 Temporary Redirect	Temporary redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
n/a			308 Permanent Redirect	Permanent redirection, during the notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative V2X application specific server where the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22] with the difference: SCEF is replaced by the VAE Server and the SCS/AS is replaced by the V2X application specific server.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply.				

Table 6.9.5.6.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

Table 6.9.5.6.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative V2X application specific server towards which the notification should be redirected.

6.9.6 Data Model

6.9.6.1 General

This clause specifies the application data model supported by the API.

Table 6.9.6.1-1 specifies the data types defined for the VAE_PC5ProvisioningRequirement API.

Table 6.9.6.1-1: VAE_PC5ProvisioningRequirement specific Data Types

Data type	Section defined	Description	Applicability
Notification	6.9.6.2.3	Represents a notificaton of result of PC5 Provisioning Requirement.	
ProvisioningRequirement	6.9.6.2.2	Represents an Individual PC5 Provisioning Requirement Subscription resource.	

Table 6.9.6.1-2 specifies data types re-used by the VAE_PC5ProvisioningRequirement service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the VAE_PC5ProvisioningRequirement service based interface.

Table 6.9.6.1-2: VAE_PC5ProvisioningRequirement re-used Data Types

Data type	Reference	Comments	Applicability
AppplicationQosRequirement	6.7.6.2.4	Used to indicate a QoS requirements for an application.	
AppServerId	6.1.6.3.2	Identity of the V2X application specific server.	
PlmnId	3GPP TS 29.571 [11]	Used to indicate a PLMN identity.	
Result	6.2.6.3.3	Used to indicate success or failure.	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features.	
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
Uri	3GPP TS 29.571 [11]	Used to indicate an URI.	
V2xGroupId	6.1.6.3.2	Used to indicate the group ID	
V2xServiceId	6.1.6.3.2	Used to indicate the V2X service ID.	
V2xUeId	6.1.6.3.2	Identifier of the destination V2X UE	
WebsockNotifConfig	3GPP TS 29.122 [22]	Pepresents configuration for the delivery of notifications over Websockets.	Notification_websocket

6.9.6.2 Structured data types

6.9.6.2.1 Introduction

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

6.9.6.2.2 Type: ProvisioningRequirement

Table 6.9.6.2.2-1: Definition of type ProvisioningRequirement

Attribute name	Data type	P	Cardinality	Description	Applicability
ueId	V2xUeId	C	0..1	Identity of the V2X UE for which V2X application requirement is initiated. (NOTE)	
groupId	V2xGroupId	C	0..1	Identity of the V2X group for which the V2X application requirement is initiated. (NOTE)	
notifUri	Uri	M	1	Identifies the recipient of notification sent by the VAE server.	
serviceId	V2xServiceId	M	1	The V2X service ID for which application requirement corresponds to.	
appQosReq	AppplicationQosRequirement	O	0..1	The application QoS requirements for the session-oriented service.	
plmnList	array(PlmnId)	O	1..N	The list of the PLMN identities for the PLMNs which offer the V2X service	
requestTestNotification	boolean	O	0..1	Set to true by the 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
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol as defined in clause 6.3.5.4.	Notification_websocket
suppFeat	SupportedFeatures	C	0..1	Indicates the features supported by the service consumer. It shall be included in the first interaction.	
NOTE: Either "ueId" attribute or "groupId" attribute shall be present.					

6.9.6.2.3 Type: Notification

Table 6.9.6.2.3-1: Definition of type Notification

Attribute name	Data type	P	Cardinality	Description	Applicability
resourceUri	Uri	M	1	The resource URI of the Individual PC5 Provisioning Requirement Subscription related to the notification.	
result	Result	M	1	The result indicating success or failure to provisioning of QoS requirement.	

6.9.6.3 Simple data types and enumerations

6.9.6.3.1 Introduction

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

6.9.6.3.2 Simple data types

The simple data types defined in table 6.9.6.3.2-1 shall be supported.

Table 6.9.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.9.7 Error Handling

6.9.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [2].

For the VAE_PC5ProvisioningRequirement Service API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [3].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [2] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [2].

In addition, the requirements in the following clauses are applicable for the VAE_PC5ProvisioningRequirement Service API.

6.9.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the VAE_PC5ProvisioningRequirement API.

6.9.7.3 Application Errors

The application errors defined for the VAE_PC5ProvisioningRequirement service are listed in table 6.3.7.3-1.

Table 6.9.7.3-1: Application errors

Application Error	HTTP status code	Description

6.9.8 Feature negotiation

The optional features in table 6.9.8-1 are defined for the VAE_PC5ProvisioningRequirement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [2].

Table 6.9.8-1: Supported Features

Feature number	Feature Name	Description
1	Notification_test_event	The testing of notification connection is supported according to clause 6.9.5.3.
2	Notification_websocket	The delivery of notifications over Websocket is supported according to clause 6.9.5.4. This feature requires that the Notification_test_event feature is also supported.

6.10 VAE_ServiceAndQoSControlInfo API

6.10.1 Introduction

The VAE_ServiceAndQoSControlInfo service shall use the VAE_ServiceAndQoSControlInfo API.

The API URI of the VAE_ServiceAndQoSControlInfo Service API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [22], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].
- The <apiName> shall be "vae-sqci".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].

NOTE: When 3GPP TS 29.122 [22] is referenced for the common protocol and interface aspects for API definition in the clauses under clause 6.10, the VAE Server takes the role of the SCEF and the service consumer takes the role of the SCS/AS.

6.10.2 Usage of HTTP

The provisions of clause 5.2.2 of 3GPP TS 29.122 [22] shall apply for the VAE_ServiceAndQoSControlInfo API.

6.10.3 Resources

6.10.3.1 Overview

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

Figure 6.10.3.1-1 depicts the resource URIs structure for the VAE_ServiceAndQoSControlInfo API.

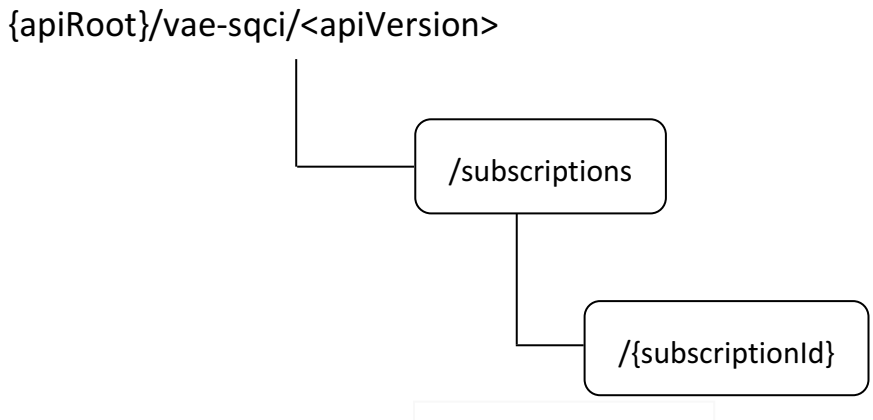

Figure 6.10.3.1-1: Resource URIs structure of the VAE_ServiceAndQoSControlInfo API

Table 6.10.3.1-1 provides an overview of the resources and applicable HTTP methods for the VAE_ServiceAndQoSControlInfo API.

Table 6.10.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Service Adaptation And QoS Control Subscriptions	/subscriptions	POST	Request the creation of a Service Adaptation And QoS Control Subscription.
Individual Service Adaptation And QoS Control Subscription	/subscriptions/{subscriptionId}	GET	Retrieve an existing "Individual Service Adaptation And QoS Control Subscription" resource.
		PUT	Request the update of an existing "Individual Service Adaptation And QoS Control Subscription" resource.
		PATCH	Request the modification of an existing "Individual Service Adaptation And QoS Control Subscription" resource.
		DELETE	Request the deletion of an existing "Individual Service Adaptation And QoS Control Subscription" resource.

6.10.3.2 Resource: Service Adaptation And QoS Control Subscriptions

6.10.3.2.1 Description

This resource represents the collection of Service Adaptation And QoS Control Subscriptions managed by the VAE Server.

6.10.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-sqci/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.10.3.2.2-1.

Table 6.10.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.10.1.

6.10.3.2.3 Resource Standard Methods

6.10.3.2.3.1 POST

The HTTP POST method allows a service consumer to request the creation of a Service Adaptation And QoS Control Subscription at the VAE Server.

This method shall support the URI query parameters specified in table 6.10.3.2.3.1-1.

Table 6.10.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.10.3.2.3.1-2 and the response data structures and response codes specified in table 6.10.3.2.3.1-3.

Table 6.10.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ServAdaptQoSCtrlSubsc	M	1	Represents the parameters to request the creation of a Service Adaptation And QoS Control Subscription.

Table 6.10.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServAdaptQoSCtrlSubsc	M	1	201 Created	Successful case. The Service Adaptation And QoS Control Subscription is successfully created and a representation of the created "Individual Service Adaptation And QoS Control Subscription" resource shall be returned. An HTTP "Location" header that contains the URI of the created resource shall also be included.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.3.2.3.1-4: 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}/vae-sqci/<apiVersion>/subscriptions/{subscriptionId}

6.10.3.2.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.10.3.3 Resource: Individual Service Adaptation And QoS Control Subscription

6.10.3.3.1 Description

This resource represents a Service Adaptation And QoS Control Subscription managed by the VAE Server.

6.10.3.3.2 Resource Definition

Resource URI: **{apiRoot}/vae-sqci/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.10.3.3.2-1.

Table 6.10.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.10.1.
subscriptionId	string	Represents the identifier of the "Individual Service Adaptation And QoS Control Subscription" resource.

6.10.3.3.3 Resource Standard Methods

6.10.3.3.3.1 GET

The HTTP GET method allows a service consumer to retrieve an existing "Individual Service Adaptation And QoS Control Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.10.3.3.3.1-1.

Table 6.10.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.10.3.3.3.1-2 and the response data structures and response codes specified in table 6.10.3.3.3.1-3.

Table 6.10.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.10.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServAdaptQoSCtrlSubsc	M	1	200 OK	Successful case. The requested "Individual Service Adaptation And QoS Control Subscription" resource shall be returned.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.10.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.10.3.3.3.2 PUT

The HTTP PUT method allows a service consumer to request the update of an existing "Individual Service Adaptation And QoS Control Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.10.3.3.3.2-1.

Table 6.10.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.10.3.3.3.2-2 and the response data structures and response codes specified in table 6.10.3.3.3.2-3.

Table 6.10.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
ServAdaptQoSCtrlSubsc	M	1	Represents the updated representation of the "Individual Service Adaptation And QoS Control Subscription" resource.

Table 6.10.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServAdaptQoSCtrlSubsc	M	1	200 OK	Successful case. The "Individual Service Adaptation And QoS Control Subscription" resource is successfully updated and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual Service Adaptation And QoS Control Subscription" resource is successfully updated and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.10.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.10.3.3.3.3 PATCH

The HTTP PATCH method allows a service consumer to request the modification of an existing "Individual Service Adaptation And QoS Control Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.10.3.3.3.3-1.

Table 6.10.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.10.3.3.3.3-2 and the response data structures and response codes specified in table 6.10.3.3.3.3-3.

Table 6.10.3.3.3.3-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
ServAdaptQoSCtrlSubsc Patch	M	1	Represents the parameters to request the modification of the "Individual Service Adaptation And QoS Control Subscription" resource.

Table 6.10.3.3.3.3-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServAdaptQoSCtrlSubsc	M	1	200 OK	Successful case. The "Individual Service Adaptation And QoS Control Subscription" resource is successfully modified and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual Service Adaptation And QoS Control Subscription" resource is successfully modified and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.10.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.10.3.3.3.4 DELETE

The HTTP DELETE method allows a service consumer to request the deletion of an existing "Individual Service Adaptation And QoS Control Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.10.3.3.3.4-1.

Table 6.10.3.3.3.4-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.10.3.3.3.4-2 and the response data structures and response codes specified in table 6.10.3.3.3.4-3.

Table 6.10.3.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.10.3.3.3.4-3: 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 Service Adaptation And QoS Control Subscription" resource is successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.3.3.3.4-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.10.3.3.3.4-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.10.3.3.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.10.4 Custom Operations without associated resources

There are no custom operations without associated resources defined for this API in this release of the specification.

6.10.5 Notifications

6.10.5.1 General

Notifications shall comply to clause 5.2.5 of 3GPP TS 29.122 [22].

Table 6.10.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Service Requirements And QoS Adaptation Notification	{notifUri}/req-qos-adapt	POST	Enables a VAE Server to notify a previously subscribed service consumer on Service Requirements And QoS Adaptation event(s).
QoS Change Notification	{notifUri}/qos-change	POST	Enables a VAE Server to notify a previously subscribed service consumer on QoS change event(s).

6.10.5.2 Service Requirements And QoS Adaptation Notification

6.10.5.2.1 Description

The Service Requirements And QoS Adaptation Notification is used by a VAE Server to notify a previously subscribed service consumer on Service Requirements And QoS Adaptation event(s).

6.10.5.2.2 Target URI

The Callback URI **"{notifUri}/req-qos-adapt"** shall be used with the callback URI variables defined in table 6.10.5.2.2-1.

Table 6.10.5.2.2-1: Callback URI variables

Name	Data type	Definition
notifUri	Uri	Represents the callback URI encoded as a string formatted as a URI.

6.10.5.2.3 Standard Methods

6.10.5.2.3.1 POST

This method shall support the request data structures specified in table 6.10.5.2.3.1-1 and the response data structures and response codes specified in table 6.10.5.2.3.1-2.

Table 6.10.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AdaptNotif	M	1	Represents the Service Requirements And QoS Adaptation Notification.

Table 6.10.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
AdaptNotifResp	M	1	200 OK	Successful case. The Service Requirements And QoS Adaptation Notification is successfully received and acknowledged, and acknowledgment related information shall be returned in the response body.
n/a			204 No Content	Successful case. The Service Requirements And QoS Adaptation Notification is successfully received and acknowledged, and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

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

Table 6.10.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

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

6.10.5.3 QoS Change Notification

6.10.5.3.1 Description

The QoS Change Notification is used by a VAE Server to notify a previously subscribed service consumer on QoS change related event(s).

6.10.5.3.2 Target URI

The Callback URI **"{notifUri}/qos-change"** shall be used with the callback URI variables defined in table 6.10.5.3.2-1.

Table 6.10.5.3.2-1: Callback URI variables

Name	Data type	Definition
notifUri	Uri	Represents the callback URI encoded as a string formatted as a URI.

6.10.5.3.3 Standard Methods

6.10.5.3.3.1 POST

This method shall support the request data structures specified in table 6.10.5.3.3.1-1 and the response data structures and response codes specified in table 6.10.5.3.3.1-2.

