3GPP TS 29.486 V16.4.0 (2021-06)

Technical Specification

3rd Generation Partnership Project;

Technical Specification Group Core Network and Terminals;

V2X Application Enabler (VAE) Services;

Stage 3

(Release 16)

** 

The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP.  
The present document has not been subject to any approval process by the 3GPPOrganizational Partners and shall not be implemented.  
This Specification is provided for future development work within 3GPPonly. The Organizational Partners accept no liability for any use of this Specification.  
Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices.

Keywords

***3GPP***

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis

Valbonne - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

***Copyright Notification***

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© 2021, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

UMTS™ is a Trade Mark of ETSI registered for the benefit of its members

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  
LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners

GSM® and the GSM logo are registered and owned by the GSM Association

Contents

Foreword [14](#__RefHeading___Toc70426559)

1 Scope [14](#__RefHeading___Toc70426560)

2 References [14](#__RefHeading___Toc70426561)

3 Definitions of terms, symbols and abbreviations [15](#__RefHeading___Toc70426562)

3.1 Terms [15](#__RefHeading___Toc70426563)

3.2 Symbols [15](#__RefHeading___Toc70426564)

3.3 Abbreviations [15](#__RefHeading___Toc70426565)

4 Overview [16](#__RefHeading___Toc70426566)

5 Services offered by the V2X Application Enabler [16](#__RefHeading___Toc70426567)

5.1 Introduction [16](#__RefHeading___Toc70426568)

5.2 VAE\_MessageDelivery Service [17](#__RefHeading___Toc70426569)

5.2.1 Service Description [17](#__RefHeading___Toc70426570)

5.2.2 Service Operations [17](#__RefHeading___Toc70426571)

5.2.2.1 Introduction [17](#__RefHeading___Toc70426572)

5.2.2.2 V2X\_MessageDelivery\_Subscribe [17](#__RefHeading___Toc70426573)

5.2.2.2.1 General [17](#__RefHeading___Toc70426574)

5.2.2.2.2 Message Delivery Subscribe [17](#__RefHeading___Toc70426575)

5.2.2.3 V2X\_MessageDelivery\_Unsubscribe [18](#__RefHeading___Toc70426576)

5.2.2.3.1 General [18](#__RefHeading___Toc70426577)

5.2.2.3.2 Message Delivery Unsubscribe [19](#__RefHeading___Toc70426578)

5.2.2.4 Deliver\_DL\_Message [19](#__RefHeading___Toc70426579)

5.2.2.4.1 General [19](#__RefHeading___Toc70426580)

5.2.2.4.2 Deliver Downlink Message [20](#__RefHeading___Toc70426581)

5.2.2.5 Deliver\_UL\_Message [21](#__RefHeading___Toc70426582)

5.2.2.5.1 General [21](#__RefHeading___Toc70426583)

5.2.2.5.2 Deliver Uplink Message [21](#__RefHeading___Toc70426584)

5.3 VAE\_FileDistribution Service [21](#__RefHeading___Toc70426585)

5.3.1 Service Description [21](#__RefHeading___Toc70426586)

5.3.2 Service Operations [21](#__RefHeading___Toc70426587)

5.3.2.1 Introduction [21](#__RefHeading___Toc70426588)

5.3.2.2 Distribute\_File [22](#__RefHeading___Toc70426589)

5.3.2.2.1 General [22](#__RefHeading___Toc70426590)

5.3.2.2.2 Distribute File [22](#__RefHeading___Toc70426591)

5.4 VAE\_ApplicationRequirement Service [23](#__RefHeading___Toc70426592)

5.4.1 Service Description [23](#__RefHeading___Toc70426593)

5.4.2 Service Operations [23](#__RefHeading___Toc70426594)

