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Foreword

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

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

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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].

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 7540: "Hypertext Transfer Protocol Version 2 (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 7230: "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing".

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

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

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

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

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

[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".

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].

Void

3.2 Symbols

For the purposes of the present document, the following symbols apply:

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
V2X	Vehicle-to-Everything
VAE	V2X Application Enabler
NRM	Network Resource Management

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

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	V2X application specific server
	Deliver_UL_Message	Subscribe/Notify	V2X application specific server
	V2X_MessageDelivery_Subscribe		V2X application specific server
	V2X_MessageDelivery_Unsubscribe		V2X application specific server
VAE_FileDistribution	Distribute_File	Request/ Response	V2X application specific server
VAE_ApplicationRequirement	Reserve_NetworkResource	Subscribe/Notify	V2X application specific server
	Notify_NetworkResource		
VAE_DynamicGroup	Configure_DynamicGroup	Subscribe/Notify	V2X application specific server
VAE_ServiceContinuity	Query_ServiceContinuity	Request/Response	VAE server
VAE_HDMapDynamicInfo	Subscribe_HDMapDynamicInfo	Subscribe/Notify	V2X application specific server
VAE_SessionOrientedService	Establish_Session	Subscribe/Notify	V2X application specific server
	Notify_Establish_Session		
	Update_Session		
	Notify_Update_Session		
	Terminate_Session		
	Notify_Terminate_Session		
VAE_V2VConfigRequirement	Request_V2VConfigRequirement	Request/Response	V2X application specific server
VAE_PC5ProvisioningRequirement	Config_PC5ProvisioningRequirement	Subscribe/Notify	V2X application specific server
	Notify_PC5ProvisioningRequirement		

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.19

5.2 VAE_MessageDelivery Service

5.2.1 Service Description

This service enables a NF 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 VAE_MessageDelivery service supports following service operations:

- V2X_MessageDelivery_Subscribe;
- V2X_MessageDelivery_Unsubscribe;
- Deliver_DL_Message; and
- Deliver_UL_Message.

5.2.2.2 V2X_MessageDelivery_Subscribe

5.2.2.2.1 General

The V2X_MessageDelivery_Subscribe service operation is used to create a subscription for V2X messages delivery between the V2X application specific server and VAE server.

5.2.2.2.2 Message Delivery Subscribe

Figure 5.2.2.2.2-1: Message delivery subscribe

When the NF service consumer (e.g. V2X application specific server) needs to receive the message from the V2X UE and/or send the message to the V2X UE, the NF 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 NF service consumer shall include MessageDeliverySubscriptionData data structure in the payload body 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 NF service consumer within MessageDeliverySubscriptionData data structure shall include:

- The identity of the V2X application specific server 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF 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 NF 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".

5.2.2.3 V2X_MessageDelivery_Unsubscribe

5.2.2.3.1 General

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

5.2.2.3.2 Message Delivery Unsubscribe

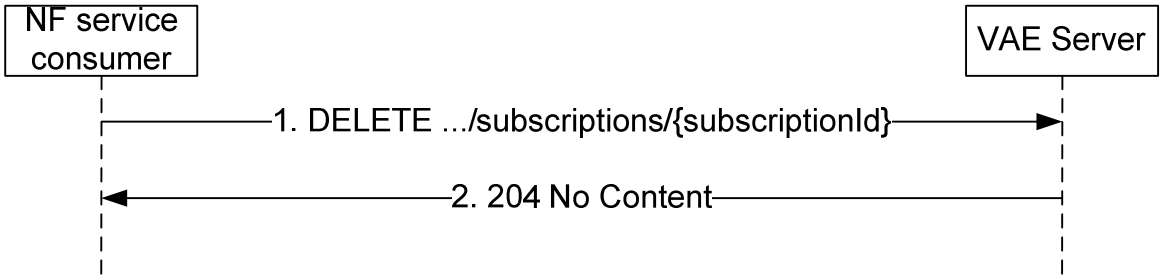

Figure 5.2.2.3.2-1: message delivery unsubscribe

When the NF service consumer (e.g. V2X application specific server) needs to remove an existing subscription for receiving the message from the V2X UE or sending the message to the V2X UE, the NF 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 using the Deliver_DL_Message service operation are supported:

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

5.2.2.4.2 Downlink Message Delivery

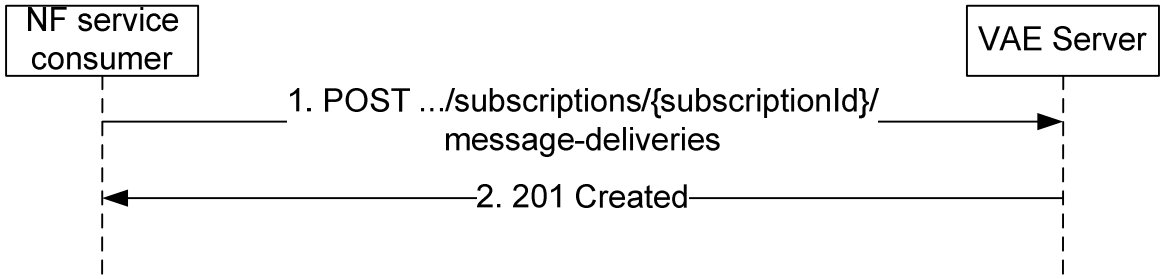

Figure 5.2.2.4.2-1: Downlink Message Delivery

When the NF service consumer (e.g. V2X application specific server) needs to send the message to the V2X UE, the NF 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 NF service consumer shall include DownlinkMessageDeliveryData data structure in the payload body 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 NF 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;
- V2X message payload carried by the V2X message within the "payload" attribute;

and may include:

- The duration within the "duration" attribute; and
- The geographical area identifier within the "geoId" attribute.

When the VAE Server receives the HTTP POST request from the NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The NF 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 NF 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 NF 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: Termination of Downlink Message Delivery

When the NF service consumer (e.g. V2X application specific server) needs to terminate the message delivery to the V2X UE, the NF 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 NF 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 NF 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 NF service consumer (e.g. V2X application specific server).

