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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Contents

Foreword

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

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

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.

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

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

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

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

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

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

can indicates that something is possible

cannot indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

1 Scope

The present document specifies the protocol aspects for the data delivery management capability of SEAL for the application content/data for vertical applications (e.g. V2X) over the 3GPP system as part of SEAL services specified in 3GPP TS 23.434 [3] and 3GPP TS 23.433 [2].

The present document is applicable to the user equipment (UE) supporting the data delivery management client functionality as described in 3GPP TS 23.433 [2], to the application server supporting the data delivery management server functionality as described in 3GPP TS 23.433 [2] and to the application server supporting the vertical application server (VAL server) functionality as defined in the specific vertical application service (VAL service) specifications.

NOTE: The specification of the VAL server for a specific VAL service is out of scope of present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.433: "Service Enabler Architecture Layer for Verticals (SEAL); Data Delivery enabler for vertical applications".

[3] 3GPP TS 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".

[4] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[5] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[6] 3GPP TS 24.546: "Configuration management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[7] 3GPP TS 24.547: "Identity management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[8] 3GPP TS 24.558: "Enabling Edge Applications; Protocol specification".

[9] 3GPP TS 29.548: "Service Enabler Architecture Layer for Verticals (SEAL); SEAL Data Delivery (SEALDD) Server Services; Stage 3".

[10] 3GPP TS 29.558: "Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3".

[11] IETF RFC 3339: "Date and Time on the Internet: Timestamps".

[12] IETF RFC 4825: "The Extensible Markup Language (XML) Configuration Access Protocol (XCAP)".

[13] IETF RFC 6750: "The OAuth 2.0 Authorization Framework: Bearer Token Usage".

[13A] IETF RFC 6838: "Media Type Specifications and Registration Procedures".

[14] IETF RFC 7252: "The Constrained Application Protocol (CoAP)".

[15] IETF RFC 7641: "Observing Resources in the Constrained Application Protocol (CoAP)".

[16] IETF RFC 7959: "Block-Wise Transfers in the Constrained Application Protocol (CoAP) ".

[17] IETF RFC 8132: "PATCH and FETCH Methods for the Constrained Application Protocol (CoAP)".

[18] IETF RFC 8323: "CoAP (Constrained Application Protocol) over TCP, TLS, and WebSockets".

[19] IETF RFC 8610: "Concise Data Definition Language (CDDL): A Notational Convention to Express Concise Binary Object Representation (CBOR) and JSON Data Structures".

[20] IETF RFC 8949: "Concise Binary Object Representation (CBOR)".

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

[22] IETF RFC 9177: "Constrained Application Protocol (CoAP) Block-Wise Transfer Options Supporting Robust Transmission".

[23] OMA OMA-TS-XDM_Core-V2_1-20120403-A: "XML Document Management (XDM) Specification".

[24] IEEE Std 802.11-2020: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[25] IETF RFC 3168: "The Addition of Explicit Congestion Notification (ECN) to IP".

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].

Data delivery management SEAL client: An entity that provides the client-side functionalities corresponding to the data delivery management SEAL service.

Data delivery management SEAL server: An entity that provides the server-side functionalities corresponding to the data delivery management SEAL service.

Multi-modal service: a service which uses two or more distinct data flows, e.g. video, audio, positioning which are related to each other and subject to application coordination. An example of a multi-modal sevice is an XR application. Definition derived from 3GPP TS 23.434 [3].

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.433 [2] apply:

Application traffic
Multi-modal SEALDD flows
SEALDD-UU

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.434 [3] apply:

SEAL client
SEAL server
SEAL service
VAL user
VAL server
VAL service
Vertical

Vertical application

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ACR	Application Context Relocation
API	Application Programming Interface
BAT	Burst Arrival Time
CDDL	Concise Data Definition Language
CoAP	Constrained Application Protocol
DNS	Domain Name System
EAS	Edge Application Server
ECN	Explicit Congestion Notification
ECS	Edge Configuration Server
EDN	Edge Data Network
EES	Edge Enabler Server
L4S	Low Latency, Low Loss and Scalable Throughput
MIME	Multipurpose Internet Mail Extensions
NAS	Non Access Stratum
SEAL	Service Enabler Architecture Layer for verticals
SEALDD	SEAL Data Delivery
SDDM	SEAL Data Delivery Management
SDDM-C	SEAL Data Delivery Management Client
SDDM-S	SEAL Data Delivery Management Server
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URLLC	Ultra-Reliable Low Latency Communication
V2X	Vehicle-to-Everything
VAL	Vertical Application Layer
XCAP	XML Configuration Access Protocol
XR	eXtended Reality

4 General description

Data delivery management is a SEAL service that provides the data delivery management related capabilities (data delivery and storage capabilities) to one or more vertical applications. The present document enables a SEAL data delivery management client (SDDM-C) and a VAL server to communicate with a SEAL data delivery management server (SDDM-S).

5 Edge applications over 3GPP services

The SDDM-C and the SDDM-S can utilize edge applications over 3GPP services to support SDDM. The edge applications over 3GPP services are specified in 3GPP TS 24.558 [8] and 3GPP TS 29.558 [10]. Interactions between the SDDM-C, the SDDM-S and the edge applications over 3GPP services are described in detail in clause 7.

6 Functional entities

6.1 SEAL data delivery management client (SDDM-C)

The SDDM-C functional entity acts as the application client for data delivery management related transactions. To be compliant with the procedures in the present document the SDDM-C:

a) shall support the role of XCAP client as specified in IETF RFC 4825 [12];

b) shall support the role of XDMC as specified in OMA OMA-TS-XDM_Core-V2_1 [23]; and

c) shall support the data delivery management procedures in clause 7.2.

To be compliant with the CoAP procedures in the present document the SDDM-C:

a) shall support the role of CoAP client as specified in IETF RFC 7252 [14];

b) shall support the capability to observe resources as specified in IETF RFC 7641 [15];

c) shall support the block-wise transfer as specified in IETF RFC 7959 [16];

d) may support the robust block transfer as specified in IETF RFC 9177 [22];

e) shall support FETCH method of CoAP as specified in IETF RFC 8132 [17];

f) should support CoAP over TCP and Websocket as specified in IETF RFC 8323 [18];

g) shall support CBOR encoding as specified in IETF RFC 8949 [20]; and

h) shall support the procedures defined in clause 7.2.

NOTE 1: The security mechanism to be supported for the CoAP procedures is described in 3GPP TS 24.547 [7].

NOTE 2: Support for TCP for the CoAP procedures is required if the client connects over the network which blocks or impedes the use of UDP, e.g. when NATs are present in the communication path.

NOTE 3: The CoAP protocol supports mechanism for reliable message exchange over UDP. Use of TCP can also be beneficial if reliable transport is required for other reasons, e.g. better observability of resources. Usage of CoAP over TCP is an implementation choice.

NOTE 4: Support for the robust block transfer mechanism for the CoAP procedures is beneficial in environments where packet loss is highly asymmetrical and where performance optimization of block transfers is required.

6.2 SEAL data delivery management server (SDDM-S)

The SDDM-S is a functional entity used to provide data delivery management supported within the vertical application layer. To be compliant with the procedures in the present document the SDDM-S:

a) shall support the role of XCAP server as specified in IETF RFC 4825 [12];

b) shall support the role of XDMS as specified in OMA OMA-TS-XDM_Core-V2_1 [23]; and

c) shall support the data delivery management procedures in clause 7.2.

To be compliant with the CoAP procedures in the present document the SDDM-S:

a) shall support the role of CoAP server as specified in IETF RFC 7252 [14];

b) shall support the capability to observe resources as specified in IETF RFC 7641 [15];

c) shall support the block-wise transfer as specified in IETF RFC 7959 [16];

d) shall support the robust block transfer as specified in IETF RFC 9177 [22];

e) shall support FETCH method of CoAP as specified in IETF RFC 8132 [17];

f) shall support CoAP over TCP and Websocket as specified in IETF RFC 8323 [18];

g) shall support CBOR encoding as specified in IETF RFC 8949 [20]; and

h) shall support the procedures defined in clause 7.2.