5.4.2.1 Introduction [23](#__RefHeading___Toc70426595)

5.4.2.2 Reserve\_NetworkResource [23](#__RefHeading___Toc70426596)

5.4.2.2.1 General [23](#__RefHeading___Toc70426597)

5.4.2.2.2 Reserve Network Resource [24](#__RefHeading___Toc70426598)

5.4.2.3 Notify\_NetworkResource [24](#__RefHeading___Toc70426599)

5.4.2.3.1 General [24](#__RefHeading___Toc70426600)

5.4.2.3.2 Notify Network Resource [25](#__RefHeading___Toc70426601)

5.5 VAE\_DynamicGroup Service [25](#__RefHeading___Toc70426602)

5.5.1 Service Description [25](#__RefHeading___Toc70426603)

5.5.2 Service Operations [25](#__RefHeading___Toc70426604)

5.5.2.1 Introduction [25](#__RefHeading___Toc70426605)

5.5.2.2 Configure\_DynamicGroup [25](#__RefHeading___Toc70426606)

5.5.2.2.1 General [25](#__RefHeading___Toc70426607)

5.5.2.2.2 Configure Dynamic Group [26](#__RefHeading___Toc70426608)

5.5.2.3 Notify\_DynamicGroup [26](#__RefHeading___Toc70426609)

5.5.2.3.1 General [26](#__RefHeading___Toc70426610)

5.5.2.3.2 Notify Dynamic Group [27](#__RefHeading___Toc70426611)

5.6 VAE\_ServiceContinuity Service [27](#__RefHeading___Toc70426612)

5.6.1 Service Description [27](#__RefHeading___Toc70426613)

5.6.2 Service Operations [27](#__RefHeading___Toc70426614)

5.6.2.1 Introduction [27](#__RefHeading___Toc70426615)

5.6.2.2 Query\_ServiceContinuity [27](#__RefHeading___Toc70426616)

5.6.2.2.1 General [27](#__RefHeading___Toc70426617)

5.6.2.2.2 Query service continuity [28](#__RefHeading___Toc70426618)

6 API Definitions [28](#__RefHeading___Toc70426619)

6.1 VAE\_MessageDelivery Service API [28](#__RefHeading___Toc70426620)

6.1.1 Introduction [28](#__RefHeading___Toc70426621)

6.1.2 Usage of HTTP [29](#__RefHeading___Toc70426622)

6.1.2.1 General [29](#__RefHeading___Toc70426623)

6.1.2.2 HTTP standard headers [29](#__RefHeading___Toc70426624)

6.1.2.2.1 General [29](#__RefHeading___Toc70426625)

6.1.2.2.2 Content type [29](#__RefHeading___Toc70426626)

6.1.2.3 HTTP custom headers [29](#__RefHeading___Toc70426627)

6.1.2.3.1 General [29](#__RefHeading___Toc70426628)

6.1.3 Resources [30](#__RefHeading___Toc70426629)

6.1.3.1 Overview [30](#__RefHeading___Toc70426630)

6.1.3.2 Resource: Message Delivery Subscriptions [31](#__RefHeading___Toc70426631)

6.1.3.2.1 Description [31](#__RefHeading___Toc70426632)

6.1.3.2.2 Resource Definition [31](#__RefHeading___Toc70426633)

6.1.3.2.3 Resource Standard Methods [31](#__RefHeading___Toc70426634)

6.1.3.2.3.1 POST [31](#__RefHeading___Toc70426635)

6.1.3.2.4 Resource Custom Operations [31](#__RefHeading___Toc70426636)

6.1.3.3 Resource: Individual Message Delivery Subscription [32](#__RefHeading___Toc70426637)

6.1.3.3.1 Description [32](#__RefHeading___Toc70426638)

6.1.3.3.2 Resource definition [32](#__RefHeading___Toc70426639)

6.1.3.3.3 Resource Standard Methods [32](#__RefHeading___Toc70426640)

6.1.3.3.3.1 GET [32](#__RefHeading___Toc70426641)

6.1.3.3.3.2 DELETE [32](#__RefHeading___Toc70426642)

6.1.3.3.4 Resource Custom Operations [33](#__RefHeading___Toc70426643)

6.1.3.4 Resource: Downlink Message Deliveries [33](#__RefHeading___Toc70426644)

6.1.3.4.1 Description [33](#__RefHeading___Toc70426645)

6.1.3.4.2 Resource Definition [33](#__RefHeading___Toc70426646)

6.1.3.4.3 Resource Standard Methods [33](#__RefHeading___Toc70426647)

6.1.3.4.3.1 POST [33](#__RefHeading___Toc70426648)

6.1.3.4.4 Resource Custom Operations [34](#__RefHeading___Toc70426649)