5.2.2.5.2 Deliver Uplink Message

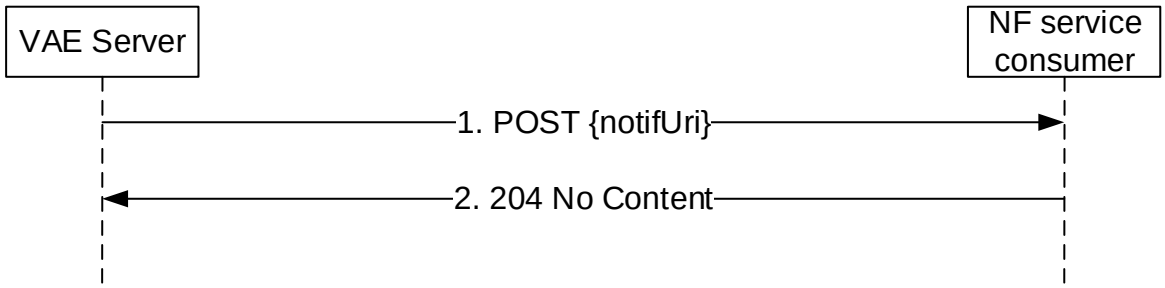

Figure 5.2.2.5.2-1: Deliver Uplink Message

If the VAE Server receives the uplink message for a V2X UE which an NF service consumer has subscribed to or a V2X UE belongs to a V2X group which the NF 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 NF 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.

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

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

When the VAE Server receives the response from the NF 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 V2X application specific server 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 using the Distribute_File service operation are supported:

- File Distribution;
- Termination of File Distribution.

5.3.2.2.2 File Distribution

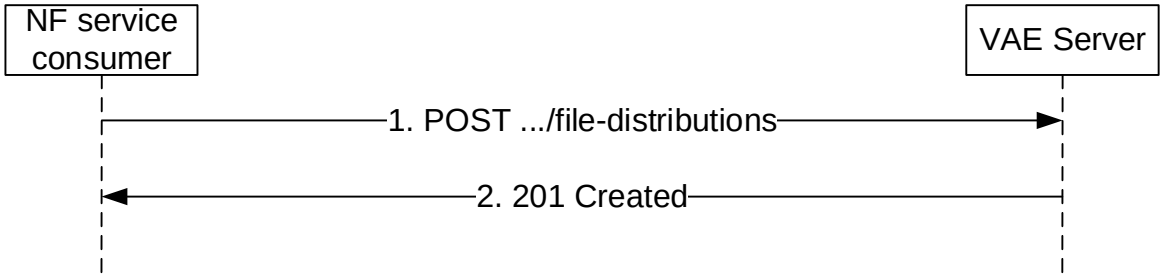

Figure 5.3.2.2.2-1: File Distribution

When the NF service consumer (e.g. V2X application specific server) needs to distribute the file to the V2X UEs, the NF 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 NF service consumer shall include FileDistributionData data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF 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

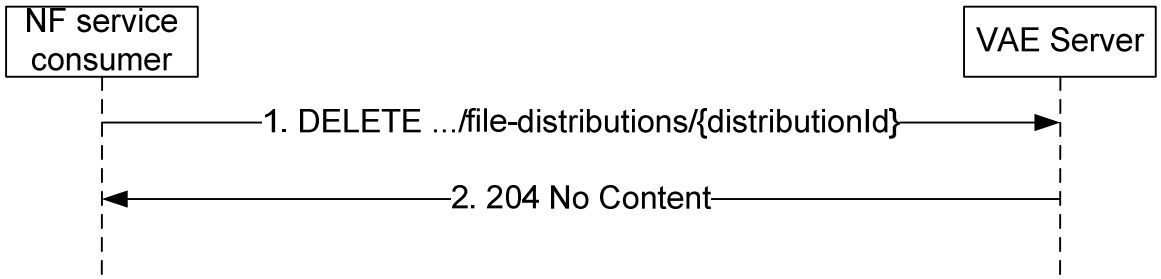

Figure 5.3.2.2.3-1: Termination of File Distribution

When the NF service consumer (e.g. V2X application specific server) needs to terminate the File Distribution to the V2X UE, the NF 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 NF 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 NF 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 V2X application specific server 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 using the Reserve_NetworkResource service operation are supported:

- Network Resource Reservation;
- Termination of Network Resource Reservation

5.4.2.2.2 Network Resource Reservation

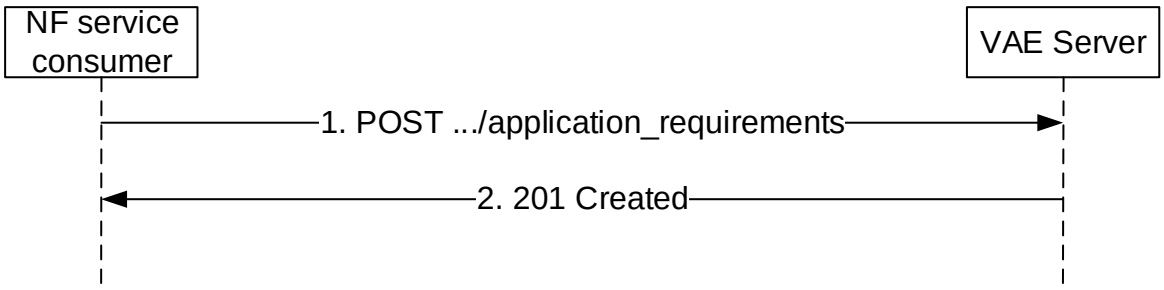

Figure 5.4.2.2.2-1: Network Resource Reservation

When the NF service consumer (e.g. V2X application specific server) needs to provide V2X application requirement to the underlying 3GPP network, the NF 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 NF service consumer shall include ApplicationRequirementData data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF 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 NF 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

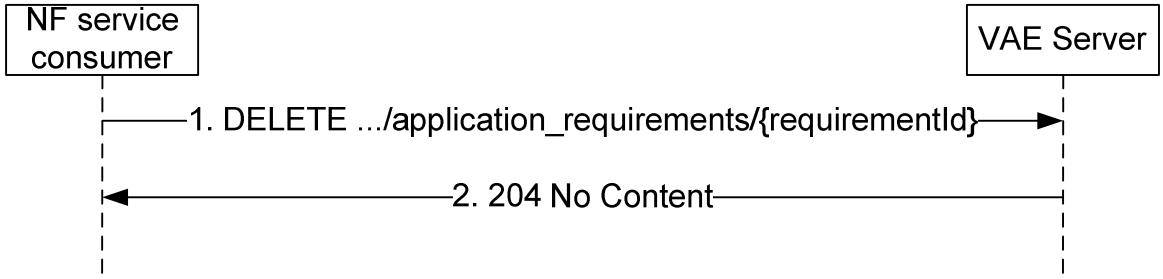

Figure 5.4.2.2.3-1: Termination of Network Resource Reservation

When the NF service consumer (e.g. V2X application specific server) needs to terminate network resource reservation, the NF 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 NF 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 NF 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.