Table 6.10.5.3.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
QoSChangeNotif	M	1	Represents the QoS Change Notification.

Table 6.10.5.3.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The QoS Change Notification is successfully received and acknowledged.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.10.5.3.3.1-3: Headers supported by the 307 Response Code on this resource

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

Table 6.10.5.3.3.1-4: Headers supported by the 308 Response Code on this resource

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

6.10.6 Data Model

6.10.6.1 General

This clause specifies the application data model supported by the API.

Table 6.10.6.1-1 specifies the data types defined for the VAE_ServiceAndQoSControlInfo API.

Table 6.10.6.1-1: VAE_ServiceAndQoSControlInfo API specific Data Types

Data type	Clause defined	Description	Applicability
AckResult	6.10.6.3.3	Represents the acknowledgement result.	
AdaptNotif	6.10.6.2.4	Represents a Service Requirements And QoS Adaptation Notification.	
AdaptNotifResp	6.10.6.2.5	Represents the Service Requirements And QoS Adaptation Notification acknowledgment related information.	
AdaptFeedback	6.10.6.2.7	Represents the feedback to a Service Requirements And QoS Adaptation report.	
AdaptReport	6.10.6.2.6	Represents a Service Requirements And QoS Adaptation report.	
LoA	6.10.6.3.4	Represents the Level of Automation (LoA).	
QoSChangeInfo	6.10.6.2.8	Represents the QoS change related information.	
QoSChangeNotif	6.10.6.2.9	Represents a QoS Change Notification.	
QoSChangeReport	6.10.6.2.10	Represents a QoS Change report.	
ServAdaptQoSCtrlSubsc	6.10.6.2.2	Represents a Service Adaptation And QoS Control Subscription.	
ServAdaptQoSCtrlSubscPatch	6.10.6.2.3	Represents the parameters to request the modification of a Service Adaptation And QoS Control Subscription.	
V2xTarget	6.10.6.2.11	Represents the targeted V2X entity.	

Table 6.10.6.1-2 specifies data types re-used by the VAE_ServiceAndQoSControlInfo API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the VAE_ServiceAndQoSControlInfo API.

Table 6.10.6.1-2: VAE_ServiceAndQoSControlInfo API re-used Data Types

Data type	Reference	Comments	Applicability
Uri	3GPP TS 29.122 [22]	Represents a URI.	
V2xGroupId	Clause 6.1.6.3.2	Represents the identifier of a V2X Group.	
V2xServiceId	Clause 6.1.6.3.2	Represents the identifier of a V2X Service.	
V2xUeId	Clause 6.1.6.3.2	Represents the identifier of a V2X UE.	
SupportedFeatures	3GPP TS 29.571 [18]	Used to negotiate the applicability of the optional features.	

6.10.6.2 Structured data types

6.10.6.2.1 Introduction

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

6.10.6.2.2 Type: ServAdaptQoSCtrlSubsc

Table 6.10.6.2.2-1: Definition of type ServAdaptQoSCtrlSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
subscTarget	V2xTarget	M	1	Represents the identifier of the target (e.g., V2X group, V2X service, V2X UE) to which the subscription is related.	
notifUri	Uri	M	1	Contains the URI via which notifications shall be delivered.	
suppFeat	SupportedFeatures	C	0..1	Contains the list of supported features among the ones defined in clause 6.10.8. This attribute shall be present only when feature negotiation needs to take place.	

6.10.6.2.3 Type: ServAdaptQoSCtrlSubscPatch

Table 6.10.6.2.3-1: Definition of type ServAdaptQoSCtrlSubscPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
subscTarget	V2xTarget	O	0..1	Represents the updated identifier of the target (e.g., V2X group, V2X service, V2X UE) to which the subscription is related.	
notifUri	Uri	O	0..1	Contains the updated URI via which notifications shall be delivered.	

6.10.6.2.4 Type: AdaptNotif

Table 6.10.6.2.4-1: Definition of type AdaptNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
subscriptionId	string	M	1	Contains the identifier of the subscription to which the notification is related.	
adaptReports	array(AdaptReport)	M	1..N	Contains the service requirements and QoS adaptation report(s).	

6.10.6.2.5 Type: AdaptNotifResp

Table 6.10.6.2.5-1: Definition of type AdaptNotifResp

Attribute name	Data type	P	Cardinality	Description	Applicability
result	AckResult	M	1	Contains the acknowledgement result.	
adaptFeedbacks	array(AdaptFeedback)	C	1..N	Contains the service requirements and QoS adaptation report(s). This attribute may be present only if the "result" attribute is set to "POSITIVE".	

6.10.6.2.6 Type: AdaptReport

Table 6.10.6.2.6-1: Definition of type AdaptReport

Attribute name	Data type	P	Cardinality	Description	Applicability
ueIdsList	array(V2xUeId)	O	1..N	Contains the identifier(s) of the V2X UE(s) that are affected by the service requirements and QoS adaptation.	
serviceId	V2xServiceId	O	0..1	Represents the identifier of the V2X Service that is affected by the service requirements and QoS adaptation for the V2X UE(s) identified by the "ueIdsList" attribute.	
qosChangeInfo	QoSChangeInfo	M	1	Contains the actual or expected QoS change related information for service requirements and QoS adaptation.	

6.10.6.2.7 Type: AdaptFeedback

Table 6.10.6.2.7-1: Definition of type AdaptFeedback

Attribute name	Data type	P	Cardinality	Description	Applicability
ueIdsList	array(V2xUeId)	M	1..N	Contains the identifier(s) of the V2X UE(s) that shall be affected by the service requirements adaptation.	
serviceId	V2xServiceId	O	0..1	Represents the identifier of the V2X Service that shall be affected by the service requirements and QoS adaptation for the V2X UE(s) identified by the "ueIdsList" attribute.	

6.10.6.2.8 Type: QoSChangeInfo

Table 6.10.6.2.8-1: Definition of type QoSChangeInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
loa	LoA	C	0..1	Contains the Level of Automation (LoA) adaptation information. (NOTE)	

NOTE: At least one of these attributes shall be present.

6.10.6.2.9 Type: QoSChangeNotif

Table 6.10.6.2.9-1: Definition of type QoSChangeNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
subscriptionId	String	M	1	Contains the identifier of the subscription to which the notification is related.	
reports	array(QoSChangeReport)	O	1..N	Contains the QoS change/adaptation report(s) containing the set(s) of V2X UE(s) and/or V2X service for which QoS change/adaptation was successfully performed.	

6.10.6.2.10 Type: QoSChangeReport

Table 6.10.6.2.10-1: Definition of type QoSChangeReport

Attribute name	Data type	P	Cardinality	Description	Applicability
ueIdsList	array(V2xUeId)	O	1..N	Contains the identifier(s) of the V2X UE(s) for which QoS change/adaptation was successfully performed. (NOTE)	
serviceId	V2xServiceId	O	0..1	Represents the identifier of the V2X Service for which QoS change/adaptation was successfully performed for the V2X UE(s) identified by the "ueIdsList" attribute. (NOTE)	
NOTE: At least one of these attributes shall be present.					

6.10.6.2.11 Type: V2xTarget

Table 6.10.6.2.11-1: Definition of type V2xTarget

Attribute name	Data type	P	Cardinality	Description	Applicability
groupId	V2xGroupId	C	0..1	Represents the identifier of the target V2X group. (NOTE)	
serviceId	V2xServiceId	C	0..1	Represents the identifier of the target V2X service. (NOTE)	
ueId	V2xUeId	C	0..1	Represents the identifier of the target V2X UE. (NOTE)	
NOTE: These attributes are mutually exclusive. Either one of them shall be present.					

6.10.6.3 Simple data types and enumerations

6.10.6.3.1 Introduction

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

6.10.6.3.2 Simple data types

The simple data types defined in table 6.10.6.3.2-1 shall be supported.

Table 6.10.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.10.6.3.3 Enumeration: AckResult

The enumeration AckResult represents the acknowledgement result. It shall comply with the provisions defined in table 6.10.6.3.3-1.

Table 6.10.6.3.3-1: Enumeration AckResult

Enumeration value	Description	Applicability
POSITIVE	Indicates that the acknowledgement is positive.	
NEGATIVE	Indicates that the acknowledgement is negative.	

6.10.6.3.4 Enumeration: LoA

The enumeration LoA represents the Level of Automation (LoA). It shall comply with the provisions defined in table 6.10.6.3.4-1.

Table 6.10.6.3.4-1: Enumeration LoA

Enumeration value	Description	Applicability
0_NO_AUTOMATION	Indicates that the LoA is 0, i.e., No Automation.	
1_DRIVER_ASSISTANCE	Indicates that the LoA is 1, i.e., Driver Assistance.	
2_PARTIAL_AUTOMATION	Indicates that the LoA is 2, i.e., Partial Automation.	
3_CONDITIONAL_AUTOMATION	Indicates that the LoA is 3, i.e., Conditional Automation.	
4_HIGH_AUTOMATION	Indicates that the LoA is 4, i.e., High Automation.	
5_FULL_AUTOMATION	Indicates that the LoA is 5, i.e., Full Automation.	

NOTE: The definition of this enumeration data type complies with the LoA definition specified in clause 4.2 of 3GPP TS 22.186 [35].

6.10.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

6.10.6.5 Binary data

6.10.6.5.1 Binary Data Types

Table 6.10.6.5.1-1: Binary Data Types

Name	Clause defined	Content type

6.10.7 Error Handling

6.10.7.1 General

For the VAE_ServiceAndQoSControlInfo API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [22]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [22] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [22].

In addition, the requirements in the following clauses are applicable for the VAE_ServiceAndQoSControlInfo API.

6.10.7.2 Protocol Errors

No specific protocol errors for the VAE_ServiceAndQoSControlInfo API are specified.

6.10.7.3 Application Errors

The application errors defined for the VAE_ServiceAndQoSControlInfo API are listed in Table 6.10.7.3-1.

Table 6.10.7.3-1: Application errors

Application Error	HTTP status code	Description	Applicability

6.10.8 Feature negotiation

The optional features listed in table 6.10.8-1 are defined for the VAE_ServiceAndQoSControlInfo API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [22].

Table 6.10.8-1: Supported Features

Feature number	Feature Name	Description

6.10.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [22] shall apply for the VAE_ServiceAndQoSControlInfo API.

6.11 VAE_VRUZoneManagement API

6.11.1 Introduction

The VAE_VRUZoneManagement service shall use the VAE_VRUZoneManagement API.

The API URI of the VAE_VRUZoneManagement Service API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [22], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].
- The <apiName> shall be "vae-vzm".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].

NOTE: When 3GPP TS 29.122 [22] is referenced for the common protocol and interface aspects for API definition in the clauses under clause 6.11, the VAE Server takes the role of the SCEF and the service consumer takes the role of the SCS/AS.

6.11.2 Usage of HTTP

The provisions of clause 5.2.2 of 3GPP TS 29.122 [22] shall apply for the VAE_VRUZoneManagement API.

6.11.3 Resources

6.11.3.1 Overview

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

Figure 6.11.3.1-1 depicts the resource URIs structure for the VAE_VRUZoneManagement API.

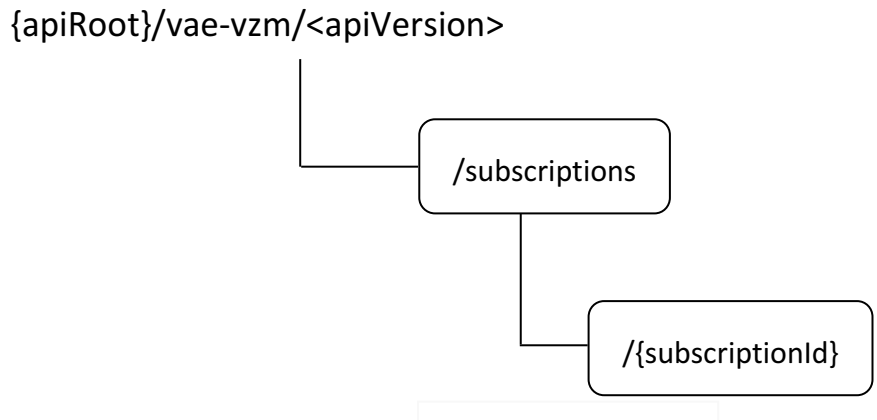

Figure 6.11.3.1-1: Resource URIs structure of the VAE_VRUZoneManagement API

Table 6.11.3.1-1 provides an overview of the resources and applicable HTTP methods for the VAE_VRUZoneManagement API.

Table 6.11.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
VRU Zone Management Subscriptions	/subscriptions	POST	Request the creation of a VRU Zone Management Subscription.
Individual VRU Zone Management Subscription	/subscriptions/{subscriptionId}	GET	Retrieve an existing "Individual VRU Zone Management Subscription" resource.
		PUT	Request the update of an existing "Individual VRU Zone Management Subscription" resource.
		PATCH	Request the modification of an existing "Individual VRU Zone Management Subscription" resource.
		DELETE	Request the deletion of an existing "Individual VRU Zone Management Subscription" resource.

6.11.3.2 Resource: VRU Zone Management Subscriptions

6.11.3.2.1 Description

This resource represents the collection of VRU Zone Management Subscriptions managed by the VAE Server.

6.11.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-vzm/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.11.3.2.2-1.

Table 6.11.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.11.1.

6.11.3.2.3 Resource Standard Methods

6.11.3.2.3.1 POST

The HTTP POST method allows a service consumer to request the creation of a VRU Zone Management Subscription at the VAE Server.

This method shall support the URI query parameters specified in table 6.11.3.2.3.1-1.

Table 6.11.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.11.3.2.3.1-2 and the response data structures and response codes specified in table 6.11.3.2.3.1-3.

Table 6.11.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
VRUZoneMngtSubsc	M	1	Represents the parameters to request the creation of a VRU Zone Management Subscription.

Table 6.11.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VRUZoneMngtSubsc	M	1	201 Created	Successful case. The VRU Zone Management Subscription is successfully created and a representation of the created "Individual VRU Zone Management Subscription" resource shall be returned. An HTTP "Location" header that contains the URI of the created resource shall also be included.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.3.2.3.1-4: 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}/vae-vzm/<apiVersion>/subscriptions/{subscriptionId}

6.11.3.2.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.11.3.3 Resource: Individual VRU Zone Management Subscription

6.11.3.3.1 Description

This resource represents a VRU Zone Management Subscription managed by the VAE Server.

6.11.3.3.2 Resource Definition

Resource URI: **{apiRoot}/vae-vzm/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.11.3.3.2-1.

Table 6.11.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.11.1.
subscriptionId	string	Represents the identifier of the "Individual VRU Zone Management Subscription" resource.