6.1.3.5 Resource: Individual Downlink Message Delivery [34](#__RefHeading___Toc70426650)

6.1.3.3.1 Description [34](#__RefHeading___Toc70426651)

6.1.3.5.2 Resource definition [34](#__RefHeading___Toc70426652)

6.1.3.5.3 Resource Standard Methods [35](#__RefHeading___Toc70426653)

6.1.3.5.3.1 GET [35](#__RefHeading___Toc70426654)

6.1.3.5.3.2 DELETE [35](#__RefHeading___Toc70426655)

6.1.3.3.4 Resource Custom Operations [35](#__RefHeading___Toc70426656)

6.1.4 Custom Operations without associated resources [36](#__RefHeading___Toc70426657)

6.1.5 Notifications [36](#__RefHeading___Toc70426658)

6.1.5.1 General [36](#__RefHeading___Toc70426659)

6.1.5.2 Notification Delivery using a separate HTTP connection [36](#__RefHeading___Toc70426660)

6.1.5.3 Notification Test Event [36](#__RefHeading___Toc70426661)

6.1.5.4 Notification Delivery using Websocket [36](#__RefHeading___Toc70426662)

6.1.5.5 Methods [36](#__RefHeading___Toc70426663)

6.1.5.6 Uplink Message Delivery [36](#__RefHeading___Toc70426664)

6.1.5.6.1 Description [36](#__RefHeading___Toc70426665)

6.1.5.6.2 Operation Definition [36](#__RefHeading___Toc70426666)

6.1.6 Data Model [37](#__RefHeading___Toc70426667)

6.1.6.1 General [37](#__RefHeading___Toc70426668)

6.1.6.2 Structured data types [38](#__RefHeading___Toc70426669)

6.1.6.2.1 Introduction [38](#__RefHeading___Toc70426670)

6.1.6.2.2 Type: DownlinkMessageDeliveryData [38](#__RefHeading___Toc70426671)

6.1.6.2.3 Type: MessageDeliverySubscriptionData [39](#__RefHeading___Toc70426672)

6.1.6.2.4 Type: UplinkMessageDeliveryData [39](#__RefHeading___Toc70426673)

6.1.6.3 Simple data types and enumerations [39](#__RefHeading___Toc70426674)

6.1.6.3.1 Introduction [39](#__RefHeading___Toc70426675)

6.1.6.3.2 Simple data types [39](#__RefHeading___Toc70426676)

6.1.7 Error Handling [40](#__RefHeading___Toc70426677)

6.1.7.1 General [40](#__RefHeading___Toc70426678)

6.1.7.2 Protocol Errors [40](#__RefHeading___Toc70426679)

6.1.7.3 Application Errors [40](#__RefHeading___Toc70426680)

6.1.8 Feature negotiation [40](#__RefHeading___Toc70426681)

6.2 VAE\_FileDistribution Service API [41](#__RefHeading___Toc70426682)

6.2.1 Introduction [41](#__RefHeading___Toc70426683)

6.2.2 Usage of HTTP [41](#__RefHeading___Toc70426684)

6.2.2.1 General [41](#__RefHeading___Toc70426685)

6.2.2.2 HTTP standard headers [41](#__RefHeading___Toc70426686)

6.2.2.2.1 General [41](#__RefHeading___Toc70426687)

6.2.2.2.2 Content type [41](#__RefHeading___Toc70426688)

6.2.2.3 HTTP custom headers [41](#__RefHeading___Toc70426689)

6.2.2.3.1 General [41](#__RefHeading___Toc70426690)

6.2.3 Resources [42](#__RefHeading___Toc70426691)

6.2.3.1 Overview [42](#__RefHeading___Toc70426692)

6.2.3.2 Resource: File Distributions [42](#__RefHeading___Toc70426693)

6.2.3.2.1 Description [42](#__RefHeading___Toc70426694)

6.2.3.2.2 Resource Definition [42](#__RefHeading___Toc70426695)

6.2.3.2.3 Resource Standard Methods [43](#__RefHeading___Toc70426696)

6.2.3.2.3.1 POST [43](#__RefHeading___Toc70426697)

6.2.3.2.4 Resource Custom Operations [43](#__RefHeading___Toc70426698)

6.2.3.3 Resource: Individual File Distribution [43](#__RefHeading___Toc70426699)

6.2.3.3.1 Description [43](#__RefHeading___Toc70426700)

6.2.3.3.2 Resource definition [43](#__RefHeading___Toc70426701)

6.2.3.3.3 Resource Standard Methods [44](#__RefHeading___Toc70426702)