5.4.2.3.2 Notify Network Resource

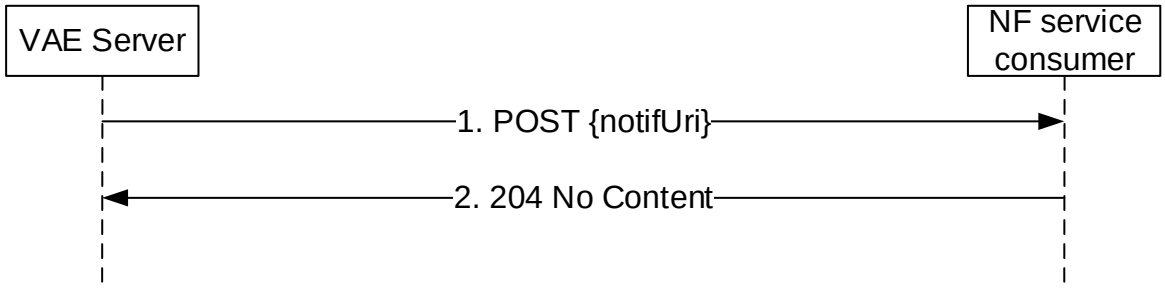

Figure 5.4.2.3.2-1: Notify Network Resource

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 NF 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 NF service consumer successfully processed and accepted the received HTTP POST request, the NF 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 V2X application specific server 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 using the Configure_DynamicGroup service operation are supported:

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

5.5.2.2.2 Dynamic Group Configuration

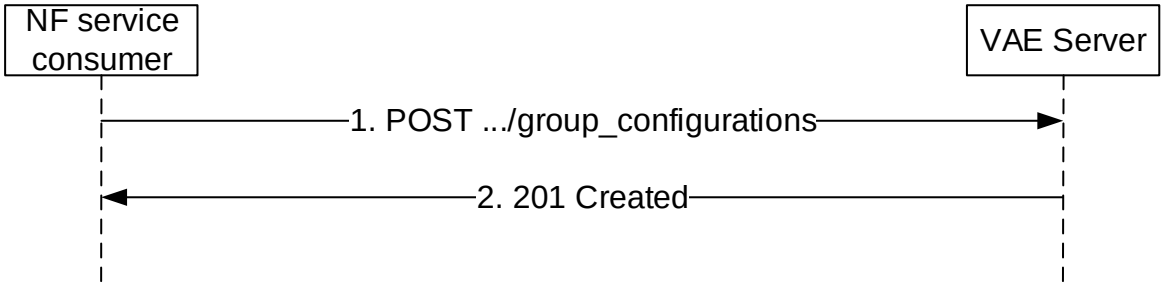

Figure 5.5.2.2.2-1: Dynamic Group Configuration

When the NF service consumer (e.g. V2X application specific server) needs to configures the dynamic group information at the VAE server, the NF 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 NF service consumer shall include GroupConfigurationData data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF 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 NF 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

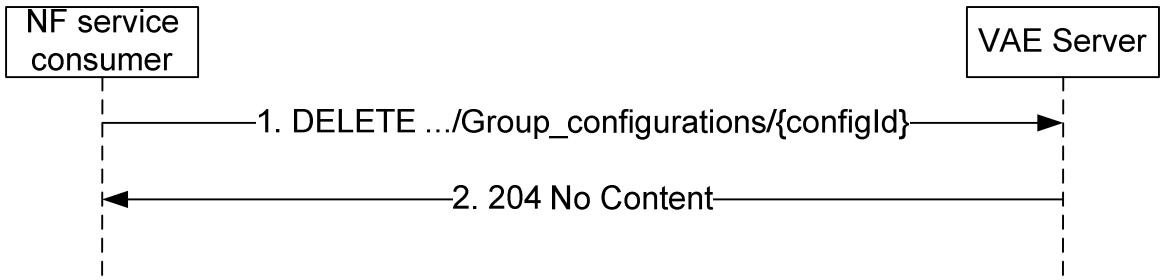

Figure 5.5.2.2.3-1: Termination of Dynamic Group Configuration

When the NF service consumer (e.g. V2X application specific server) needs to terminate the Dynamic Group Configuration at the VAE server, the NF 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 NF 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 NF 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.

5.5.2.3.2 Notify Dynamic Group

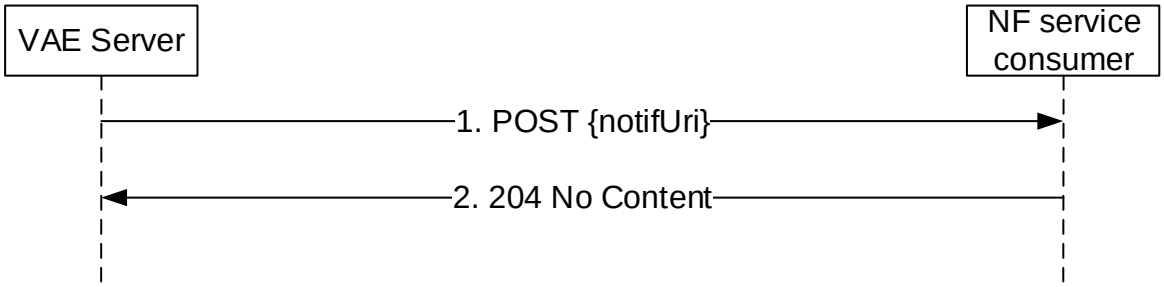

Figure 5.5.2.3.2-1: Notify Dynamic Group

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 NF 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 NF service consumer shall send an "204 No Content" HTTP response for a succesfull processing.