6.11.3.3.3 Resource Standard Methods

6.11.3.3.3.1 GET

The HTTP GET method allows a service consumer to retrieve an existing "Individual VRU Zone Management Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.11.3.3.3.1-1.

Table 6.11.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.11.3.3.3.1-2 and the response data structures and response codes specified in table 6.11.3.3.3.1-3.

Table 6.11.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.11.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VRUZoneMngtSubsc	M	1	200 OK	Successful case. The requested "Individual VRU Zone Management Subscription" resource shall be returned.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.11.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.11.3.3.3.2 PUT

The HTTP PUT method allows a service consumer to request the update of an existing "Individual VRU Zone Management Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.11.3.3.3.2-1.

Table 6.11.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.11.3.3.3.2-2 and the response data structures and response codes specified in table 6.11.3.3.3.2-3.

Table 6.11.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
VRUZoneMngtSubsc	M	1	Represents the updated representation of the "Individual VRU Zone Management Subscription" resource.

Table 6.11.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VRUZoneMngtSubsc	M	1	200 OK	Successful case. The "Individual VRU Zone Management Subscription" resource is successfully updated and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual VRU Zone Management Subscription" resource is successfully updated and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.11.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.11.3.3.3.3 PATCH

The HTTP PATCH method allows a service consumer to request the modification of an existing "Individual VRU Zone Management Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.11.3.3.3.3-1.

Table 6.11.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.11.3.3.3.3-2 and the response data structures and response codes specified in table 6.11.3.3.3.3-3.

Table 6.11.3.3.3.3-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
VRUZoneMngtSubscPatch	M	1	Represents the parameters to request the modification of the "Individual VRU Zone Management Subscription" resource.

Table 6.11.3.3.3.3-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
VRUZoneMngtSubsc	M	1	200 OK	Successful case. The "Individual VRU Zone Management Subscription" resource is successfully modified and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual VRU Zone Management Subscription" resource is successfully modified and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.11.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.11.3.3.3.4 DELETE

The HTTP DELETE method allows a service consumer to request the deletion of an existing "Individual VRU Zone Management Subscription" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.11.3.3.3.4-1.

Table 6.11.3.3.3.4-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.11.3.3.3.4-2 and the response data structures and response codes specified in table 6.11.3.3.3.4-3.

Table 6.11.3.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.11.3.3.3.4-3: 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 VRU Zone Management Subscription" resource is successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.3.3.3.4-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.11.3.3.3.4-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.11.3.3.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.11.4 Custom Operations without associated resources

There are no custom operations without associated resources defined for this API in this release of the specification.

6.11.5 Notifications

6.11.5.1 General

Notifications shall comply to clause 5.2.5 of 3GPP TS 29.122 [22].

Table 6.11.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
VRU Zone Management Enter/Leave Notification	{notifUri}	POST	Enables a VAE Server to notify a previously subscribed service consumer on VRU Zone Management Enter/Leave event(s).

6.11.5.2 VRU Zone Management Enter/Leave Notification

6.11.5.2.1 Description

The VRU Zone Management Enter/Leave Notification is used by a VAE Server to notify a previously subscribed service consumer on VRU Zone Management Enter/Leave event(s).

6.11.5.2.2 Target URI

The Callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 6.11.5.2.2-1.

Table 6.11.5.2.2-1: Callback URI variables

Name	Data type	Definition
notifUri	Uri	Represents the callback URI encoded as a atring formatted as a URI.

6.11.5.2.3 Standard Methods

6.11.5.2.3.1 POST

This method shall support the request data structures specified in table 6.11.5.2.3.1-1 and the response data structures and response codes specified in table 6.11.5.2.3.1-2.

Table 6.11.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
EnterLeaveNotif	M	1	Represents the VRU Zone Management Enter/Leave Notification.

Table 6.11.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The VRU Zone Management Enter/Leave notification is successfully received and acknowledged, and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI representing the end point of an alternative service consumer towards which the notification should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.11.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

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

Table 6.11.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

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

6.11.6 Data Model

6.11.6.1 General

This clause specifies the application data model supported by the API.

Table 6.11.6.1-1 specifies the data types defined for the VAE_VRUZoneManagement API.

Table 6.11.6.1-1: VAE_VRUZoneManagement API specific Data Types

Data type	Clause defined	Description	Applicability
EnterLeaveInfo	6.11.6.2.8	Represents the information related to a V2X UE or a V2X group entering/leaving a VRU zone.	
EnterLeaveNotif	6.11.6.2.4	Represents a VRU Zone Management Enter/Leave Notification.	
GeographicAreaRm	6.11.6.2.10	Represents the same as the GeographicArea data type defined in clause 6.1.6.2.5 of 3GPP TS 29.572 [42], but with the "nullable: true" property.	
MobilityInfo	6.11.6.2.9	Represents mobility information.	
MsgType	6.11.6.3.5	Represents the message types.	
TimeValidity	6.11.6.2.7	Represents the time validity information.	
UEType	6.11.6.3.3	Represents the type of UE(s) to be considered.	
VRUAppReqs	6.11.6.2.6	Represents application requirements.	
VRUZoneInfo	6.11.6.2.5	Represents VRU zone related information.	
VRUZoneMngtSubsc	6.11.6.2.2	Represents a VRU Zone Management Subscription.	
VRUZoneMngtSubscPatch	6.11.6.2.3	Represents the parameters to request the modification of a VRU Zone Management Subscription.	
VRUZoneType	6.11.6.3.4	Represents the VRU zone type.	

Table 6.11.6.1-2 specifies data types re-used by the VAE_VRUZoneManagement API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the VAE_VRUZoneManagement API.

Table 6.11.6.1-2: VAE_VRUZoneManagement API re-used Data Types

Data type	Reference	Comments	Applicability
AppplicationQosRequirement	6.7.6.2.4	Represents the V2X application QoS requirements.	
DateTime	3GPP TS 29.122 [22]	Represents a data and a time.	
Direction	3GPP TS 29.520 [33]	Represents a direction.	
DurationSec	3GPP TS 29.122 [22]	Represents a duration expressed in seconds.	
GeographicArea	3GPP TS 29.572 [42]	Represents a geographical area.	
Float	3GPP TS 29.571 [18]	Represents a float number.	
Uri	3GPP TS 29.122 [22]	Represents a URI.	
V2xGroupId	Clause 6.1.6.3.2	Represents the identifier of a V2X Group.	
V2xUeId	Clause 6.1.6.3.2	Represents the identifier of a V2X UE.	
SupportedFeatures	3GPP TS 29.571 [18]	Used to negotiate the applicability of the optional features.	

6.11.6.2 Structured data types

6.11.6.2.1 Introduction

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

6.11.6.2.2 Type: VRUZoneMngtSubsc

Table 6.11.6.2.2-1: Definition of type VRUZoneMngtSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Represents the identifier of the service requestor.	
ueIdsList	array(V2xUeId)	C	1..N	Represents the list of the identifier(s) of the V2X UE(s) to which the subscription is related. (NOTE 1)	
vruZoneInfo	VRUZoneInfo	M	1	Represents the VRU zone related information. (NOTE 1)	
vruAppReqs	VRUAppReqs	M	1	Represents the VRU application requirements.	
notifUri	Uri	M	1	Contains the URI via which notifications shall be delivered.	
vruZoneId	string	O	0..1	Contains the identifier of the VRU zone. (NOTE 2)	
areaOfInterest	GeographicArea	C	0..1	Represents the targeted area of interest. (NOTE 1)	
timeValidity	TimeValidity	O	0..1	Represents the subscription's time validity information.	
suppFeat	SupportedFeatures	C	0..1	Contains the list of supported features among the ones defined in clause 6.11.8. This attribute shall be present only when feature negotiation needs to take place.	

NOTE 1: When the "vruZoneType" attribute of the VRUZoneInfo data structure used to encode the "vruZoneInfo" attribute is set to "STATIC", then one of the "ueIdsList" attribute or the "areaOfInterest" attribute shall be present. When the "vruZoneType" attribute of the VRUZoneInfo data structure used to encode the "vruZoneInfo" attribute is set to "DYNAMIC", then at least one of the "ueIdsList" attribute and the "areaOfInterest" attribute shall be present.

NOTE 2: The VRU zone ID within the "vruZoneId" attribute may either be assigned and provided by the service consumer in requests or assigned and provided by the VAE Server in responses.

6.11.6.2.3 Type: VRUZoneMngtSubscPatch

Table 6.11.6.2.3-1: Definition of type VRUZoneMngtSubscPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
ueIdsList	array(V2xUeId)	O	1..N	Represents the updated list of the identifier(s) of the V2X UE(s) to which the subscription is related. (NOTE)	
vruZoneInfo	VRUZoneInfo	O	0..1	Represents the updated VRU zone related information. (NOTE)	
vruAppReqs	VRUAppReqs	O	0..1	Represents the updated VRU application requirements.	
notifUri	Uri	O	0..1	Contains the updated URI via which notifications shall be delivered.	
areaOfInterest	GeographicAreaRm	O	0..1	Represents the updated targeted area of interest. (NOTE)	
timeValidity	TimeValidity	O	0..1	Represents the updated subscription's time validity information.	
NOTE: The respect of the conditions of NOTE 1 of Table 6.11.6.2.2-1 shall be ensured.					

6.11.6.2.4 Type: EnterLeaveNotif

Table 6.11.6.2.4-1: Definition of type EnterLeaveNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
groupId	V2xGroupId	C	0..1	Represents the identifier of the V2X group to which the notification is related. (NOTE)	
ueId	V2xUeId	C	0..1	Represents the identifier of the V2X UE to which the notification is related. (NOTE)	
vruZoneInfo	VRUZoneInfo	M	1	Represents the VRU zone related information.	
vruZoneId	string	M	1	Contains the identifier of the VRU zone.	
enterLeaveInfo	EnterLeaveInfo	M	1	Indicates whether the V2X UE(s) enter or leave the VRU zone and the related timing information.	
mobilityInfo	MobilityInfo	O	0..1	Represents the mobility information of the V2X UE or V2X group.	
NOTE: These attributes are mutually exclusive. Either one of them shall be present.					

6.11.6.2.5 Type: VRUZoneInfo

Table 6.11.6.2.5-1: Definition of type VRUZoneInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
ueTypes	array(UEType)	M	1..N	Indicates the UE type(s) (e.g., V2X UE(s), pedestrian UE(s) to be considered. (NOTE)	
zoneType	VRUZoneType	M	1	Represents the VRU zone type (e.g., static or dynamic) for the considered UE type(s). (NOTE)	

6.11.6.2.6 Type: VRUAppReqs

Table 6.11.6.2.6-1: Definition of type VRUAppReqs

Attribute name	Data type	P	Cardinality	Description	Applicability
supportedMsgs	array(MsgType)	O	1..N	Represents the supported types of messages within the VRU zone. (NOTE)	
appQosReq	AppplicationQosRequirement	O	0..1	Represents the V2X application requirements for the VRU zone. (NOTE)	
NOTE: At least one of these attributes shall be present.					

6.11.6.2.7 Type: TimeValidity

Table 6.11.6.2.7-1: Definition of type TimeValidity

Attribute name	Data type	P	Cardinality	Description	Applicability
startTime	DateTime	O	0..1	Represents the start time. When absent, this means that the validity shall apply immediately. (NOTE)	
endTime	DateTime	O	0..1	Represents the end time. When absent, this means that the validity shall never end. (NOTE)	
NOTE: At least one of these attributes shall be present.					

6.11.6.2.8 Type: EnterLeaveInfo

Table 6.11.6.2.8-1: Definition of type EnterLeaveInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
time	DateTime	M	1	Represents the time of VRUP. - When the reported event is entering the VRU zone, the start time of VRUP. - When the reported event is leaving the VRU zone, the time at which the V2X UE or V2X group is/are expected to leave the VRU zone.	
duration	DurationSec	C	0..1	Represents the duration the V2X UE or V2X group is/are expected to stay within the VRU zone. This attribute shall be present only when the reported event is entering the VRU zone.	

6.11.6.2.9 Type: MobilityInfo

Table 6.11.6.2.9-1: Definition of type MobilityInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
speed	Float	O	0..1	Represents the expected speed (expressed in kilometres per second) of the V2X UE or V2X group. (NOTE)	
direction	Direction	O	0..1	Represents the expected direction of the V2X UE or V2X group. (NOTE)	
NOTE: At least one of these attributes shall be present.					

6.11.6.2.10 Type: GeographicAreaRm

This data type is defined in the same way as the GeographicArea data type defined in clause 6.1.6.2.5 of 3GPP TS 29.572 [42], but with the OpenAPI "nullable: true" property.

6.11.6.3 Simple data types and enumerations

6.11.6.3.1 Introduction

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

6.11.6.3.2 Simple data types

The simple data types defined in table 6.11.6.3.2-1 shall be supported.

Table 6.11.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.11.6.3.3 Enumeration: UEType

The enumeration UEType represents the type of UE(s) to be considered. It shall comply with the provisions defined in table 6.11.6.3.3-1.

Table 6.11.6.3.3-1: Enumeration UEType

Enumeration value	Description	Applicability
V2X	Indicates V2X UE(s).	
PEDESTRIAN	Indicates pedestrian UE(s).	

6.11.6.3.4 Enumeration: VRUZoneType

The enumeration VRUZoneType represents the VRU zone type. It shall comply with the provisions defined in table 6.11.6.3.4-1.

Table 6.11.6.3.4-1: Enumeration VRUZoneType

Enumeration value	Description	Applicability
STATIC	Indicates that the VRU zone is static.	
DYNAMIC	Indicates that the VRU zone is dynamic.	

6.11.6.3.5 Enumeration: MsgType

The enumeration MsgType represents the message type. It shall comply with the provisions defined in table 6.11.6.3.5-1.

Table 6.11.6.3.5-1: Enumeration MsgType

Enumeration value	Description	Applicability
VAM	Indicates that the message type is VAM.	
CAM	Indicates that the message type is CAM.	
DENM	Indicates that the message type is DENM.	
BSM	Indicates that the message type is BSM.	
CPM	Indicates that the message type is CPM.	

6.11.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

6.11.6.5 Binary data

6.11.6.5.1 Binary Data Types

Table 6.11.6.5.1-1: Binary Data Types

Name	Clause defined	Content type

6.11.7 Error Handling

6.11.7.1 General

For the VAE_VRUZoneManagement API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [22]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [22] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [22].

In addition, the requirements in the following clauses are applicable for the VAE_VRUZoneManagement API.

6.11.7.2 Protocol Errors

No specific protocol errors for the VAE_VRUZoneManagement API are specified.

6.11.7.3 Application Errors

The application errors defined for the VAE_VRUZoneManagement API are listed in Table 6.11.7.3-1.