6.2.3.3.3.1 GET [44](#__RefHeading___Toc70426703)

6.2.3.3.3.2 DELETE [44](#__RefHeading___Toc70426704)

6.2.3.4 Resource Custom Operations [45](#__RefHeading___Toc70426705)

6.2.4 Custom Operations without associated resources [45](#__RefHeading___Toc70426706)

6.2.5 Notifications [45](#__RefHeading___Toc70426707)

6.2.6 Data Model [45](#__RefHeading___Toc70426708)

6.2.6.1 General [45](#__RefHeading___Toc70426709)

6.2.6.2 Structured data types [45](#__RefHeading___Toc70426710)

6.2.6.2.1 Introduction [45](#__RefHeading___Toc70426711)

6.2.6.2.2 Type: FileDistributionData [46](#__RefHeading___Toc70426712)

6.2.6.2.3 Type: FileList [46](#__RefHeading___Toc70426713)

6.2.6.3 Simple data types and enumerations [47](#__RefHeading___Toc70426714)

6.2.6.3.1 Introduction [47](#__RefHeading___Toc70426715)

6.2.6.3.2 Simple data types [47](#__RefHeading___Toc70426716)

6.2.6.3.3 Enumeration: FileStatus [47](#__RefHeading___Toc70426717)

6.2.7 Error Handling [47](#__RefHeading___Toc70426718)

6.2.7.1 General [47](#__RefHeading___Toc70426719)

6.2.7.2 Protocol Errors [47](#__RefHeading___Toc70426720)

6.2.7.3 Application Errors [47](#__RefHeading___Toc70426721)

6.2.8 Feature negotiation [48](#__RefHeading___Toc70426722)

6.3 VAE\_ApplicationRequirement API [48](#__RefHeading___Toc70426723)

6.3.1 Introduction [48](#__RefHeading___Toc70426724)

6.3.2 Usage of HTTP [48](#__RefHeading___Toc70426725)

6.3.2.1 General [48](#__RefHeading___Toc70426726)

6.3.2.2 HTTP standard headers [48](#__RefHeading___Toc70426727)

6.3.2.2.1 General [48](#__RefHeading___Toc70426728)

6.3.2.2.2 Content type [49](#__RefHeading___Toc70426729)

6.3.2.3 HTTP custom headers [49](#__RefHeading___Toc70426730)

6.3.2.3.1 General [49](#__RefHeading___Toc70426731)

6.3.3 Resources [49](#__RefHeading___Toc70426732)

6.3.3.1 Overview [49](#__RefHeading___Toc70426733)

6.3.3.2 Resource: Application Requirements [49](#__RefHeading___Toc70426734)

6.3.3.2.1 Description [49](#__RefHeading___Toc70426735)

6.3.3.2.2 Resource Definition [49](#__RefHeading___Toc70426736)

6.3.3.2.3 Resource Standard Methods [50](#__RefHeading___Toc70426737)

6.3.3.2.3.1 POST [50](#__RefHeading___Toc70426738)

6.3.3.2.4 Resource Custom Operations [50](#__RefHeading___Toc70426739)

6.3.3.3 Resource: Individual Application Requirement [50](#__RefHeading___Toc70426740)

6.3.3.3.1 Description [50](#__RefHeading___Toc70426741)

6.3.3.3.2 Resource definition [50](#__RefHeading___Toc70426742)

6.3.3.3.3 Resource Standard Methods [51](#__RefHeading___Toc70426743)

6.3.3.3.3.1 GET [51](#__RefHeading___Toc70426744)

6.3.3.3.3.2 DELETE [51](#__RefHeading___Toc70426745)

6.3.3.4 Resource Custom Operations [52](#__RefHeading___Toc70426746)

6.3.4 Custom Operations without associated resources [52](#__RefHeading___Toc70426747)

6.3.5 Notifications [52](#__RefHeading___Toc70426748)

6.3.5.1 General [52](#__RefHeading___Toc70426749)

6.3.5.2 Notification Delivery using a separate HTTP connection [52](#__RefHeading___Toc70426750)

6.3.5.3 Notification Test Event [52](#__RefHeading___Toc70426751)

6.3.5.4 Notification Delivery using Websocket [52](#__RefHeading___Toc70426752)

6.3.5.5 Methods [53](#__RefHeading___Toc70426753)

6.3.5.6 Notify Network Resource [53](#__RefHeading___Toc70426754)

6.3.5.6.1 Description [53](#__RefHeading___Toc70426755)

6.3.5.6.2 Operation Definition [53](#__RefHeading___Toc70426756)