If errors occur when processing the HTTP POST request, the NF 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.

5.6.2.2.2 Query service continuity

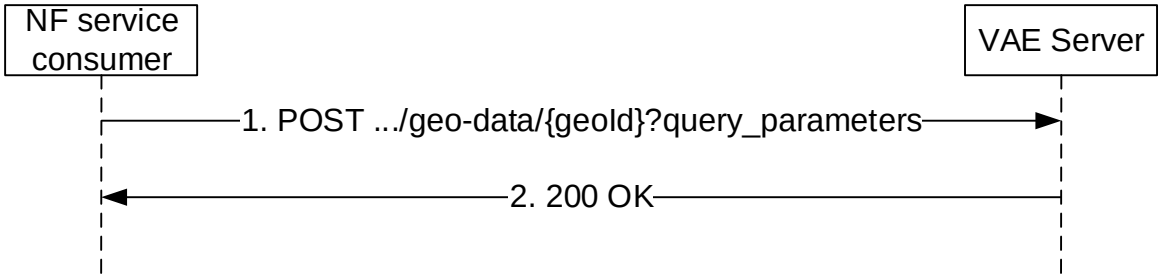

Figure 5.6.2.2.2-1: Query service continuity

When the NF 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 NF 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 NF 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 V2X application specific server 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.

5.7.2.2.2 Subscribe HD Map Dynamic Information

Figure 5.7.2.2.2-1: Subscribe HD Map Dynamic Information

When the NF service consumer (e.g. V2X application specific server) needs to subscribe for the HD map dynamic information, the NF 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 NF service consumer shall include HdMapDynamicInfoData data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The NF 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 NF 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 NF 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.

5.7.2.3.2 Notify HD Map Dynamic Information

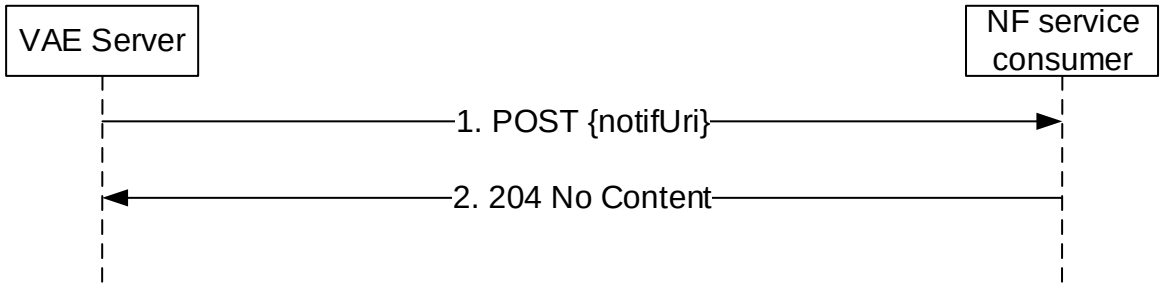

Figure 5.7.2.3.2-1: Notify HD Map Dynamic Information

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 NF 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 NF service consumer successfully processed and accepted the received HTTP POST request, the NF 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 V2X application specific server 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.

5.8.2.2.2 Establish Session

Figure 5.8.2.2.2-1: Establish Session

When the NF service consumer (e.g. V2X application specific server) needs to trigger the establishment of the session-oriented service by the VAE server, the NF 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 NF service consumer shall include SessionOrientedData data structure in the payload body 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 NF 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 V2X application specific server 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The NF 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 NF 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.

5.8.2.3.2 Notify Establish Session

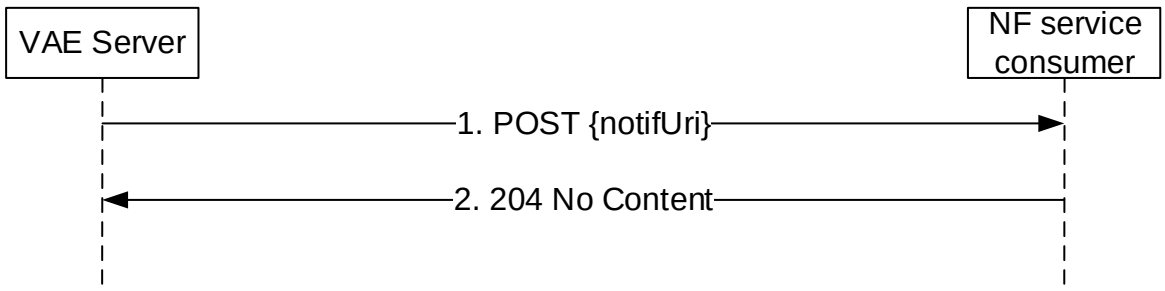

Figure 5.8.2.3.2-1: Notify Establish Session

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 NF 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 NF service consumer successfully processed and accepted the received HTTP POST request, the NF 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.

5.8.2.4.2 Update Session

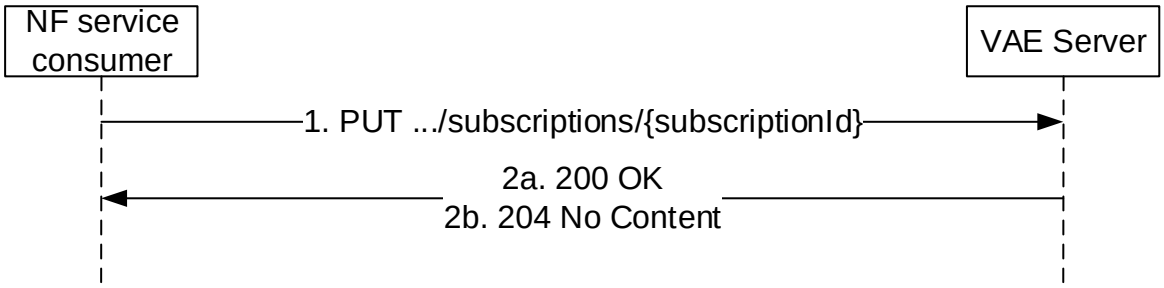

Figure 5.8.2.4.2-1: Update Session

When the NF service consumer (e.g. V2X application specific server) needs to trigger the update to the session-oriented service by the VAE server, the NF 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 NF service consumer shall include SessionOrientedData data structure in the payload body 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 V2X application specific server shall remain unchanged from previous values.