Table 6.11.7.3-1: Application errors

Application Error	HTTP status code	Description	Applicability

6.11.8 Feature negotiation

The optional features listed in table 6.11.8-1 are defined for the VAE_VRUZoneManagement API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [22].

Table 6.11.8-1: Supported Features

Feature number	Feature Name	Description

6.11.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [22] shall apply for the VAE_VRUZoneManagement API.

6.12 VAE_V2PApplicationRequirement API

6.12.1 Introduction

The VAE_V2PApplicationRequirement service shall use the VAE_V2PApplicationRequirement API.

The API URI of the VAE_V2PApplicationRequirement Service API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [22], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].
- The <apiName> shall be "vae-v2p-app-req".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [22].

NOTE: When 3GPP TS 29.122 [22] is referenced for the common protocol and interface aspects for API definition in the clauses under clause 6.12, the VAE Server takes the role of the SCEF and the service consumer takes the role of the SCS/AS.

6.12.2 Usage of HTTP

The provisions of clause 5.2.2 of 3GPP TS 29.122 [22] shall apply for the VAE_V2PApplicationRequirement API.

6.12.3 Resources

6.12.3.1 Overview

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

Figure 6.12.3.1-1 depicts the resource URIs structure for the VAE_V2PApplicationRequirement API.

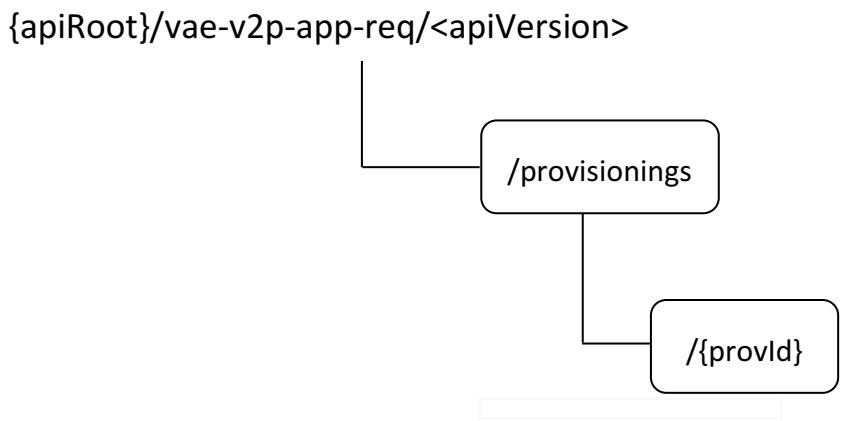

Figure 6.12.3.1-1: Resource URIs structure of the VAE_V2PApplicationRequirement API

Table 6.12.3.1-1 provides an overview of the resources and applicable HTTP methods for the VAE_V2PApplicationRequirement API.

Table 6.12.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
V2P Application Requirements Provisionings	/provisionings	POST	Request the creation of a V2P Application Requirements Provisioning.
Individual V2P Application Requirements Provisioning	/provisionings/{provId}	GET	Retrieve an existing "Individual V2P Application Requirements Provisioning" resource.
		PUT	Request the update of an existing "Individual V2P Application Requirements Provisioning" resource.
		PATCH	Request the modification of an existing "Individual V2P Application Requirements Provisioning" resource.
		DELETE	Request the deletion of an existing "Individual V2P Application Requirements Provisioning" resource.

6.12.3.2 Resource: V2P Application Requirements Provisionings

6.12.3.2.1 Description

This resource represents the collection of V2P Application Requirements Provisionings managed by the VAE Server.

6.12.3.2.2 Resource Definition

Resource URI: **{apiRoot}/vae-v2p-app-req/<apiVersion>/provisionings**

This resource shall support the resource URI variables defined in table 6.12.3.2.2-1.

Table 6.12.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.12.1.

6.12.3.2.3 Resource Standard Methods

6.12.3.2.3.1 POST

The HTTP POST method allows a service consumer to request the creation of a V2P Application Requirements Provisioning at the VAE Server.

This method shall support the URI query parameters specified in table 6.12.3.2.3.1-1.

Table 6.12.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.12.3.2.3.1-2 and the response data structures and response codes specified in table 6.12.3.2.3.1-3.

Table 6.12.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
V2pAppReqData	M	1	Represents the parameters to request the creation of a V2P Application Requirements Provisioning.

Table 6.12.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2pAppReqData	M	1	201 Created	Successful case. The V2P Application Requirements Provisioning is successfully created and a representation of the created "Individual V2P Application Requirements Provisioning" resource shall be returned. An HTTP "Location" header that contains the URI of the created resource shall also be included.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.12.3.2.3.1-4: 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}/vae-v2p-app-req/<apiVersion>/provisionings/{provId}

6.12.3.2.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.12.3.3 Resource: Individual V2P Application Requirements Provisioning

6.12.3.3.1 Description

This resource represents a V2P Application Requirements Provisioning managed by the VAE Server.

6.12.3.3.2 Resource Definition

Resource URI: **{apiRoot}/vae-v2p-app-req/<apiVersion>/provisionings/{provId}**

This resource shall support the resource URI variables defined in table 6.12.3.3.2-1.

Table 6.12.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.12.1.
provId	string	Represents the identifier of the "Individual V2P Application Requirements Provisioning" resource.

6.12.3.3.3 Resource Standard Methods

6.12.3.3.3.1 GET

The HTTP GET method allows a service consumer to retrieve an existing "Individual V2P Application Requirements Provisioning" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.12.3.3.3.1-1.

Table 6.12.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.12.3.3.3.1-2 and the response data structures and response codes specified in table 6.12.3.3.3.1-3.

Table 6.12.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.12.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2pAppReqData	M	1	200 OK	Successful case. The requested "Individual V2P Application Requirements Provisioning" resource shall be returned.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.12.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.12.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.12.3.3.3.2 PUT

The HTTP PUT method allows a service consumer to request the update of an existing "Individual V2P Application Requirements Provisioning" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.12.3.3.3.2-1.

Table 6.12.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.12.3.3.3.2-2 and the response data structures and response codes specified in table 6.12.3.3.3.2-3.

Table 6.12.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
V2pAppReqData	M	1	Represents the updated representation of the "Individual V2P Application Requirements Provisioning" resource.

Table 6.12.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2pAppReqData	M	1	200 OK	Successful case. The "Individual V2P Application Requirements Provisioning" resource is successfully updated and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual V2P Application Requirements Provisioning" resource is successfully updated and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.12.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.12.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.12.3.3.3.3 PATCH

The HTTP PATCH method allows a service consumer to request the modification of an existing "Individual V2P Application Requirements Provisioning" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.12.3.3.3.3-1.

Table 6.12.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.12.3.3.3.3-2 and the response data structures and response codes specified in table 6.12.3.3.3.3-3.

Table 6.12.3.3.3.3-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
V2pAppReqDataPatch	M	1	Represents the parameters to request the modification of the "Individual V2P Application Requirements Provisioning" resource.

Table 6.12.3.3.3.3-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
V2pAppReqData	M	1	200 OK	Successful case. The "Individual V2P Application Requirements Provisioning" resource is successfully modified and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual V2P Application Requirements Provisioning" resource is successfully modified and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.12.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.12.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.12.3.3.3.4 DELETE

The HTTP DELETE method allows a service consumer to request the deletion of an existing "Individual V2P Application Requirements Provisioning" resource at the VAE Server.

This method shall support the URI query parameters specified in table 6.12.3.3.3.4-1.

Table 6.12.3.3.3.4-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.12.3.3.3.4-2 and the response data structures and response codes specified in table 6.12.3.3.3.4-3.

Table 6.12.3.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.12.3.3.3.4-3: 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 V2P Application Requirements Provisioning" resource is successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative VAE Server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [22].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [22] shall also apply.				

Table 6.12.3.3.3.4-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

Table 6.12.3.3.3.4-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative VAE Server.

6.12.3.3.4 Resource Custom Operations

There are no resource custom operations defined for this resource in this release of the specification.

6.12.4 Custom Operations without associated resources

There are no custom operations without associated resources defined for this API in this release of the specification.

6.12.5 Notifications

There are no notification defined for this resource in this release of the specification.

6.12.6 Data Model

6.12.6.1 General

This clause specifies the application data model supported by the API.

Table 6.12.6.1-1 specifies the data types defined for the VAE_V2PApplicationRequirement API.

Table 6.12.6.1-1: VAE_V2PApplicationRequirement API specific Data Types

Data type	Clause defined	Description	Applicability
AppTrafficPattern	6.12.6.2.4	Represents an application traffic pattern for V2P services.	
V2pAppReqData	6.12.6.2.2	Represents a V2P Application Requirements Provisioning.	
V2pAppReqDataPatch	6.12.6.2.3	Represents the requested modifications to a V2P Application Requirements Provisioning.	

Table 6.12.6.1-2 specifies data types re-used by the VAE_V2PApplicationRequirement API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the VAE_V2PApplicationRequirement API.

Table 6.12.6.1-2: VAE_V2PApplicationRequirement API re-used Data Types

Data type	Reference	Comments	Applicability
DurationSec	3GPP TS 29.122 [22]	Represents a time duration expressed in seconds.	
AppplicationQosRequirement	6.7.6.2.4	Represents the V2X application QoS requirements.	
ParameterOverPc5	3GPP TS 29.522 [34]	Represents V2X policies/parameters for V2X communication over PC5.	
ParameterOverPc5Rm	3GPP TS 29.522 [34]	Represents the same as the ParameterOverPc5 data type but with the "nullable: true" property.	
TimeWindow	3GPP TS 29.122 [22]	Represents a time window.	
SupportedFeatures	3GPP TS 29.571 [18]	Used to negotiate the applicability of the optional features.	
V2xGroupId	6.1.6.3.2	Represents the identifier of a V2X Group.	
V2xServiceId	6.1.6.3.2	Represents the identifier of a V2X Service.	

6.12.6.2 Structured data types

6.12.6.2.1 Introduction

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

6.12.6.2.2 Type: V2pAppReqData

Table 6.12.6.2.2-1: Definition of type V2pAppReqData

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Represents the identifier of the requestor.	
serviceId	V2xServiceId	C	0..1	Represents the identifier of the V2X service to which the provisioned V2P Application Requirements are related. (NOTE)	
groupId	V2xGroupId	C	0..1	Represents the identifier of the V2X group to which the provisioned V2P Application Requirements are related. (NOTE)	
v2pQosReqs	AppplicationQosRequirement	M	1	Represents the V2P QoS requirements.	
trafficPattern	AppTrafficPattern	M	1	Represents the application traffic pattern for the V2P service.	
paramOverPc5	ParameterOverPc5	O	0..1	Represents the PC5 provisioning policies/parameters to be used by the involved V2X UE(s).	
suppFeat	SupportedFeatures	C	0..1	Contains the list of supported features among the ones defined in clause 6.12.8. This attribute shall be present only when feature negotiation needs to take place.	
NOTE: These attributes are mutually exclusive. Either one of them shall be present.					

6.12.6.2.3 Type: V2pAppReqDataPatch

Table 6.12.6.2.3-1: Definition of type V2pAppReqDataPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
v2pQosReqs	AppplicationQosRequirement	O	0..1	Represents the updated V2P QoS requirements.	
trafficPattern	AppTrafficPattern	O	0..1	Represents the updated application traffic pattern for the V2P service.	
paramOverPc5	ParameterOverPc5Rm	O	0..1	Represents the updated PC5 provisioning policies/parameters to be used by the involved V2X UE(s).	

6.12.6.2.4 Type: AppTrafficPattern

Table 6.12.6.2.4-1: Definition of type AppTrafficPattern

Attribute name	Data type	P	Cardinality	Description	Applicability
timeWindows	array(TimeWindow)	M	1..N	Contains one or several time window(s). This attribute shall include either: - a single array element containing the start time and end time of the transmission cycle for the V2P service; or - one or several array element(s) with a set of pre-defined time window(s) constituting the schedule of the expected transmission/reception of V2X messages for the V2P service.	
periodicity	DurationSec	C	0..1	Contains the periodicity of the tansmission cycle. This attribute shall be present only if the application traffic pattern is in the form of a transmission cycle, i.e., the "timeWindows" contains a single array element containing the transmission cycle's time window.	

6.12.6.3 Simple data types and enumerations

6.12.6.3.1 Introduction

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

6.12.6.3.2 Simple data types

The simple data types defined in table 6.12.6.3.2-1 shall be supported.

Table 6.12.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.12.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

6.12.7 Error Handling

6.12.7.1 General

For the VAE_V2PApplicationRequirement API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [22]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [22] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [22].

In addition, the requirements in the following clauses are applicable for the VAE_V2PApplicationRequirement API.

6.12.7.2 Protocol Errors

No specific protocol errors for the VAE_V2PApplicationRequirement API are specified.

6.12.7.3 Application Errors

The application errors defined for the VAE_V2PApplicationRequirement API are listed in Table 6.12.7.3-1.

Table 6.12.7.3-1: Application errors

Application Error	HTTP status code	Description	Applicability

6.12.8 Feature negotiation

The optional features listed in table 6.12.8-1 are defined for the VAE_V2PApplicationRequirement API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [22].

Table 6.12.8-1: Supported Features

Feature number	Feature Name	Description

6.12.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [22] shall apply for the VAE_V2PApplicationRequirement API.

7 Security

TLS shall be used to support the security communication between the VAE server and the V2X application specific server over Vs interface, and also between different VAE servers over VAE-E interface as specified in 3GPP TS 33.536 [31] and 3GPP TS 33.501 [32]. The access to the VAE service APIs shall be authorized by means of OAuth2 protocol (see IETF RFC 6749 [23]), based on local configuration, using the "Client Credentials" authorization grant. If OAuth2 is used, a client, prior to consuming services offered by the VAE service APIs, shall obtain a "token" from the authorization server.

8 Using Common API Framework

8.1 General

When CAPIF is used with a VAE service, the VAE server shall support the following as defined in 3GPP TS 29.222 [26]:

- 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 [25], 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 VAE service, the VAE 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 VAE Server, the service consumer (e.g. VASS) as API invoker shall negotiate the security method (PKI, TLS-PSK or OAUTH2) with CAPIF core function and ensure the VAE Server has enough credential to authenticate the service consumer (e.g. VASS), see 3GPP TS 29.222 [26], 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 service consumer (e.g. VASS) and the VAE Server, upon API invocation, the VAE Server shall retrieve the authorization information from the CAPIF core function as described in 3GPP TS 29.222 [26], clause 5.6.2.4.