6.3.6 Data Model [53](#__RefHeading___Toc70426757)

6.3.6.1 General [53](#__RefHeading___Toc70426758)

6.3.6.2 Structured data types [54](#__RefHeading___Toc70426759)

6.3.6.2.1 Introduction [54](#__RefHeading___Toc70426760)

6.3.6.2.2 Type: ApplicationRequirementData [55](#__RefHeading___Toc70426761)

6.3.6.2.3 Type: ApplicationRequirement [55](#__RefHeading___Toc70426762)

6.3.6.2.4 Type: AppReqNotification [56](#__RefHeading___Toc70426763)

6.3.6.3 Simple data types and enumerations [56](#__RefHeading___Toc70426764)

6.3.6.3.1 Introduction [56](#__RefHeading___Toc70426765)

6.3.6.3.2 Simple data types [56](#__RefHeading___Toc70426766)

6.3.6.3.3 Enumeration: ServiceLevel [56](#__RefHeading___Toc70426767)

6.3.6.3.4 Enumeration: ReservationResult [56](#__RefHeading___Toc70426768)

6.3.7 Error Handling [56](#__RefHeading___Toc70426769)

6.3.7.1 General [56](#__RefHeading___Toc70426770)

6.3.7.2 Protocol Errors [57](#__RefHeading___Toc70426771)

6.3.7.3 Application Errors [57](#__RefHeading___Toc70426772)

6.3.8 Feature negotiation [57](#__RefHeading___Toc70426773)

6.4 VAE\_DynamicGroup API [57](#__RefHeading___Toc70426774)

6.4.1 Introduction [57](#__RefHeading___Toc70426775)

6.4.2 Usage of HTTP [58](#__RefHeading___Toc70426776)

6.4.2.1 General [58](#__RefHeading___Toc70426777)

6.4.2.2 HTTP standard headers [58](#__RefHeading___Toc70426778)

6.4.2.2.1 General [58](#__RefHeading___Toc70426779)

6.4.2.2.2 Content type [58](#__RefHeading___Toc70426780)

6.4.2.3 HTTP custom headers [58](#__RefHeading___Toc70426781)

6.4.2.3.1 General [58](#__RefHeading___Toc70426782)

6.4.3 Resources [58](#__RefHeading___Toc70426783)

6.4.3.1 Overview [58](#__RefHeading___Toc70426784)

6.4.3.2 Resource: Group Configurations [59](#__RefHeading___Toc70426785)

6.4.3.2.1 Description [59](#__RefHeading___Toc70426786)

6.4.3.2.2 Resource Definition [59](#__RefHeading___Toc70426787)

6.4.3.2.3 Resource Standard Methods [59](#__RefHeading___Toc70426788)

6.4.3.2.3.1 POST [59](#__RefHeading___Toc70426789)

6.4.3.2.4 Resource Custom Operations [60](#__RefHeading___Toc70426790)

6.4.3.3 Resource: Individual Group Configuration [60](#__RefHeading___Toc70426791)

6.4.3.3.1 Description [60](#__RefHeading___Toc70426792)

6.4.3.3.2 Resource definition [60](#__RefHeading___Toc70426793)

6.4.3.3.3 Resource Standard Methods [60](#__RefHeading___Toc70426794)

6.4.3.3.3.1 GET [60](#__RefHeading___Toc70426795)

6.4.3.3.3.2 DELETE [61](#__RefHeading___Toc70426796)

6.4.3.4 Resource Custom Operations [61](#__RefHeading___Toc70426797)

6.4.4 Custom Operations without associated resources [61](#__RefHeading___Toc70426798)

6.4.5 Notifications [61](#__RefHeading___Toc70426799)

6.4.5.1 General [61](#__RefHeading___Toc70426800)

6.4.5.2 Notification Delivery using a separate HTTP connection [62](#__RefHeading___Toc70426801)

6.4.5.3 Notification Test Event [62](#__RefHeading___Toc70426802)

6.4.5.4 Notification Delivery using Websocket [62](#__RefHeading___Toc70426803)

6.4.5.5 Methods [62](#__RefHeading___Toc70426804)

6.4.5.6 Notify Dynamic Group [62](#__RefHeading___Toc70426805)

6.4.5.6.1 Description [62](#__RefHeading___Toc70426806)

6.4.5.6.2 Operation Definition [62](#__RefHeading___Toc70426807)

6.4.6 Data Model [63](#__RefHeading___Toc70426808)

6.4.6.1 General [63](#__RefHeading___Toc70426809)

6.4.6.2 Structured data types [63](#__RefHeading___Toc70426810)