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

After the VAE Server responded to the NF 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.

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.

5.8.2.6.2 Terminate Session

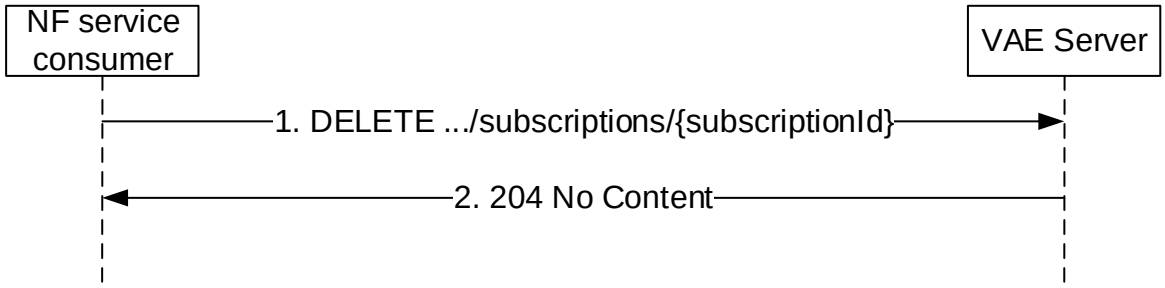

Figure 5.8.2.6.2-1: Terminate Session

When the NF service consumer (e.g. V2X application specific server) needs to trigger the termination of the session-oriented service by the VAE server, the NF 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 NF service consumer, the VAE server shall authorize the request from the NF 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 NF 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 V2X application specific server 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 V2X application specific server.

5.9.2.2.2 Request V2V Configuration Requirement

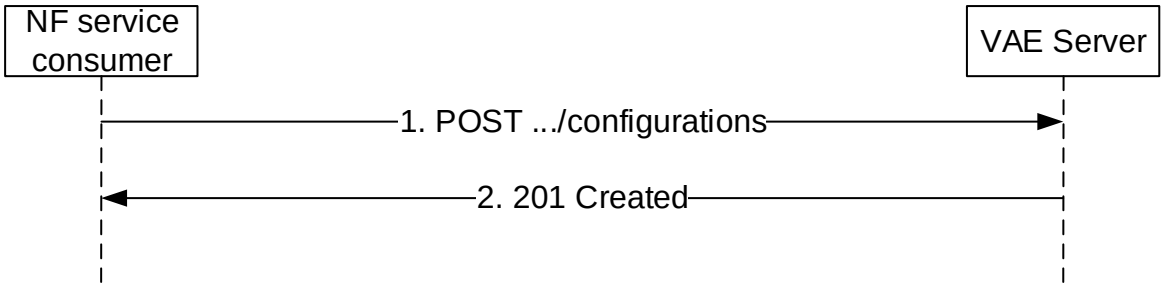

Figure 5.9.2.2.2-1: Request_V2VConfigRequirement

When the NF service consumer (e.g. V2X application specific server) needs to provide a V2V configuration requirement, the NF 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 NF service consumer shall include V2vConfigurationData data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The NF 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 NF 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 NF service consumer.

The NF service consumer may include the V2vConfigurationData data structure in the payload body 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF service consumer. If the authorization is successful, the VAE Server shall update the "Individual V2V Configuration" and respond to the NF service consumer with a 200 OK or 204 No Content status code. After the VAE Server responded to the NF 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 NF 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 NF service consumer with a 204 No Content success message. After the VAE Server responded to the NF 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 V2X application specific server 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 V2X application specific server to provide a V2X PC5 provisioning requirement to the VAE server.

5.10.2.2.2 Config_PC5ProvisioningRequirement

Figure 5.10.2.2.2-1: Config_PC5ProvisioningRequirement

When the NF service consumer (e.g. V2X application specific server) needs to provide a V2X PC5 provisioning requirement to the VAE server, the NF 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 NF service consumer shall include ProvisioningRequirement data structure in the payload body 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 NF 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF 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 NF service consumer with a 201 Created message, including Location header field containing the URI for the created resource.

The NF 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 NF 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 NF service consumer may include the ProvisioningRequirement data structure in the payload body 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 NF service consumer, the VAE server shall make an authorization based on the information received from the NF service consumer. If the authorization is successful, the VAE Server shall update the "Individual PC5 Provisioning Requirement Subscription" and respond to the NF service consumer with a 200 OK or 204 No Content status code. After the VAE Server responded to the NF 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 NF 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 NF service consumer with a 204 No Content success message. After the VAE Server responded to the NF 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.

5.10.2.3.2 Notify_PC5ProvisioningRequirement

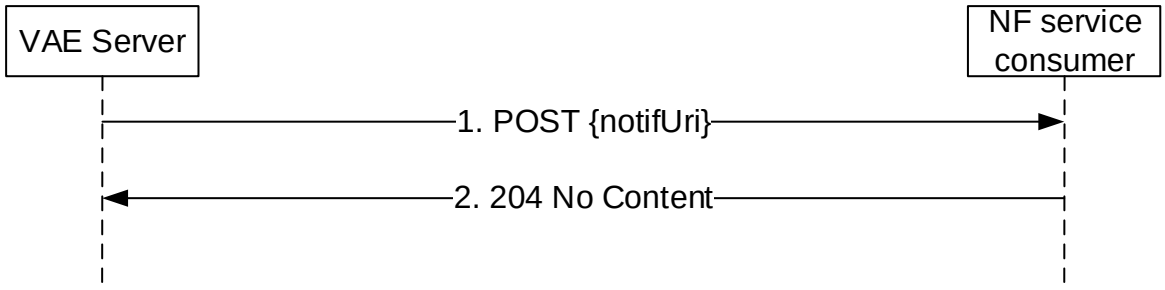

Figure 5.10.2.3.2-1: Notify_PC5ProvisioningRequirement

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 NF 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 NF service consumer successfully processed and accepted the received HTTP POST request, the NF 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.