As indicated in 3GPP TS 33.122 [27], the access to the VAE APIs may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [23]), using the "Client Credentials" authorization grant, where the CAPIF core function (see 3GPP TS 29.222 [TS29222]) 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 service consumer (e.g. VASS) and the VAE Server, the service consumer (e.g. VASS), prior to consuming services offered by the VAE APIs, shall obtain a "token" from the authorization server, by invoking the Obtain_Authorization service, as described in 3GPP TS 29.222 [26], clause 5.6.2.3.2.

The VAE APIs do not define any scopes for OAuth2 authorization. It is the VAE Server responsibility to check whether the service consumer (e.g. VASS) is authorized to use an API based on the "token". Once the VAE Server verifies the "token", it shall check whether the VAE 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 service consumer (e.g. VASS) has full authority to access any resource or operation for the invoked API.

NOTE 2: For aforementioned security methods, the VAE Server needs to apply admission control according to access control policies after performing the authorization checks.

Annex A (normative): OpenAPI specification

A.1 General

This Annex is based on the OpenAPI Specification [6] and provides corresponding representations of all APIs defined in the present specification.

NOTE 1: An OpenAPIs representation embeds JSON Schema representations of HTTP message bodies.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 2: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository, that uses the GitLab software version control system (see clause 5B of the 3GPP TS 21.900 [8] and clause 5.3.1 of the 3GPP TS 29.501 [3] for further information).

A.2 VAE_MessageDelivery API

```
openapi: 3.0.0

info:
  version: 1.2.0-alpha.3
  title: VAE_MessageDelivery
  description: |
    API for VAE Message Delivery Service
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/vae-message-delivery/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /subscriptions:
    post:
      summary: Create a new Individual Message Delivery Data Subscription resource
      operationId: CreateIndividualMessageDeliveryDataSubscription
      tags:
        - Message Delivery Data Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MessageDeliverySubscriptionData'
      responses:
        '201':
          description: The subscription was created successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MessageDeliverySubscriptionData'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        uplinkMessageDelivery:
          '{$request.body#/notifUri}':
```

```
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UplinkMessageDeliveryData'
        responses:
          '204':
            description: No Content, Notification was successful
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    receptReportOfDownlinkMesageDelivery:
      '{$request.body#/notifUri}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/Result'
          responses:
            '204':
              description: No Content, Notification was successful
            '307':
              $ref: 'TS29122_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29122_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '401':
              $ref: 'TS29571_CommonData.yaml#/components/responses/401'
            '403':
              $ref: 'TS29571_CommonData.yaml#/components/responses/403'
            '404':
              $ref: 'TS29571_CommonData.yaml#/components/responses/404'
            '411':
              $ref: 'TS29571_CommonData.yaml#/components/responses/411'
            '413':
              $ref: 'TS29571_CommonData.yaml#/components/responses/413'
            '415':
              $ref: 'TS29571_CommonData.yaml#/components/responses/415'
            '429':
              $ref: 'TS29571_CommonData.yaml#/components/responses/429'
            '500':
              $ref: 'TS29571_CommonData.yaml#/components/responses/500'
            '503':
              $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    get:
      summary: Get an existing individual Message Delivery Subscription resource
```

```
    operationId: ReadIndividualMessageDeliverySubscription
    tags:
      - Individual Message Delivery Subscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: >
          String identifying a subscription to the Individual Message Delivery Subscription
        required: true
        schema:
          type: string
    responses:
      '200':
        description: The subscription information is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MessageDeliverySubscriptionData'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  delete:
    summary: Delete an individual Message Delivery Subscription resource
    operationId: DeleteMessageDeliverySubscription
    tags:
      - Individual Message Delivery Subscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: >
          String identifying a subscription to the Individual Message Delivery Subscription
        required: true
        schema:
          type: string
    responses:
      '204':
        description: The subscription was terminated successfully.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}/message-deliveries:
```

```
    post:
      summary: VAE Message delivery resource create service Operation
      tags:
        - message deliveries collection (Collection)
      operationId: CreateDownlinkMessageDelivery
      parameters:
        - name: subscriptionId
          in: path
          description: >
            String identifying a subscription to the Individual Message Delivery Subscription
          required: true
          schema:
            type: string
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/DownlinkMessageDeliveryData'
        required: true
      responses:
        '201':
          description: Downlink Message Delivery Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DownlinkMessageDeliveryData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}/message-deliveries/{dlDeliveryId}:
    get:
      summary: VAE Message delivery resource Read service Operation
      tags:
        - Individual downlink message delivery (Document)
      operationId: ReadIndividualDownlinkMessageDelivery
      parameters:
        - name: subscriptionId
          in: path
          description: >
            String identifying a subscription to the Individual Message Delivery Subscription
          required: true
          schema:
            type: string
        - name: dlDeliveryId
          in: path
          description: Identifier of a downlink messge delivery resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
```

```
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/DownlinkMessageDeliveryData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE Message delivery resource delete service Operation
      tags:
        - Individual message delivery (Document)
      operationId: DeleteMessageDelivery
      parameters:
        - name: subscriptionId
          in: path
          description: >
            String identifying a subscription to the Individual Message Delivery Subscription
          required: true
          schema:
            type: string
        - name: dlDeliveryId
          in: path
          required: true
          description: Unique ID of the message delivery to be deleted
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
```

```
  schemas:
    DownlinkMessageDeliveryData:
      description: Contains the downlink V2X message delivery data.
      type: object
      properties:
        ueId:
          $ref: '#/components/schemas/V2xUeId'
        groupId:
          $ref: '#/components/schemas/V2xGroupId'
        serviceId:
          $ref: '#/components/schemas/V2xServiceId'
        duration:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        geoId:
          $ref: '#/components/schemas/GeoId'
        payload:
          $ref: '#/components/schemas/V2xMessagePayload'
      required:
        - payload

    MessageDeliverySubscriptionData:
      description: Represents the V2X message delivery subscription data.
      type: object
      properties:
        appSerId:
          $ref: '#/components/schemas/AppServerId'
        serviceId:
          $ref: '#/components/schemas/V2xServiceId'
        geoId:
          $ref: '#/components/schemas/GeoId'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the service consumer to request the VAE server to send a test
            notification as defined in clause 6.1.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - appSerId
        - serviceId
        - notifUri


    UplinkMessageDeliveryData:
      description: Represents the uplink V2X message delivery data.
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        ueId:
          $ref: '#/components/schemas/V2xUeId'
        serviceId:
          $ref: '#/components/schemas/V2xServiceId'
        geoId:
          $ref: '#/components/schemas/GeoId'
        payload:
          $ref: '#/components/schemas/V2xMessagePayload'
      required:
        - resourceUri
        - ueId
        - payload

    Result:
      description: Contains the result of downlink message delivery.
      anyOf:
      - type: string
        enum:
          - SUCCESS
          - FAIL
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration and is not used to encode
          content defined in the present version of this API.
```

```
    AppServerId:
      description: Represents the service consumer identifier.
      type: string

    V2xUeId:
      description: Represents the identifier of the V2X UE.
      type: string

    V2xGroupId:
      description: Represents the group ID for which a V2X message is addressed.
      type: string

    V2xServiceId:
      description: Represents the V2X service ID to which a V2X message belongs.
      type: string

    GeoId:
      description: Represents a geographical area identifier.
      type: string

    V2xMessagePayload:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
```

A.3 VAE_FileDistribution API

```
openapi: 3.0.0

info:
  version: 1.2.0-alpha.2
  title: VAE_FileDistribution
  description: |
    API for VAE File Distribution Service
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-file-distribution/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /file-distributions:
    post:
      summary: VAE File Distributions resource create service Operation
      tags:
        - file distributions collection (Document)
      operationId: CreateFileDistributions
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/FileDistributionData'
        required: true
      responses:
        '201':
          description: File Distribution Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/FileDistributionData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /file-distributions/{distributionId}:
    get:
```

```
      summary: Get an existing individual file distribution resource
      operationId: ReadIndividualFileDistribution
      tags:
        - Individual File Distribution (Document)
      parameters:
        - name: distributionId
          in: path
          description: Identifier of a file distribution resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/FileDistributionData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE File Distribution resource delete service Operation
      tags:
        - Individual file distribution (Document)
      operationId: DeleteFileDistribution
      parameters:
        - name: distributionId
          in: path
          required: true
          description: Unique ID of the file distribution to be deleted
          schema:
            type: string
      responses:
        '204':
          description: The subscription was terminated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
```

```
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    FileDistributionData:
      description: Represents an individual File Distribution resource for a V2X group ID.
      type: object
      properties:
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        fileLists:
          type: array
          items:
            $ref: '#/components/schemas/FileList'
          minItems: 1
        serviceClass:
          type: string
        geoArea:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        maxBitrate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        maxDelay:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        duration:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        localMbmsInfo:
          $ref: '#/components/schemas/LocalMbmsInfo'
        localMbmsActInd:
          type: boolean
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - fileLists
        - geoArea
        - maxBitrate
        - maxDelay

    FileList:
      description: Represents a file list.
      type: object
      properties:
        fileUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        fileDisplayUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        fileEarFetchTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        fileLatFetchTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        fileSize:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        fileStatus:
          $ref: '#/components/schemas/FileStatus'
        completionTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        keepUpdateInterval:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        uniAvailability:
          type: boolean
        fileRepetition:
          type: integer
      required:
        - fileUri
        - fileDisplayUri
        - fileEarFetchTime
        - fileLatFetchTime
        - fileStatus
        - completionTime
        - keepUpdateInterval

    LocalMbmsInfo:
      description: Contains the local MBMS information.
      type: object
      properties:
```

```
        mbmsEnbIpv4MulAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        mbmsEnbIpv6MulAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        mbmsGwIpv4SsmAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        mbmsGwIpv6SsmAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        cteid:
          type: string
        bmscIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        bmscIpv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        bmscPort:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'

# Simple data types and Enumerations
    FileStatus:
      description: Represents a file status.
      anyOf:
      - type: string
        enum:
          - PENDING
          - FETCHED
          - PREPARED
          - TRANSMITTING
          - SENT
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration and is not used to encode
          content defined in the present version of this API.
```

A.4 VAE_ApplicationRequirement API

```
openapi: 3.0.0

info:
  version: 1.2.0-alpha.2
  title: VAE_ApplicationRequirement
  description: |
    API for VAE Application Requirement Service
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.1.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-app-req/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /application-requirements:
    post:
      summary: VAE_Application_Requirements resource create service Operation
      tags:
        - application requirements collection (Document)
      operationId: CreateApplicationRequirement
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ApplicationRequirementData'
        required: true
      responses:
        '201':
          description: Application Requirement Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ApplicationRequirementData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        NotifyNetworkResource:
```

```
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/AppReqNotification'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /application-requirements/{requirementId}:
    get:
      summary: VAE Application Requirement resource read service Operation
      tags:
        - Individual application requirement (Document)
      operationId: ReadApplicationRequirement
      parameters:
        - name: requirementId
          in: path
          description: Identifier of an application requirement resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ApplicationRequirementData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE Application Requirement resource delete service Operation
      tags:
        - Individual application requirement (Document)
      operationId: DeleteApplicationRequirement
      parameters:
        - name: requirementId
          in: path
          required: true
          description: Unique ID of the application requirement to be deleted
          schema:
            type: string
      responses:
        '204':
          description: The subscription was terminated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    ApplicationRequirementData:
      description: >
        Represents an individual Application Requirement resource for a V2X UE ID or a V2X group ID.
      type: object
      properties:
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        duration:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        appRequirement:
          $ref: '#/components/schemas/ApplicationRequirement'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the 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.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - serviceId
        - appRequirement
        - notifUri
```

```
    ApplicationRequirement:
      description: Represents the requirements for application change.
      type: object
      properties:
        serviceLevel:
          $ref: '#/components/schemas/ServiceLevel'

    AppReqNotification:
      description: >
        Represents a notificaton of the result of the network resource adaptation corresponding to
        the V2X application requirement.
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        result:
          $ref: '#/components/schemas/ReservationResult'
      required:
        - resourceUri
        - result

# Simple data types and Enumerations
    ServiceLevel:
      description: Indicates a service level for application service.
      anyOf:
      - type: string
        enum:
          - HIGH
          - MEDIUM
          - LOW
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration and is not used to encode
          content defined in the present version of this API.

    ReservationResult:
      description: >
        Represents the result of the network resource adaptation corresponding to the V2X
        application requirement.
      anyOf:
      - type: string
        enum:
          - SUCCESSFUL
          - FAILURE
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration and is not used to encode
          content defined in the present version of this API.
```

A.5 VAE_DynamicGroup API

```
openapi: 3.0.0

info:
  version: 1.2.0-alpha.2
  title: VAE_DynamicGroup
  description: |
    VAE_Dynamic_Group Service
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.1.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-dynamic-group/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /group-configurations:
    post:
      summary: VAE_Dynamice_Group resource create service Operation
      tags:
        - application requirements collection (Document)
      operationId: CreateGroupConfiguration
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/GroupConfigurationData'
        required: true
      responses:
        '201':
          description: Application Requirement Resource created
          headers:
            Location:
              description: Contains the URI of the newly created resource.
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GroupConfigurationData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        NotifyDynamicGroup:
```

```
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/DynamicGroupNotification'
            responses:
              '204':
                description: No Content, notification was succesfull
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /group-configurations/{configId}:
    get:
      summary: VAE Group Configuration resource read service Operation
      tags:
        - Individual Group Configuration(Document)
      operationId: ReadDynamicGroupConfiguration
      parameters:
        - name: configId
          in: path
          description: Identifier of an group configuration resource.
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/GroupConfigurationData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE Group Configuration resource delete service Operation
      tags:
        - Individual group configuration (Document)
      operationId: DeleteGroupConfiguration
      parameters:
        - name: configId
          in: path
          required: true
          description: Unique ID of the group configuration to be deleted.
          schema:
            type: string
      responses:
        '204':
          description: The subscription was terminated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    GroupConfigurationData:
      description: Represents an individual Group Configuration resource for a V2X group ID.
      type: object
      properties:
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        definition:
          type: string
        leaderId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        duration:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the service consumer to request the VAE server to test
            a notification connection. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - groupId
        - definition
        - leaderId
        - notifUri

    DynamicGroupNotification:
      description: >
```

```
    Represents a notification on the dynamic group information (i.e. group member
    joins or leaves).
  type: object
  properties:
    resourceUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    joinedUeIds:
      type: array
      items:
        $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
      minItems: 1
    leftUeIds:
      type: array
      items:
        $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
      minItems: 1
  required:
    - resourceUri
```