6.4.6.2.1 Introduction [63](#__RefHeading___Toc70426811)

6.4.6.2.2 Type: GroupConfigurationData [64](#__RefHeading___Toc70426812)

6.4.6.2.3 Type: DynamicGroupNotification [64](#__RefHeading___Toc70426813)

6.4.6.3 Simple data types and enumerations [65](#__RefHeading___Toc70426814)

6.4.6.3.1 Introduction [65](#__RefHeading___Toc70426815)

6.4.6.3.2 Simple data types [65](#__RefHeading___Toc70426816)

6.4.7 Error Handling [65](#__RefHeading___Toc70426817)

6.4.7.1 General [65](#__RefHeading___Toc70426818)

6.4.7.2 Protocol Errors [65](#__RefHeading___Toc70426819)

6.4.7.3 Application Errors [65](#__RefHeading___Toc70426820)

6.4.8 Feature negotiation [65](#__RefHeading___Toc70426821)

6.5 VAE\_ServiceContinuity Service API [66](#__RefHeading___Toc70426822)

6.5.1 Introduction [66](#__RefHeading___Toc70426823)

6.5.2 Usage of HTTP [66](#__RefHeading___Toc70426824)

6.5.2.1 General [66](#__RefHeading___Toc70426825)

6.5.2.2 HTTP standard headers [66](#__RefHeading___Toc70426826)

6.5.2.2.1 General [66](#__RefHeading___Toc70426827)

6.5.2.2.2 Content type [66](#__RefHeading___Toc70426828)

6.5.2.3 HTTP custom headers [67](#__RefHeading___Toc70426829)

6.5.2.3.1 General [67](#__RefHeading___Toc70426830)

6.5.3 Resources [67](#__RefHeading___Toc70426831)

6.5.3.1 Overview [67](#__RefHeading___Toc70426832)

6.5.3.2 Resource: Individual Geographical Area [67](#__RefHeading___Toc70426833)

6.5.3.2.1 Description [67](#__RefHeading___Toc70426834)

6.5.3.2.2 Resource Definition [67](#__RefHeading___Toc70426835)

6.5.3.2.3 Resource Standard Methods [68](#__RefHeading___Toc70426836)

6.5.3.2.3.1 GET [68](#__RefHeading___Toc70426837)

6.5.3.2.4 Resource Custom Operations [68](#__RefHeading___Toc70426838)

6.5.4 Custom Operations without associated resources [68](#__RefHeading___Toc70426839)

6.5.5 Notifications [68](#__RefHeading___Toc70426840)

6.5.6 Data Model [68](#__RefHeading___Toc70426841)

6.5.6.1 General [68](#__RefHeading___Toc70426842)

6.5.6.2 Structured data types [69](#__RefHeading___Toc70426843)

6.5.6.2.1 Introduction [69](#__RefHeading___Toc70426844)

6.5.6.2.2 Type: V2xServiceInfo [69](#__RefHeading___Toc70426845)

6.5.6.3 Simple data types and enumerations [69](#__RefHeading___Toc70426846)

6.5.6.3.1 Introduction [69](#__RefHeading___Toc70426847)

6.5.6.3.2 Simple data types [69](#__RefHeading___Toc70426848)

6.5.7 Error Handling [69](#__RefHeading___Toc70426849)

6.5.7.1 General [69](#__RefHeading___Toc70426850)

6.5.7.2 Protocol Errors [70](#__RefHeading___Toc70426851)

6.5.7.3 Application Errors [70](#__RefHeading___Toc70426852)

6.5.8 Feature negotiation [70](#__RefHeading___Toc70426853)

7 Security [70](#__RefHeading___Toc70426854)

Annex A (normative): OpenAPI specification [71](#__RefHeading___Toc70426855)

A.1 General [71](#__RefHeading___Toc70426856)

A.2 VAE\_MessageDelivery API [71](#__RefHeading___Toc70426857)

A.3 VAE\_FileDistribution API [76](#__RefHeading___Toc70426858)

A.4 VAE\_ApplicationRequirement API [79](#__RefHeading___Toc70426859)

A.5 VAE\_DynamicGroup API [82](#__RefHeading___Toc70426860)

A.6 VAE\_ServiceContinuity API [85](#__RefHeading___Toc70426861)

Annex B (informative): Change history [87](#__RefHeading___Toc70426862)

# 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 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.

[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".