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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

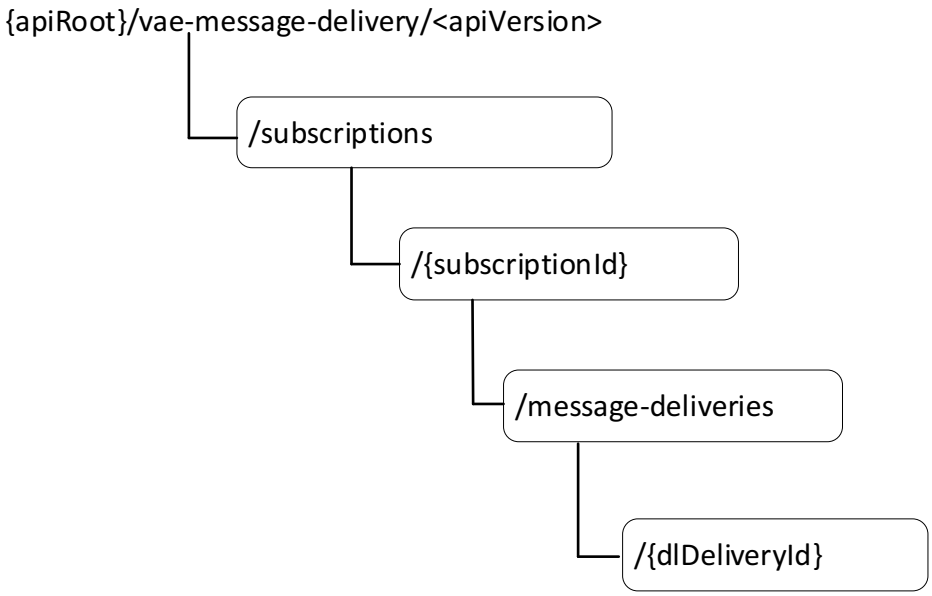

Figure 6.1.3.1-1: Resource URI structure of the VAE_MessageDelivery API

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

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.1.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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 NF 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	O	0..1	Indicates an identifier of the V2X UE.	
groupId	V2xGroupId	O	0..1	Indicates a group ID for which the V2X message is addressed.	
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 NF 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 V2X application specific server.	
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 NF 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.	
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.

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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

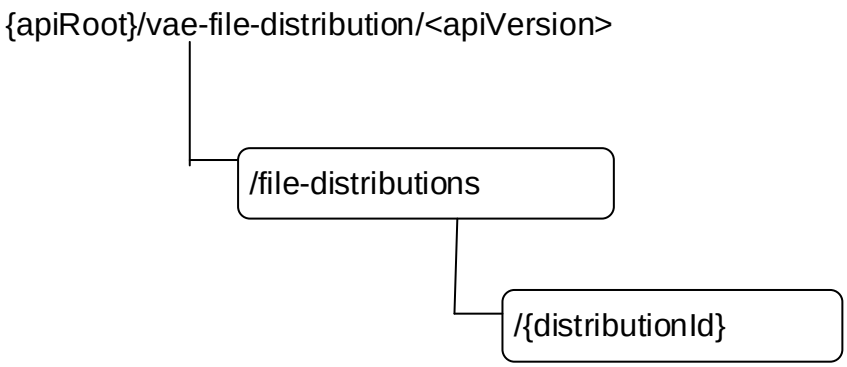

Figure 6.2.3.1-1: Resource URI structure of the VAE_FileDistribution API

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
FileStatus	6.2.6.3.3		
FileDistributionData	6.2.6.2.2		
Filelist	6.2.6.2.3		
LocalMbmsInfo	6.2.6.2.4		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 NF 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 NF 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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

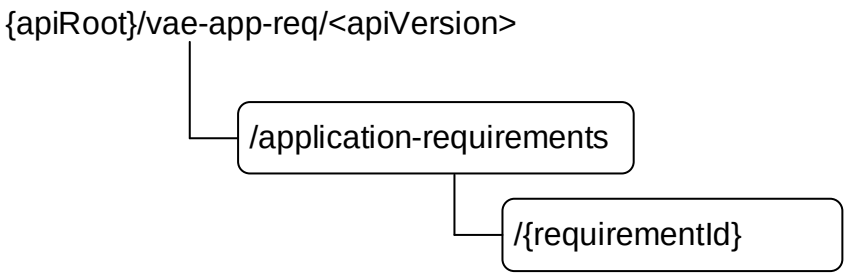

Figure 6.3.3.1-1: Resource URI structure of the VAE_ApplicationRequirement API

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

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.3.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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		
AppReqNotification	6.3.6.2.4		
ApplicationRequirementData	6.3.6.2.2		
ReservationResult	6.3.6.3.4		
ServiceLevel	6.3.6.3.3		

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]		
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]	URI.	
V2xGroupId	6.1.6.3.2		
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	O	0..1	Indicates a UE ID for which the V2X message is addressed. (NOTE)	
groupId	V2xGroupId	O	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 NF 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 NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

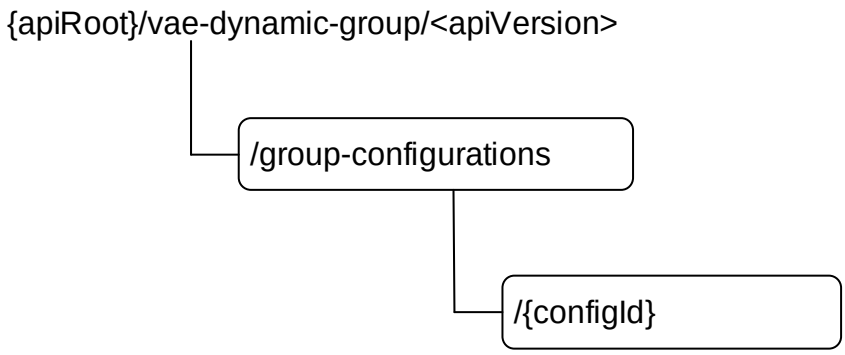

Figure 6.4.3.1-1: Resource URI structure of the VAE_DynamicGroup API

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

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.4.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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		
GroupConfigurationData	6.3.6.2.2		