A.6 VAE_ServiceContinuity API

```
openapi: 3.0.0

info:
  version: 1.2.0-alpha.1
  title: VAE_Service Continuity
  description: |
    API for VAE Service Continuity Service
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externalDocs:
  description: 3GPP TS 29.486 V18.0.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'
security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-service-continuity/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /geo-areas/{geoId}:
    get:
      summary: VAE service continuity query service operation
      tags:
        - Individual geographical area (Document)
      operationId: QueryServiceContinuity
      parameters:
        - name: geoId
          in: path
          description: Identifier of a geographical area
          required: true
          schema:
            type: string
        - name: service-id
          in: query
          description: Identifier of a V2X service
          required: true
          schema:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        - name: supp-feat
          in: query
          description: To filter irrelevant responses related to unsupported features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2xServiceInfo'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    V2xServiceInfo:
      description: >
        Represents an individual geographical area resource including the designated V2X
        service identifier.
      type: object
      properties:
        serviceIds:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
          minItems: 1
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - serviceIds
```

A.7 VAE_HDMapDynamicInfo API

```
openapi: 3.0.0

info:
  version: 1.1.0-alpha.2
  title: VAE_HDMapDynamicInfo
  description: |
    API for VAE HDMapDynamicInfo Service
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externalDocs:
  description: 3GPP TS 29.486 V18.1.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-hdmap-dynamic-info/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /subscriptions:
    post:
      summary: VAE_HDMapDynamicInfo resource create service Operation
      tags:
        - hdmap dynamicinfo subscriptions collection (Document)
      operationId: Create
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/HdMapDynamicInfoData'
        required: true
      responses:
        '201':
          description: HdMap DynamicInfo Subscription Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/HdMapDynamicInfoData'
        '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:
        NotifyHdMapDynamicInfo:
```

```
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/HdMapDynamicInfoNotification'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /subscriptions/{subscriptionId}:
    get:
      summary: VAE HdMap DynamicInfo Subscription resource read service Operation
      tags:
        - Individual HdMap DynamicInfo Subscription(Document)
      operationId: ReadHdMapDynamicInfoSubscription
      parameters:
        - name: subscriptionId
          in: path
          description: Identifier of an HdMap DynamicIfo Subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/HdMapDynamicInfoData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE HdMap DynamicInfo Subscription resource delete service Operation
      tags:
        - Individual hdmap dynamicinfo subscription (Document)
      operationId: DeleteHdMapDynamicInfoSubscription
      parameters:
        - name: subscriptionId
          in: path
          required: true
          description: Unique ID of the hdmap dynamicinfo subscription to be deleted
          schema:
            type: string
      responses:
        '204':
          description: The subscription was terminated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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:
    HdMapDynamicInfoData:
      description: >
        Represents an individual HdMap DynamicInfo Subscription resource for a V2X UE ID.
      type: object
      properties:
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        range:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the 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.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - ueId
        - notifUri
        - range

    HdMapDynamicInfoNotification:
      description: >
        Represents a notificaton of HD map dynamic info corresponding to the subscription.
      type: object
      properties:
        resourceUri:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      nearbyUeInfo:
        type: array
        items:
          $ref: '#/components/schemas/NearbyUeInfo'
        minItems: 1
        description: Contains the informaiotn of nearby UEs.
    required:
      - resourceUri
      - nearbyUeInfo

  NearbyUeInfo:
    description: Represents the informaiotn of nearby UEs.
    type: object
    properties:
      nearbyUeId:
        $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
      location:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
      distance:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    required:
      - nearbyUeId
      - location
      - distance
```

A.8 VAE_SessionOrientedService API

```
openapi: 3.0.0

info:
  version: 1.1.0-alpha.3
  title: VAE_SessionOrientedService
  description: |
    API for VAE_SessionOrientedService
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/vae-session-Oriented-service/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /subscriptions:
    post:
      summary: VAE_SessionOrientedService resource create service Operation
      tags:
        - session oriented service subscriptions collection (Document)
      operationId: Create
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SessionOrientedData'
        required: true
      responses:
        '201':
          description: Session Oriented Service Subscription Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SessionOrientedData'
        '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:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      callbacks:
        NotifyResutOfSessionOrientedService:
          '{$request.body#/notifUri}':
```

```
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/Notification'
        responses:
          '204':
            description: No Content, Notification was succesfull
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29122_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29122_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29122_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /subscriptions/{subscriptionId}:
    get:
      summary: VAE Session Oriented Service Subscription resource read service Operation
      tags:
        - Individual Session Oriented Service Subscription (Document)
      operationId: ReadSessionOrientedServiceSubscription
      parameters:
        - name: subscriptionId
          in: path
          description: Identifier of an Session Oriented Service Subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SessionOrientedData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
    put:
      summary: Updates/replaces an existing subscription resource
      tags:
        - VAE Session Oriented Service Subscription resource put service Operation
      parameters:
        - name: subscriptionId
          in: path
          description: Identifier of an Session Oriented Service Subscription resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing subscription
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SessionOrientedData'
      responses:
        '200':
          description: OK (Successful update of the subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SessionOrientedData'
        '204':
          description: No Content (Successful update of the subscription)
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE Session Oriented Service Subscription resource delete service Operation
      tags:
        - Individual Session Oriented Service Subscription (Document)
      operationId: DeleteSessionOrientedServiceSubscription
      parameters:
        - name: subscriptionId
          in: path
          required: true
          description: Unique ID of the Session Oriented Service Subscription n to be deleted
          schema:
            type: string
      responses:
        '204':
          description: The subscription was terminated successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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:
    SessionOrientedData:
      description: >
        Represents data to trigger establishment or update of session-oriented service.
      type: object
      properties:
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        appSerId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/AppServerId'
        appQosReq:
          $ref: '#/components/schemas/AppplicationQosRequirement'
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the 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.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - ueId
        - notifUri
        - serviceId
        - appSerId

    Notification:
      description: >
        Represents the result of the establishment or update of the session-oriented service.
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        action:
          $ref: '#/components/schemas/Action'
        result:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/Result'
      required:
        - resourceUri
        - action
        - result

    AppplicationQosRequirement:
      description: Represents application layer QoS requirement.
      type: object
      properties:
        pqi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/5Qi'
        resourceType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/QosResourceType'
        priorityLevel:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        packetDelayBudget:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketDelBudget'
        packetErrorRate:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PacketErrRate'
        averagingWindow:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AverWindow'
        maxDataBurstVol:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ExtMaxDataBurstVol'
        not:
          required: [pqi, resourceType, packetDelayBudget, packetErrorRate]

# Simple data types and Enumerations
    Action:
      description: Indicate the action to the session-oriented service.
      anyOf:
      - type: string
        enum:
          - ESTABLISHMENT
          - UPDATE
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration and is not used to encode
          content defined in the present version of this API.
```

A.9 VAE_V2VConfigRequirement API

```
openapi: 3.0.0

info:
  version: 1.1.0-alpha.1
  title: VAE_V2VConfigRequirement
  description: |
    API for VAE_V2VConfigRequirement
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.0.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-v2v-config-req/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /configurations:
    post:
      summary: VAE V2V Configuration resource create service Operation
      tags:
        - V2V Configurations collection (Document)
      operationId: Create
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/V2vConfigurationData'
        required: true
      responses:
        '201':
          description: V2V Configuration Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2vConfigurationData'
        '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'
  /configurations/{configurationId}:
    get:
```

```
    summary: VAE V2V Configuration resource read service Operation
    tags:
      - Individual V2V Configuration (Document)
    operationId: ReadV2VConfiguration
    parameters:
      - name: configurationId
        in: path
        description: Identifier of a V2V Configuration resource
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/V2vConfigurationData'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    summary: Updates/replaces an existing configuration resource
    tags:
      - VAE V2V Configuration resource put service Operation
    operationId: UpdateV2VConfiguration
    parameters:
      - name: configurationId
        in: path
        description: Identifier of a V2V Configuration resource
        required: true
        schema:
          type: string
    requestBody:
      description: Parameters to update/replace the existing configuration
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/V2vConfigurationData'
    responses:
      '200':
        description: OK (Successful update of the configuration)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/V2vConfigurationData'
      '204':
        description: No Content (Successful update of the configuration)
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: VAE V2V Configuration resource delete service Operation
      tags:
        - Individual V2V Configuration (Document)
      operationId: DeleteV2VConfiguration
      parameters:
        - name: configurationId
          in: path
          required: true
          description: Unique ID of the V2V Configuration to be deleted
          schema:
            type: string
      responses:
        '204':
          description: The configuration was deleted successfully.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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:
    V2vConfigurationData:
      description: Contains the V2V configuration data.
      type: object
      properties:
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        canUeIds:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
        appQosReq:
          $ref:
'TS29486_VAE_SessionOrientedService.yaml#/components/schemas/AppplicationQosRequirement'
```

```
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
```

A.10 VAE_PC5ProvisioningRequirement API

```
openapi: 3.0.0

info:
  version: 1.1.0-alpha.2
  title: VAE_PC5ProvisioningRequirement
  description: |
    API for VAE_PC5ProvisioningRequirement
    © 2023, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.1.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-pc5-prov-req/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

paths:
  /subscriptions:
    post:
      summary: VAE_PC5 Provisioning Requirement resource create service Operation
      tags:
        - PC5 provisioning requirement subscriptions collection (Document)
      operationId: Create
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ProvisioningRequirement'
        required: true
      responses:
        '201':
          description: PC5 Provisioning Requirement Subscription Resource Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ProvisioningRequirement'
        '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:
        NotifyResutOfMultiOperationPC5Provisioning:
```

```
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/Notification'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  /subscriptions/{subscriptionId}:
    get:
      summary: VAE PC5 Provisioning Requirement Subscription resource read service Operation
      tags:
        - Individual PC5 Provisioning Requirement Subscription (Document)
      operationId: ReadPC5ProvisioningRequirementSubscription
      parameters:
        - name: subscriptionId
          in: path
          description: Identifier of an PC5 Provisioning Requirement Subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ProvisioningRequirement'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
      $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    summary: Updates/replaces an existing subscription resource
    tags:
      - VAE PC5 Provisioning Requirement Subscription resource put service Operation
    operationId: UpdatePC5ProvisioningRequirementSubscription
    parameters:
      - name: subscriptionId
        in: path
        description: Identifier of an PC5 Provisioning Requirement Subscription resource
        required: true
        schema:
          type: string
    requestBody:
      description: Parameters to update/replace the existing subscription
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/ProvisioningRequirement'
    responses:
      '200':
        description: OK (Successful update of the subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ProvisioningRequirement'
      '204':
        description: No Content (Successful update of the subscription)
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  delete:
    summary: VAE PC5 Provisioning Requirement Subscription resource delete service Operation
    tags:
      - Individual PC5 Provisioning Requirement Subscription (Document)
    operationId: DeletePC5ProvisioningRequirementSubscription
    parameters:
      - name: subscriptionId
        in: path
        required: true
        description: Unique ID of the PC5 Provisioning Requirement Subscription to be deleted
        schema:
          type: string
    responses:
      '204':
        description: The subscription was terminated successfully.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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:
    ProvisioningRequirement:
      description: Represents an Individual PC5 Provisioning Requirement Subscription resource.
      type: object
      properties:
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        appQosReq:
          $ref:
'TS29486_VAE_SessionOrientedService.yaml#/components/schemas/AppplicationQosRequirement'
        plmnList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
          minItems: 1
        requestTestNotification:
          type: boolean
          description: >
            Set to true by the 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.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - serviceId
        - notifUri

    Notification:
      description: Represents a notificaton of result of PC5 Provisioning Requirement.
      type: object
      properties:
        resourceUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        result:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/Result'
      required:
        - resourceUri
        - result
```