# 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].

V2X Vehicle-to-Everything

VAE V2X Application Enabler

# 4 Overview

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

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

The Vs interface supports the following APIs:

- VAE\_MessageDelivery

- VAE\_FileDistribution

- VAE\_ApplicationRequirement

- VAE\_DynamicGroup

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 |

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 |

## 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 subclause 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 subclause 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.

##### 5.2.2.4.2 Deliver Downlink Message



Figure 5.2.2.4.2-1: V2X 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 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".

Upon receipt of the HTTP DELETE message from the NF service consumer, the VAE Server shall check if the Individual 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 Message Delivery resource locally.

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

## 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.

##### 5.3.2.2.2 Distribute File



Figure 5.3.2.2.2-1: Distribute File

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; and

- 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 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".

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 HTTP POST or DELETE request, the VAE Server shall apply error handling procedures as specified in subclause 6.2.7.

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

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 |

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

## 5.4 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.

##### 5.4.2.2.2 Reserve Network Resource



Figure 5.4.2.2.2-1: Reserve Network Resource

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 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".

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 POST or DELETE request, the VAE Server shall apply error handling procedures as specified in subclause 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, 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 subclause 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.

##### 5.5.2.2.2 Configure Dynamic Group



Figure 5.5.2.2.2-1: Configure Dynamic Group

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.

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".

Upon receipt of the HTTP DELETE message from the NF service consumer, the VAE Server shall check if the Individual 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.

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

When the message delivery duration expires, the VAE server may remove the associated Individual Message Delivery 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), 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 subclause 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, 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 subclause 6.5.7.

# 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 (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\_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 mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [2] shall be applicable.

### 6.1.3 Resources

#### 6.1.3.1 Overview



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 |
| apiVersion | 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 |
| MessageDeliverySubscriptionData | 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 |
| MessageDeliverySubscriptionData | 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 |
| apiVersion | string | See clause 6.1.1 |
| subscriptionId | string | Unique identifier of the individual Message Delivery Subscription resource for the V2X UE IDor 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. |
| 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. | | | | |

###### 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. |
| 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. | | | | |

##### 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 |
| apiVersion | string | See clause 6.1.1 |
| subscriptionId | string | Unique identifier of the individual Message Delivery Subscription resource for the V2X UE IDor 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 |
| DownlinkMessageDeliveryData | M | 1 | Parameters to create an Individual Downlink Message Delivery resources. |

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 |
| DownlinkMessageDeliveryData | 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 |
| apiVersion | string | See clause 6.1.1 |
| subscriptionId | string | Unique identifier of the individual Message Delivery Subscription resource for the V2X UE IDor 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. |
| 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. | | | | |

###### 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. |
| 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. | | | | |

##### 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

Table 6.1.5.5-1: Notifications

|  |  |  |
| --- | --- | --- |
| Callback URI | HTTP method or custom operation | Description (service operation) |
| {notifUri} | POST | Uplink 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. |
| 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. | | | | |

### 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 |  |
| UplinkMessageDeliveryData | 6.1.6.2.4 | Contains the uplink V2X message delivery data |  |
| MessageDeliverySubscriptionData | 6.1.6.2.3 | Contains the V2X message delivery subscription 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. |  |

### 6.1.7 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 subclause 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 subclauses 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 (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\_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 mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [2] shall be applicable.

### 6.2.3 Resources

#### 6.2.3.1 Overview



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 |
| apiVersion | 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 |
| apiVersion | 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 6.2.3.3.1-2: 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. |
| 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. | | | | |

###### 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. |
| 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. | | | | |

##### 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 |  |  |

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 |  |
| 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 |  |  |

#### 6.2.6.3 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. |  |

### 6.2.7 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 subclause 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 subclauses 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 |
|  |  |  |

## 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 (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\_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 mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [2] shall be applicable.

### 6.3.3 Resources

#### 6.3.3.1 Overview



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 |
| apiVersion | 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 |
| apiVersion | 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. |
| 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. | | | | |

###### 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 |
| 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. | | | | |

##### 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 | . |
| 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. | | | | |

### 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 subclause 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 subclauses 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 (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\_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 mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [2] shall be applicable.

### 6.4.3 Resources

#### 6.4.3.1 Overview



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 |
| apiVersion | 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**-**configuration**s**/{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. |
| apiVersion | 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. |
| 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. | | | | |

###### 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 |  |
| 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. | | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| n/a |  |  | 204 No Content | . |
| 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. | | | | |

### 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 subclause 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 subclauses 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 (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\_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 mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [2] shall be applicable.