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]		
TestNotification	3GPP TS 29.122 [22]	Represents a notification that can be sent to test whether a chosen notification mechanism works.	Notification_test_event
V2xGroupId	6.1.6.3.2		
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 NF 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 NF 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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

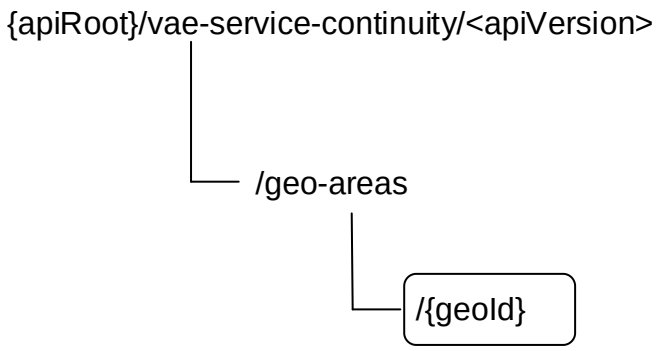

Figure 6.5.3.1-1: Resource URI structure of the VAE_ServiceContinuity API

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		

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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

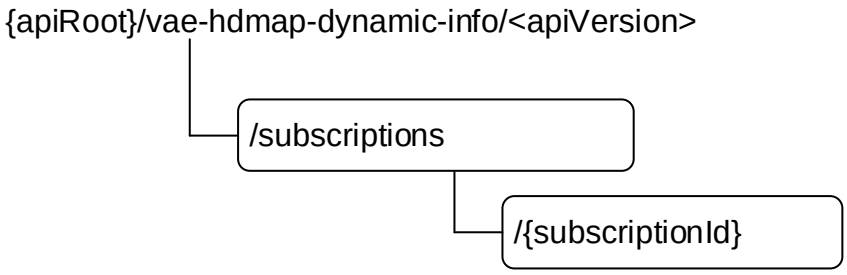

Figure 6.6.3.1-1: Resource URI structure of the VAE_HDMapDynamicInfo API

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 NF service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the NF service consumer described in clause 6.6.5.2.

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.6.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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		
HdMapDynamicInfoNotification	6.6.6.2.3		
NearbyUeInfo	6.6.6.2.4		

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]		
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]	URI.	
Uinteger	3GPP TS 29.571 [11]		
UserLocation	3GPP TS 29.571 [11]		
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 NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

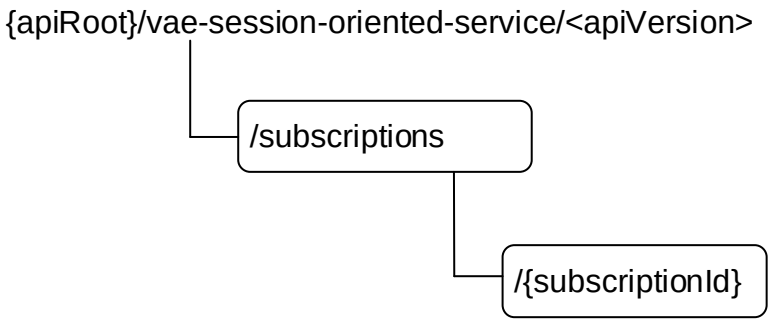

Figure 6.7.3.1-1: Resource URI structure of the VAE_SessionOrientedService API

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 DELETE

This method shall support the URI query parameters specified in table 6.7.3.3.3-1.

Table 6.7.3.3.3-1: 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 6.7.3.3.3-2 and the response data structures and response codes specified in table 6.7.3.3.3-3.

Table 6.7.3.3.3-2: 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: 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 6.7.3.3.3-4: 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 NF service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the NF service consumer described in clause 6.7.5.2.

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.7.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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	6.7.6.3.4	Contains the application layer QoS requirement.	
Notification	6.7.6.2.3	Contains the result of the establishment or update of the session-oriented service.	
SessionOrientedData	6.7.6.2.2	Contains 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
AverWindow	3GPP TS 29.571 [11]		
ExtMaxDataBurstVol	3GPP TS 29.571 [11]		
PacketDelBudget	3GPP TS 29.571 [11]		
PacketErrRate	3GPP TS 29.571 [11]		
QosResourceType	3GPP TS 29.571 [11]		
Result	6.1.6.3.3		
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
Uinteger	3GPP TS 29.571 [11]		
Uri	3GPP TS 29.571 [11]	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 V2X application specific server.	
appQosReq	AppplicationQosRequirement	O	0..1	The application QoS requirements for the session-oriented service.	
requestTestNotification	boolean	O	0..1	Set to true by the NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
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	PQI is a special 5QI (see clause 5.4.2.1 of 3GPP TS 23.287 [30]).	
resourceType	QosResourceType	C	0..1	Indicates whether the resource type is GBR, delay critical GBR, or non-GBR.	
priorityLevel	Uinteger	C	0..1	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.	
packetDelayBudget	PacketDelBudget	C	0..1	Unsigned integer indicates the packet delay budget. Packet Delay Budget expressed in milliseconds.	
packetErrorRate	PacketErrRate	C	0..1	String indicating 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".	
averagingWindow	AverWindow	C	0..1	Indicates the averaging window. This IE shall be present only for a GBR QoS flow or a Delay Critical GBR QoS flow.	
maxDataBurstVol	ExtMaxDataBurstVol	C	0..1	Unsigned Integer. Indicates the maximum data burst volume.	
NOTE: Either "pqi" attribute or "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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

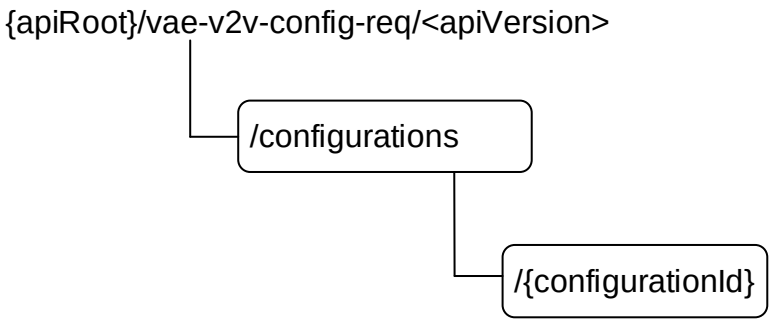

Figure 6.8.3.1-1: Resource URI structure of the VAE_V2VConfigRequirement API

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		
SupportedFeatures	3GPP TS 29.571 [11]		
Uri	3GPP TS 29.571 [11]	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.	
serviceId	V2xServiceId	C	1	The V2X service ID for which application requirement corresponds to.	
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 NF 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 7230 [12], IETF RFC 7231 [13], IETF RFC 7232 [14], IETF RFC 7233 [15], IETF RFC 7234 [16] and IETF RFC 7235 [17]) 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 7540 [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.