A.11 VAE_ServiceAndQoSControlInfo API

```
openapi: 3.0.0

info:
  title: VAE Server Service And QoS Control Info Service
  version: 1.0.0-alpha.2
  description: |
    VAE Server Service And QoS Control Info Service.
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

servers:
  - url: '{apiRoot}/vae-sqci/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122

security:
  - {}
  - oAuth2ClientCredentials: []

paths:
  /subscriptions:
    post:
      summary: Request the creation of a Service Adaptation And QoS Control Subscription.
      operationId: CreateServAdaptQoSCtrlSubsc
      tags:
        - Service Adaptation And QoS Control Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
      responses:
        '201':
          description: >
            Created. The Service Adaptation And QoS Control Subscription is successfully created
            and a representation of the created Individual Service Adaptation And QoS Control
            Subscription resource shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
          headers:
            Location:
              description: >
                Contains the URI of the created Individual Service Adaptation And QoS Control
                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:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    callbacks:
      ServReqQoSAdaptNotif:
        '{$request.body#/notifUri}/req-qos-adapt':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/AdaptNotif'
            responses:
              '200':
                description: >
                  OK. The Service Requirements And QoS Adaptation notification is successfully
                  received and acknowledged, and the acknowledgment related information shall be
                  returned in the response body.
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AdaptNotifResp'
              '204':
                description: >
                  No Content. The Service Requirements And QoS Adaptation notification is
                  successfully received and acknowledged, and no content is returned in the
                  response body.
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

      QoSChangeNotif:
        '{$request.body#/notifUri}/qos-change':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/QoSChangeNotif'
            responses:
              '204':
                description: >
                  No Content. The QoS Change notification is successfully received and
                  acknowledged, and no content is returned in the response body.
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
```

```
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    parameters:
      - name: subscriptionId
        in: path
        description: >
          Represents the identifier of the Individual Service Adaptation And QoS Control
          Subscription resource.
        required: true
        schema:
          type: string

    get:
      summary: Retrieve an existing Individual Service Adaptation And QoS Control Subscription
resource.
      operationId: GetIndServAdaptQoSCtrlSubsc
      tags:
        - Individual Service Adaptation And QoS Control Subscription (Document)
      responses:
        '200':
          description: >
            OK. The requested Individual Service Adaptation And QoS Control Subscription resource
            shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Request the update of an existing Individual Service Adaptation And QoS Control
Subscription resource.
      operationId: UpdateIndServAdaptQoSCtrlSubsc
      tags:
        - Individual Service Adaptation And QoS Control Subscription (Document)
      requestBody:
        required: true
        content:
          application/json:
            schema:
```

```
            $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
      responses:
        '200':
          description: >
            OK. The Individual Service Adaptation And QoS Control Subscription resource is
            successfully updated and a representation of the updated resource shall be returned in
            the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
        '204':
          description: >
            No Content. The Individual Service Adaptation And QoS Control Subscription resource is
            successfully updated and no content is returned in the response body.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Request the modification of an existing Individual Service Adaptation And QoS Control
Subscription resource.
      operationId: ModifyIndServAdaptQoSCtrlSubsc
      tags:
        - Individual Service Adaptation And QoS Control Subscription (Document)
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/ServAdaptQoSCtrlSubscPatch'
      responses:
        '200':
          description: >
            OK. The Individual Service Adaptation And QoS Control Subscription resource is
            successfully modified and a representation of the updated resource shall be returned in
            the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServAdaptQoSCtrlSubsc'
        '204':
          description: >
            No Content. The Individual Service Adaptation And QoS Control Subscription resource is
            successfully modified and no content is returned in the response body.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
```

```
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Request the deletion of an existing Individual Service Adaptation And QoS Control
Subscription resource.
      operationId: DeleteIndServAdaptQoSCtrlSubsc
      tags:
        - Individual Service Adaptation And QoS Control Subscription (Document)
      responses:
        '204':
          description: >
            No Content. The Individual Service Adaptation And QoS Control Subscription resource is
            successfully deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    ServAdaptQoSCtrlSubsc:
      description: >
        Represents a Service Adaptation And QoS Control Subscription.
      type: object
      properties:
        subscTarget:
          $ref: '#/components/schemas/V2xTarget'
        notifUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - subscTarget
        - notifUri

    ServAdaptQoSCtrlSubscPatch:
      description: >
        Represents the requested modifications to a Service Adaptation And QoS Control subscription.
      type: object
      properties:
        subscTarget:
          $ref: '#/components/schemas/V2xTarget'
        notifUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
```

```
    AdaptNotif:
      description: >
        Represents a Service Requirements And QoS Adaptation Notification.
      type: object
      properties:
        subscriptionId:
          type: string
        adaptReports:
          type: array
          items:
            $ref: '#/components/schemas/AdaptReport'
          minItems: 1
      required:
        - subscriptionId
        - adaptReports

    AdaptNotifResp:
      description: >
        Represents the Service Requirements And QoS Adaptation Notification acknowledgment related
        information.
      type: object
      properties:
        result:
          $ref: '#/components/schemas/AckResult'
        adaptFeedbacks:
          type: array
          items:
            $ref: '#/components/schemas/AdaptFeedback'
          minItems: 1
      required:
        - result

    AdaptReport:
      description: >
        Represents a Service Requirements And QoS Adaptation report.
      type: object
      properties:
        ueIdsList:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        qosChangeInfo:
          $ref: '#/components/schemas/QoSChangeInfo'
      required:
        - qosChangeInfo

    AdaptFeedback:
      description: >
        Represents the feedback to a Service Requirements And QoS Adaptation report.
      type: object
      properties:
        ueIdsList:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
      required:
        - ueIdsList

    QoSChangeInfo:
      description: >
        Represents the QoS change related information.
      type: object
      properties:
        loa:
          $ref: '#/components/schemas/LoA'
      anyOf:
        - required: [loa]

    QoSChangeNotif:
      description: >
        Represents a QoS Change Notification.
```

```
      type: object
      properties:
        subscriptionId:
          type: string
        reports:
          type: array
          items:
            $ref: '#/components/schemas/QoSChangeReport'
          minItems: 1
      required:
        - subscriptionId

    QoSChangeReport:
      description: >
        Represents a QoS Change report.
      type: object
      properties:
        ueIdsList:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
      anyOf:
        - required: [ueIdsList]
        - required: [serviceId]

    V2xTarget:
      description: >
        Represents the targeted V2X entity.
      type: object
      properties:
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
      oneOf:
        - required: [groupId]
        - required: [serviceId]
        - required: [ueId]

#
# SIMPLE DATA TYPES
#

#
# ENUMERATIONS
#
    AckResult:
      anyOf:
        - type: string
          enum:
          - POSITIVE
          - NEGATIVE
        - type: string
          description: >
            This string provides forward-compatibility with future extensions to the enumeration
            and is not used to encode content defined in the present version of this API.
      description: |
        Represents the acknowledgement result.
        Possible values are:
        - POSITIVE: Indicates that the acknowledgement is positive.
        - NEGATIVE: Indicates that the acknowledgement is negative.

    LoA:
      anyOf:
        - type: string
          enum:
          - 0_NO_AUTOMATION
          - 1_DRIVER_ASSISTANCE
          - 2_PARTIAL_AUTOMATION
          - 3_CONDITIONAL_AUTOMATION
          - 4_HIGH_AUTOMATION
          - 5_FULL_AUTOMATION
        - type: string
```

```
      description: >
        This string provides forward-compatibility with future extensions to the enumeration
        and is not used to encode content defined in the present version of this API.
  description: |
    Represents the Level of Automation (LoA).
    Possible values are:
    - 0_NO_AUTOMATION: Indicates that the LoA is 0, i.e., No Automation.
    - 1_DRIVER_ASSISTANCE: Indicates that the LoA is 1, i.e., Driver Assistance.
    - 2_PARTIAL_AUTOMATION: Indicates that the LoA is 2, i.e., Partial Automation.
    - 3_CONDITIONAL_AUTOMATION: Indicates that the LoA is 3, i.e., Conditional Automation.
    - 4_HIGH_AUTOMATION: Indicates that the LoA is 4, i.e., High Automation.
    - 5_FULL_AUTOMATION: Indicates that the LoA is 5, i.e., Full Automation.
```

A.12 VAE_VRUZoneManagement API

```
openapi: 3.0.0

info:
  title: VAE Server VRU Zone Management Service
  version: 1.0.0-alpha.2
  description: |
    VAE Server VRU Zone Management Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

servers:
  - url: '{apiRoot}/vae-vzm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122

security:
  - {}
  - oAuth2ClientCredentials: []

paths:
  /subscriptions:
    post:
      summary: Request the creation of a VRU Zone Management Subscription.
      operationId: CreateVRUZoneMngtSubsc
      tags:
        - VRU Zone Management Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VRUZoneMngtSubsc'
      responses:
        '201':
          description: >
            Created. The VRU Zone Management Subscription is successfully created and a
            representation of the created Individual VRU Zone Management Subscription resource
            shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/VRUZoneMngtSubsc'
          headers:
            Location:
              description: >
                Contains the URI of the created Individual VRU Zone Management 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:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    callbacks:
      EnterLeaveNotif:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/EnterLeaveNotif'
            responses:
              '204':
                description: >
                  No Content. The VRU Zone Management Enter/Leave notification is successfully
                  received and acknowledged, and no content is returned in the response body.
              '307':
                $ref: 'TS29122_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29122_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    parameters:
      - name: subscriptionId
        in: path
        description: >
          Represents the identifier of the Individual VRU Zone Management Subscription
          resource.
        required: true
        schema:
          type: string

    get:
      summary: Retrieve an existing Individual VRU Zone Management Subscription resource.
      operationId: GetIndVRUZoneMngtSubsc
      tags:
        - Individual VRU Zone Management Subscription (Document)
      responses:
        '200':
          description: >
            OK. The requested Individual VRU Zone Management Subscription resource shall be
            returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/VRUZoneMngtSubsc'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Request the update of an existing Individual VRU Zone Management Subscription
resource.
      operationId: UpdateIndVRUZoneMngtSubsc
      tags:
        - Individual VRU Zone Management Subscription (Document)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/VRUZoneMngtSubsc'
      responses:
        '200':
          description: >
            OK. The Individual VRU Zone Management Subscription resource is successfully updated
            and a representation of the updated resource shall be returned in the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/VRUZoneMngtSubsc'
        '204':
          description: >
            No Content. The Individual VRU Zone Management Subscription resource is successfully
            updated and no content is returned in the response body.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Request the modification of an existing Individual VRU Zone Management Subscription
resource.
      operationId: ModifyIndVRUZoneMngtSubsc
      tags:
        - Individual VRU Zone Management Subscription (Document)
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/VRUZoneMngtSubscPatch'
      responses:
        '200':
          description: >
```

```
            OK. The Individual VRU Zone Management Subscription resource is successfully modified
            and a representation of the updated resource shall be returned in the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/VRUZoneMngtSubsc'
        '204':
          description: >
            No Content. The Individual VRU Zone Management Subscription resource is successfully
            modified and no content is returned in the response body.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Request the deletion of an existing Individual VRU Zone Management Subscription
resource.
      operationId: DeleteIndVRUZoneMngtSubsc
      tags:
        - Individual VRU Zone Management Subscription (Document)
      responses:
        '204':
          description: >
            No Content. The Individual VRU Zone Management Subscription resource is successfully
            deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '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'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
```

```
    VRUZoneMngtSubsc:
      description: >
        Represents a VRU Zone Management Subscription.
      type: object
      properties:
        requestorId:
          type: string
        ueIdsList:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
        vruZoneInfo:
          $ref: '#/components/schemas/VRUZoneInfo'
        vruAppReqs:
          $ref: '#/components/schemas/VRUAppReqs'
        notifUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        vruZoneId:
          type: string
        areaOfInterest:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        timeValidity:
          $ref: '#/components/schemas/TimeValidity'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - requestorId
        - notifUri
        - vruZoneInfo
        - vruAppReqs

    VRUZoneMngtSubscPatch:
      description: >
        Represents the requested modifications to a VRU Zone Management Subscription.
      type: object
      properties:
        ueIdsList:
          type: array
          items:
            $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
          minItems: 1
          nullable: true
        vruZoneInfo:
          $ref: '#/components/schemas/VRUZoneInfo'
        vruAppReqs:
          $ref: '#/components/schemas/VRUAppReqs'
        notifUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
        areaOfInterest:
          $ref: '#/components/schemas/GeographicAreaRm'
        timeValidity:
          $ref: '#/components/schemas/TimeValidity'

    EnterLeaveNotif:
      description: >
        Represents a VRU Zone Management Enter/Leave Notification.
      type: object
      properties:
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        ueId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xUeId'
        vruZoneInfo:
          $ref: '#/components/schemas/VRUZoneInfo'
        vruZoneId:
          type: string
        enterLeaveInfo:
          $ref: '#/components/schemas/EnterLeaveInfo'
        mobilityInfo:
          $ref: '#/components/schemas/MobilityInfo'
      required:
        - vruZoneInfo
        - vruZoneId
        - enterLeaveInfo
      oneOf:
        - required: [groupId]
        - required: [ueId]
```

```
    VRUZoneInfo:
      description: >
        Represents VRU zone related information.
      type: object
      properties:
        ueTypes:
          type: array
          items:
            $ref: '#/components/schemas/UEType'
          minItems: 1
        zoneType:
          $ref: '#/components/schemas/VRUZoneType'
      required:
        - ueTypes
        - zoneType

    VRUAppReqs:
      description: >
        Represents VRU application requirements.
      type: object
      properties:
        supportedMsgs:
          type: array
          items:
            $ref: '#/components/schemas/MsgType'
          minItems: 1
        appQosReq:
          $ref:
'TS29486_VAE_SessionOrientedService.yaml#/components/schemas/AppplicationQosRequirement'
      anyOf:
        - required: [supportedMsgs]
        - required: [appQosReq]

    TimeValidity:
      description: >
        Represents the time validity information.
      type: object
      properties:
        startTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        endTime:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
      anyOf:
        - required: [startTime]
        - required: [endTime]

    EnterLeaveInfo:
      description: >
        Represents the information related to a V2X UE or a V2X group entering/leaving a VRU
        zone.
      type: object
      properties:
        time:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        duration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
      required:
        - time

    MobilityInfo:
      description: >
        Represents mobility information.
      type: object
      properties:
        speed:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
        direction:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/Direction'
      anyOf:
        - required: [speed]
        - required: [direction]

    GeographicAreaRm:
      description: Geographic area specified by different shape.
      nullable: true
      anyOf:
        - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Point'
```

```
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PointUncertaintyCircle'
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PointUncertaintyEllipse'
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Polygon'
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PointAltitude'
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PointAltitudeUncertainty'
      - $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/EllipsoidArc'

    UEType:
      anyOf:
        - type: string
          enum:
          - V2X
          - PEDESTRIAN
        - type: string
          description: >
            This string provides forward-compatibility with future extensions to the enumeration
            and is not used to encode content defined in the present version of this API.
      description: |
        Represents the type of UE(s) to be considered.
        Possible values are:
        - V2X: Indicates V2X UE(s).
        - PEDESTRIAN: Indicates pedestrian UE(s).

    VRUZoneType:
      anyOf:
        - type: string
          enum:
          - STATIC
          - DYNAMIC
        - type: string
          description: >
            This string provides forward-compatibility with future extensions to the enumeration
            and is not used to encode content defined in the present version of this API.
      description: |
        Represents the VRU zone type.
        Possible values are:
        - STATIC: Indicates that the VRU zone is static.
        - DYNAMIC: Indicates that the VRU zone is dynamic.

    MsgType:
      anyOf:
        - type: string
          enum:
          - VAM
          - CAM
          - DENM
          - BSM
          - CPM
        - type: string
          description: >
            This string provides forward-compatibility with future extensions to the enumeration
            and is not used to encode content defined in the present version of this API.
      description: |
        Represents the message type.
        Possible values are:
        - VAM: Indicates that the message type is VAM.
        - CAM: Indicates that the message type is CAM.
        - DENM: Indicates that the message type is DENM.
        - BSM: Indicates that the message type is BSM.
        - CPM: Indicates that the message type is CPM.
```