### 6.5.3 Resources

#### 6.5.3.1 Overview



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 |
| apiVersion | 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. |
| 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. | | | | |

##### 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 subclause 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 subclauses 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 |
|  |  |  |

# 7 Security

TLS (IETF RFC 5246 [24]) 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. 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.

Annex A (normative):  
OpenAPI specification

# A.1 General

This Annex is based on the OpenAPI 3.0.0 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: 1.0.0

title: VAE\_MessageDelivery

description: |

API for VAE Message Delivery Service

© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.486 V16.1.0 V2X Application Enabler (VAE) Services

url: 'http://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

'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'

'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.

'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:

description: Unexpected error

/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'

'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)

'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:

description: Unexpected error

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{tokenUrl}'

scopes: {}

schemas:

DownlinkMessageDeliveryData:

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:

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:

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

AppServerId:

type: string

V2xUeId:

type: string

V2xGroupId:

type: string

V2xServiceId:

type: string

GeoId:

type: string

V2xMessagePayload:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Bytes'

# A.3 VAE\_FileDistribution API

openapi: 3.0.0

info:

version: 1.0.0

title: VAE\_FileDistribution

description: |

API for VAE File Distribution Service

© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.486 V16.1.0 V2X Application Enabler (VAE) Services

url: 'http://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:

description: Unexpected error

/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'

'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.

'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:

description: Unexpected error

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{tokenUrl}'

scopes: {}

schemas:

FileDistributionData:

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'

suppFeat:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

required:

- fileLists

- geoArea

- maxBitrate

- maxDelay

FileList:

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

FileStatus:

anyOf:

- type: string

enum:

- PENDING

- FETCHED

- PREPARED

- TRANSMITTING

- SENT

- type: string

# A.4 VAE\_ApplicationRequirement API

openapi: 3.0.0

info:

version: 1.0.1

title: VAE\_ApplicationRequirement

description: |

API for VAE Application Requirement Service

© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.486 V16.4.0 V2X Application Enabler (VAE) Services

url: 'http://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

'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'

'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.

'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:

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:

type: object

properties:

serviceLevel:

$ref: '#/components/schemas/ServiceLevel'

AppReqNotification:

type: object

properties:

resourceUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

result:

$ref: '#/components/schemas/ReservationResult'

required:

- resourceUri

- result

ServiceLevel:

anyOf:

- type: string

enum:

- HIGH

- MEDIUM

- LOW

- type: string

ReservationResult:

anyOf:

- type: string

enum:

- SUCCESSFUL

- FAILURE

- type: string

# A.5 VAE\_DynamicGroup API

openapi: 3.0.0

info:

version: 1.0.1

title: VAE\_DynamicGroup

description: |

VAE\_Dynamic\_Group Service

© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.486 V16.4.0 V2X Application Enabler (VAE) Services

url: 'http://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 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

'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'

'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.

'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:

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 send a test notification as defined in clause 6.4.5.3. Set to false or omitted otherwise.

websockNotifConfig:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/WebsockNotifConfig'

suppFeat:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

required:

- groupId

- definition

- leaderId

- notifUri

DynamicGroupNotification:

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: 1.0.0

title: VAE\_Service Continuity

description: |

API for VAE Service Continuity Service

© 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

All rights reserved.

externalDocs:

description: 3GPP TS 29.486 V16.1.0 V2X Application Enabler (VAE) Services

url: 'http://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'

'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:

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

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 |
| 2021-06 | CT#92e | CP-211260 | 0028 | - | F | Correct referenced datatype for VAE\_MessageDelivery | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0030 | - | F | Correct resourceUri used in Message Delivery procedures | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0032 | - | F | Correction of Individual Downlink Message Delivery resource name | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0034 | - | F | Correct service operation name for VAE\_FileDistribution | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0036 | - | F | Correct serivce name and resourceUri for VAE\_ApplicationRequirement | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0038 | - | F | Correct service name and resourceUri for VAE\_DynamicGroup | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0042 | 1 | F | Correction of resource name in File Distribution termination procedure | 16.4.0 |
| 2021-06 | CT#92e | CP-211260 | 0046 | 1 | F | Correction of resource name in Dynamic Group Configuration procedure | 16.4.0 |
| 2021-06 | CT#92e | CP-211264 | 0057 | - | F | Update of OpenAPI version and TS version in externalDocs field | 16.4.0 |