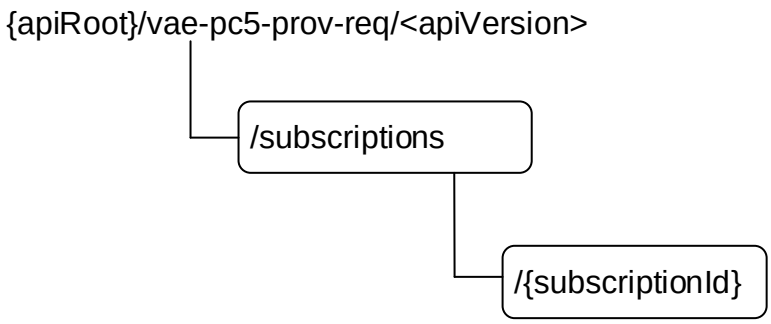

Figure 6.9.3.1-1: Resource URI structure of the VAE_PC5ProvisioningRequirement API

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 NF service consumer shall support the delivery of Notifications using a separate HTTP connection towards an address as assigned the NF service consumer described in clause 6.9.5.2.

A VAE server and NF service consumer may support testing a notification connection as described in clause 6.9.5.3. A VAE server and NF 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 NF 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 NF 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 NF 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		
ProvisioningRequirement	6.9.6.2.2		

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		
AppServerId	6.1.6.3.2	Identity of the V2X application specific server.	
PlmnId	3GPP TS 29.571 [11]		
Result	6.2.6.3.3		
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]	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	
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.	
groupId	V2xGroupId	C	0..1	Identity of the V2X group for which the V2X application requirement is initiated.	
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 NF service consumer to request the VAE server to send a test notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.	Notification_test_event
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.

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 NF service consumer (e.g. V2X application specific server) 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 NF service consumer (e.g. V2X application specific server), 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 NF service consumer (e.g. V2X application specific server) 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 NF service consumer (e.g. V2X application specific server) and the VAE server, the the NF service consumer (e.g. V2X application specific server), 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 NF service consumer (e.g. V2X application specific server) 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 NF service consumer (e.g. V2X application specific server) 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: 1.1.0
  title: VAE_MessageDelivery
  description: |
    API for VAE Message Delivery Service
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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'
        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 NF 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'
        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
    AppServerId:
      description: Represents the V2X application specific server 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: 1.1.1
  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 V17.7.0 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'
    FileStatus:
      description: Represents a file status.
      anyOf:
      - type: string
        enum:
          - PENDING
          - FETCHED
          - PREPARED
          - TRANSMITTING
          - SENT
      - type: string
```

A.4 VAE_ApplicationRequirement API

```
openapi: 3.0.0
info:
  version: 1.1.0
  title: VAE_ApplicationRequirement
  description: |
    API for VAE Application Requirement Service
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    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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 NF service consumer to request the VAE server to send a test
            notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.
        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
    ServiceLevel:
      description: Indicates a service level for application service.
      anyOf:
      - type: string
        enum:
          - HIGH
          - MEDIUM
          - LOW
      - type: string
    ReservationResult:
      description: Represents the result of the network resource adaptation corresponding to the V2X
application requirement.
      anyOf:
      - type: string
        enum:
```

```
          - SUCCESSFUL
          - FAILURE
      - type: string
```

A.5 VAE_DynamicGroup API

```
openapi: 3.0.0
info:
  version: 1.1.0
  title: VAE_DynamicGroup
  description: |
    VAE_Dynamic_Group Service
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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 NF 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: 1.1.0
  title: VAE_Service Continuity
  description: |
    API for VAE Service Continuity Service
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    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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: 1.0.0
  title: VAE_HDMapDynamicInfo
  description: |
    API for VAE HDMapDynamicInfo Service
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    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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 NF service consumer to request the VAE server to send a test
            notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.
        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

```
openapi: 3.0.0
info:
  version: 1.0.0
  title: VAE_SessionOrientedService
  description: |
    API for VAE_SessionOrientedService
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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 an Individual Session Oriented Service Subscription resource.
      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 NF service consumer to request the VAE server to send a test
            notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - ueId
        - notifUri
        - serviceId
        - appSerId
    Notification:
      description: Represents a notificaton of result of 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'
    Action:
      description: Indicate the action to the session-oriented service.
      anyOf:
      - type: string
        enum:
          - ESTABLISHMENT
          - UPDATE
      - type: string
```

A.9 VAE_V2VConfigRequirement

```
openapi: 3.0.0
info:
  version: 1.0.0
  title: VAE_V2VConfigRequirement
  description: |
    API for VAE_V2VConfigRequirement
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```

```
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.486 V17.5.0 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

```
openapi: 3.0.0
info:
  version: 1.0.0
  title: VAE_PC5ProvisioningRequirement
  description: |
    API for VAE_PC5ProvisioningRequirement
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    All rights reserved.
externalDocs:
```

```
  description: 3GPP TS 29.486 V17.5.0 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 NF service consumer to request the VAE server to send a test
            notification as defined in clause 6.3.5.3. Set to false or omitted otherwise.
        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
```

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
2024-03	CT#103	CP-240189	0114		A	Missing parameter in VAE_FileDistribution API	17.7.0
2024-03	CT#103	CP-240200	0116		F	Update of info and externalDocs fields	17.7.0

History

Document history		
V17.4.0	May 2022	Publication
V17.5.0	June 2022	Publication
V17.6.0	September 2022	Publication
V17.7.0	April 2024	Publication