A.13 VAE_V2PApplicationRequirement API

```
openapi: 3.0.0

info:
  version: 1.1.0-alpha.2
  title: VAE Server V2P Application Requirement Service
  description: |
    API for VAE Server V2P Application Requirement Service
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    All rights reserved.

externalDocs:
  description: 3GPP TS 29.486 V18.2.0 V2X Application Enabler (VAE) Services
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.486/'

security:
  - {}
  - oAuth2ClientCredentials: []

servers:
  - url: '{apiRoot}/vae-v2P-app-req/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122

paths:
  /provisionings:
    post:
      summary: Request the creation of a V2P Application Requirements Provisioning.
      tags:
        - V2P Application Requirements Provisionings (Collection)
      operationId: CreateV2PAppReqsProv
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/V2pAppReqData'
        required: true
      responses:
        '201':
          description: >
            Created. The V2P Application Requirements Provisioning is successfully created and a
            representation of the created Individual V2P Application Requirements Provisioning
            resource shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2pAppReqData'
          headers:
            Location:
              description: >
                Contains the URI of the created Individual V2P Application Requirements
                Provisioning 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'

  /provisionings/{provId}:
    parameters:
      - name: provId
        in: path
        description: >
          Represents the identifier of the Individual V2P Application Requirements Provisioning
        required: true
        schema:
          type: string

    get:
      summary: Retrieve an existing Individual V2P Application Requirement Provisioning resource.
      operationId: GetIndV2pAppReqsProv
      tags:
        - Individual V2P Application Requirements Provisioning (Document)
      responses:
        '200':
          description: >
            OK. The requested Individual V2P Application Requirements Provisioning resource
            shall be returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2pAppReqData'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Request the update of an existing Individual V2P Application Requirements
Provisioning resource.
      operationId: UpdateIndV2pAppReqsProv
      tags:
        - Individual V2P Application Requirements Provisioning (Document)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/V2pAppReqData'
      responses:
        '200':
          description: >
            OK. The Individual V2P Application Requirements Provisioning resource is successfully
            updated and a representation of the updated resource shall be returned in the response
            body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2pAppReqData'
        '204':
          description: >
            No Content. The Individual V2P Application Requirements Provisioning resource is
            successfully updated and no content is returned in the response body
        '307':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Request the modification of an existing Individual V2P Application Requirements
Provisioning resource.
      operationId: ModifyIndV2pAppReqsProv
      tags:
        - Individual V2P Application Requirements Provisioning (Document)
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/V2pAppReqDataPatch'
      responses:
        '200':
          description: >
            OK. The Individual V2P Application Requirements Provisioning resource is successfully
            modified and a representation of the updated resource shall be returned in the response
            body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/V2pAppReqData'
        '204':
          description: >
            No Content. The Individual V2P Application Requirements Provisioning resource is
            successfully modified and no content is returned in the response body.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Request the deletion of an existing Individual V2P Application Requirements
Provisioning resource.
```

```
      operationId: DeleteIndV2pAppReqsProv
      tags:
        - Individual V2P Application Requirements Provisioning (Document)
      responses:
        '204':
          description: >
            No Content. The Individual V2P Application Requirements Provisioning resource is
            successfully deleted.
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:
    V2pAppReqData:
      description: Represents the V2P Application Requirements Provisioning.
      type: object
      properties:
        requestorId:
          type: string
        serviceId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xServiceId'
        groupId:
          $ref: 'TS29486_VAE_MessageDelivery.yaml#/components/schemas/V2xGroupId'
        v2pQosReqs:
          $ref:
'TS29486_VAE_SessionOrientedService.yaml#/components/schemas/AppplicationQosRequirement'
        trafficPattern:
          $ref: '#/components/schemas/AppTrafficPattern'
        paramOverPc5:
          $ref: 'TS29522_ServiceParameter.yaml#/components/schemas/ParameterOverPc5'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      oneOf:
        - required: [serviceId]
        - required: [groupId]
      required:
        - requestorId
        - v2pQosReqs
        - trafficPattern

    V2pAppReqDataPatch:
      description: >
        Represents the requested modifications to a V2P Application Requirements Provisioning.
      type: object
      properties:
        v2pQosReqs:
          $ref:
'TS29486_VAE_SessionOrientedService.yaml#/components/schemas/AppplicationQosRequirement'
        trafficPattern:
          $ref: '#/components/schemas/AppTrafficPattern'
        paramOverPc5:
```

```
        $ref: 'TS29522_ServiceParameter.yaml#/components/schemas/ParameterOverPc5Rm'

    AppTrafficPattern:
      description: >
        Represents an application traffic pattern for V2P services.
      type: object
      properties:
        timeWindows:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
          minItems: 1
        periodicity:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
      required:
        - timeWindows
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-06						TS skeleton of V2X Application Enabler (VAE) Services	0.0.0
2019-09	CT3#105					Inclusion of C3-193499, C3-193310, C3-193501, C3-193603, C3-193604 and editorial changes from Rapporteur	0.1.0
2019-10	CT3#106					Inclusion of C3-193142, C3-194143, C3-194309, C3-194417, C3-194311 and editorial changes from Rapporteur	0.2.0
2019-11	CT3#107					Inclusion of C3-195320, C3-195102, C3-195321, C3-195322, C3-195323, C3-195407 and editorial changes from Rapporteur	0.3.0
2020-02	CT3#108e					Inclusion of C3-201341, C3-201342, C3-201343, C3-201344, C3-201345, C3-201453, C3-201454, C3-201455 and editorial changes from Rapporteur	0.4.0
2020-03	CT#87e	CP-200186				TS sent to plenary for approval	1.0.0
2020-03	CT#87e	CP-200186				TS approved by plenary	16.0.0
2020-06	CT#88e	CP-201251	0001	1	B	Apiversion of VAE_FileDistribution API	16.1.0
2020-06	CT#88e	CP-201251	0003		F	Correction to DELETE method of VAE_FileDistribution API	16.1.0
2020-06	CT#88e	CP-201251	0004	1	F	Editoral corrections of 29.486	16.1.0
2020-06	CT#88e	CP-201251	0005	1	F	Storage of YAML files	16.1.0
2020-06	CT#88e	CP-201256	0006	1	F	URI of the VAE APIs	16.1.0
2020-06	CT#88e	CP-201251	0007	1	F	Correct resource tree and service	16.1.0
2020-06	CT#88e	CP-201251	0009	1	F	Corrections to apiVersion	16.1.0
2020-06	CT#88e	CP-201251	0010	1	F	Supported headers, Resource Data type and yaml mapping	16.1.0
2020-06	CT#88e	CP-201255	0011		F	Update of OpenAPI version and TS version in externalDocs field	16.1.0
2020-12	CT#90e	CP-203139	0012	1	F	Essential corrections and alignments	16.2.0
2020-12	CT#90e	CP-203139	0013		F	Storage of YAML files in 3GPP Forge	16.2.0
2021-03	CT#91e	CP-210245	0015		F	Error handling of 29.486	16.3.0
2021-03	CT#91e	CP-210236	0014	3	F	Support Redirection for V2XAPP APIs	17.0.0
2021-03	CT#91e	CP-210221	0017	1	F	Adding some missing description fields to data type definitions in OpenAPI specification files	17.0.0
2021-03	CT#91e	CP-210220	0018		F	Corrections to HTTP custom headers handling for Northbound APIs	17.0.0
2021-03	CT#91e	CP-210220	0019		F	OpenAPI reference	17.0.0
2021-03	CT#91e	CP-210240	0020		F	Update of OpenAPI version and TS version in externalDocs field	17.0.0
2021-06	CT#92e	CP-211239	0021	1	F	Additional corrections to HTTP custom headers handling for Northbound APIs	17.1.0
2021-06	CT#92e	CP-211223	0022	3	B	Support Local MBMS	17.1.0
2021-06	CT#92e	CP-211223	0023	2	B	Introduction of VAE_HDMapDynamicInfo service	17.1.0
2021-06	CT#92e	CP-211223	0024	2	B	Procedure of VAE_HDMapDynamicInfo service	17.1.0
2021-06	CT#92e	CP-211223	0025	2	B	Resources and methods of VAE_HDMapDynamicInfo service	17.1.0
2021-06	CT#92e	CP-211223	0026	2	B	OpenAPI file of VAE_HDMapDynamicInfo service	17.1.0
2021-06	CT#92e	CP-211255	0027		F	Correct the subclause number of reference	17.1.0
2021-06	CT#92e	CP-211260	0029		A	Correct referenced datatype for VAE_MessageDelivery	17.1.0
2021-06	CT#92e	CP-211260	0031		A	Correct resourceUri used in Message Delivery procedures	17.1.0
2021-06	CT#92e	CP-211260	0033		A	Correction of Individual Downlink Message Delivery resource name	17.1.0
2021-06	CT#92e	CP-211260	0035		A	Correct service operation name for VAE_FileDistribution	17.1.0
2021-06	CT#92e	CP-211260	0037		A	Correct serivce name and resourceUri for VAE_ApplicationRequirement	17.1.0
2021-06	CT#92e	CP-211260	0039		A	Correct service name and resourceUri for VAE_DynamicGroup	17.1.0
2021-06	CT#92e	CP-211255	0041	1	F	Termination of Downlink Message Delivery procedure	17.1.0
2021-06	CT#92e	CP-211255	0043	1	F	Termination of File Distribution procedure	17.1.0
2021-06	CT#92e	CP-211255	0045	1	F	Network Resource Reservation procedure	17.1.0
2021-06	CT#92e	CP-211260	0047	1	A	Termination of Dynamic Group Configuration procedure	17.1.0
2021-06	CT#92e	CP-211255	0048	1	F	Common default HTTP response	17.1.0
2021-06	CT#92e	CP-211255	0049		F	Termination of Dynamic Group Configuration procedure	17.1.0
2021-06	CT#92e	CP-211179	0050	1	B	Reception report for downlink message delivery	17.1.0
2021-06	CT#92e	CP-211240	0051		B	Reception report for uplink message delivery	17.1.0
2021-06	CT#92e	CP-211241	0052	1	B	Behaviour of the VAE server for VAE_ApplicationRequirement Service	17.1.0
2021-06	CT#92e	CP-211241	0053	1	B	Behaviour of the VAE server for VAE_DynamicGroup Service	17.1.0
2021-06	CT#92e	CP-211240	0054		B	Behaviour of the VAE server for VAE_ServiceContinuity Service	17.1.0
2021-06	CT#92e	CP-211223	0055	1	B	CAPIF support	17.1.0
2021-06	CT#92e	CP-211265	0056		F	Update of OpenAPI version and TS version in externalDocs field	17.1.0
2021-09	CT#93e	CP-212214	0058		F	Resource URI correction on VAE APIs	17.2.0
2021-09	CT#93e	CP-212214	0059		F	Correction of some remaining invalid characters in OpenAPI specification files	17.2.0
2021-09	CT#93e	CP-212223	0060		F	Update of OpenAPI version and TS version in externalDocs field	17.2.0
2021-12	CT#94e	CP-213232	0061		B	Introduction of VAE_SessionOrientedService	17.3.0
2021-12	CT#94e	CP-213232	0062		B	Procedure of VAE_SessionOrientedService	17.3.0
2021-12	CT#94e	CP-213232	0063		B	Resources and methods of VAE_SessionOrientedService	17.3.0
2021-12	CT#94e	CP-213232	0064	2	B	OpenAPI file of VAE_SessionOrientedService	17.3.0
2021-12	CT#94e	CP-213232	0065		B	Introduction of VAE_V2VConfigRequirement	17.3.0
2021-12	CT#94e	CP-213232	0066		B	Procedure of VAE_V2VConfigRequirement	17.3.0

2021-12	CT#94e	CP-213232	0067		B	Resources and methods of VAE_V2VConfigRequirement	17.3.0
2021-12	CT#94e	CP-213232	0068	2	B	OpenAPI file of VAE_PC5ProvisioningRequirement	17.3.0
2021-12	CT#94e	CP-213232	0069		B	Introduction of VAE_PC5ProvisioningRequirement	17.3.0
2021-12	CT#94e	CP-213232	0070		B	Procedure of VAE_PC5ProvisioningRequirement	17.3.0
2021-12	CT#94e	CP-213232	0071	2	B	Resources and methods of VAE_PC5ProvisioningRequirement	17.3.0
2021-12	CT#94e	CP-213232	0072	2	B	OpenAPI file of VAE_PC5ProvisioningRequirement	17.3.0
2021-12	CT#94e	CP-213220	0073		B	Alignment with SA3 supported TLS profiles	17.3.0
2022-03	CT#95e	CP-220184	0078		F	Correction to VAE_PC5ProvisioningRequirement Service	17.4.0
2022-03	CT#95e	CP-220184	0079		F	Correction to VAE_SessionOrientedService Service	17.4.0
2022-03	CT#95e	CP-220184	0080		F	Correction to VAE_V2VConfigRequirement Service	17.4.0
2022-03	CT#95e	CP-220201	0081		F	Formatting of Description Fields	17.4.0
2022-03	CT#95e	CP-220194	0082		F	Update of info and externalDocs fields	17.4.0
2022-06	CT#96	CP-221147	0083	1	F	VAE_DynamicGroup API corrections	17.5.0
2022-06	CT#96	CP-221147	0084	2	F	Removing the apiVersion placeholder from the Resource URI variables tables	17.5.0
2022-06	CT#96	CP-221151	0085		F	Update of info and externalDocs fields	17.5.0
2022-09	CT#97e	CP-222117	0086		F	Correction of the "SubscriptionId" resource URI variable name	17.6.0
2022-12	CT#98e	CP-223185	0088		F	Correction of the tables for the re-used, API-specific data structures in VAE APIs	18.0.0
2022-12	CT#98e	CP-223185	0089	1	F	Correction the enumerations in the VAE OpenAPI files	18.0.0
2022-12	CT#98e	CP-223185	0090		F	Correction of the OpenAPI file formating and descriptions in the VAE APIs	18.0.0
2022-12	CT#98e	CP-223189	0091		F	Update of info and externalDocs fields	18.0.0
2023-12	CT#102	CP-233252	0093	1	B	Define the service description clauses of the VAE_ServiceAndQoSControlInfo API	18.1.0
2023-12	CT#102	CP-233252	0094	2	B	Define the API definition clauses of the VAE_VRUZoneManagement API	18.1.0
2023-12	CT#102	CP-233252	0095	2	B	Define the OpenAPI description of the VAE_ServiceAndQoSControlInfo API	18.1.0
2023-12	CT#102	CP-233252	0096	1	B	Define the service description clauses of the VAE_VRUZoneManagement API	18.1.0
2023-12	CT#102	CP-233252	0097	2	B	Define the API definition clauses of the VAE_ServiceAndQoSControlInfo API	18.1.0
2023-12	CT#102	CP-233252	0098	2	B	Define the OpenAPI description of the VAE_VRUZoneManagement API	18.1.0
2023-12	CT#102	CP-233231	0099	2	F	Updating the obsoleted IETF HTTP RFCs	18.1.0
2023-12	CT#102	CP-233232	0101	1	F	Various necessary updates and corrections	18.1.0
2023-12	CT#102	CP-233252	0102		B	Define the API definition clauses of the VAE_V2PApplicationRequirement API	18.1.0
2023-12	CT#102	CP-233252	0103	1	B	Define the service description clauses of the VAE_V2PApplicationRequirement API	18.1.0
2023-12	CT#102	CP-233252	0104		B	Define the OpenAPI description of the VAE_V2PApplicationRequirement API	18.1.0
2023-12	CT#102	CP-233237	0105		F	Update of info and externalDocs fields	18.1.0
2024-03	CT#103	CP-240171	0106		F	Implementation of CR #0099	18.2.0
2024-03	CT#103	CP-240189	0107	1	A	Missing parameter in VAE_FileDistribution API	18.2.0
2024-03	CT#103	CP-240171	0108	1	F	Various corrections to several data models	18.2.0
2024-03	CT#103	CP-240171	0109	1	B	V2X service id in VAE_MessageDelivery API	18.2.0
2024-03	CT#103	CP-240195	0110		B	Complete the definition of the VAE_ServiceAndQoSControlInfo API	18.2.0
2024-03	CT#103	CP-240244	0111	2	B	Complete the definition of the VAE_VRUZoneManagement API	18.2.0
2024-03	CT#103	CP-240195	0112		B	Complete the definition of the VAE_V2PApplicationRequirement API	18.2.0
2024-03	CT#103	CP-240166	0117		F	Update of info and externalDocs fields	18.2.0

History

Document history		
V18.2.0	May 2024	Publication