NOTE: The security mechanism to be supported for the CoAP procedures is described in 3GPP TS 24.547 [7].

7 Data delivery management procedures

7.1 General

This clause provides the procedures for data delivery management between the SDDM-C and the SDDM-S as well as interactions between the SDDM-S and the VAL server. Interactions between the SDDM-C, the SDDM-S and the edge applications over 3GPP services are also described.

NOTE: 3GPP TS 29.548 [9] specifies stage-3 protocol definitions, message flows and APIs for services offered by the SDDM-S to VAL servers over the SEALDD-S reference point and to other SEALDD servers over the SEALDD-E reference point (see 3GPP TS 23.433 [2]).

7.2 On-network procedures

7.2.1 General

This clause provides the on-network procedures for data delivery management between the SLM-C and the SLM-S as well as interactions between the SDDM-S and the VAL server.

7.2.1.1 Authenticated identity in HTTP request

Upon receiving an HTTP request, the SDDM-S shall verify that the identity of the sender of the HTTP request (see IETF RFC 9110 [21]) is authorized as specified in 3GPP TS 24.547 [7], and if authentication is successful, the SDDM-S shall use the identity of the sender of the HTTP request as an authenticated identity.

7.2.1.2 Authenticated identity in CoAP request

Upon receiving a CoAP request, the SDDM-S shall verify that the identity of the sender of the CoAP request as specified in 3GPP TS 24.547 [7], and if authentication is successful, the SDDM-S shall use the identity of the sender of the CoAP request as an authenticated identity.

7.2.2 SEALDD enabled signalling transmission connection establishment procedure

7.2.2.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD regular transmission connection establishment request when it needs to request an SDDM connection establishment, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <establishment-req> element in the <data-delivery-info> root element which:

   1) shall include a <requestor-id> element set to the identity of the SDDM-C, e.g. unique client identifier;

   2) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

   3) shall include a <server-id> element set to the information of the VAL server;

   4) shall include a <endpoint-id> element set to the information of the endpoint of the selected VAL server to which the SEALDD regular transmission connection establishment request has to be sent;

5) may include a <VAL-service-id> element set to the VAL service identity of the vertical application;

6) may include a <traffic-descriptor-info> element specifying the information of the traffic. In the <traffic-descriptor-info> element, the SDDM-C may include:

   i) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

   ii) a <port-number> child element specifying the identity of the port number of the traffic;

   iii) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

   iv) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic;

7) may include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request;

8) may include an <anyExt> element containing either a <bat-period-adapt-cap> element to indicate the BAT and periodicity adaptation capability of the SDDM-C or a <transmission-assist-info> element specifying a transmission assistance information.

   In the <transmission-assist-info> element, the SDDM-C:

   i) shall include at least one of the following child elements:

      A) <bat> child element specifying the arrival time of the first packet of the data burst; and

      B) a <periodicity> child element specifying the time period between the start of two bursts; and

   ii) if the <bat> element is included, may include a <bat-window> child element. In the <bat-window> element the SDDM-C shall include:

      A) <start-time> child element indicating the acceptable earliest arrival time of the first packet of the data burst; and

      B) the <stop-time> child element indicating the acceptable latest arrival time of the first packet of the data burst; and

   iii) if the <bat>, <bat-window> and <periodicity>elements are included, may include a <periodicity-range> child element specifying the periodicity range. In the <periodicity-range> element the SDDM-C shall include:

      A) a <lower-bound> child element set to the lower bound of the periodicity and an <upper-bound> child element set to the upper bound of the periodicity of the start two bursts; or

      B) a <periodicity-value-list> child element with one or more <periodicity-value> child elements set to the acceptable periodicity value;

9) may include an <anyExt> element containing an <l4s-support-capability> element set to the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based congestion control); and

NOTE 1: The L4S support capability is used for the SEALDD enabled congestion control for VAL applications (see 3GPP TS 23.433 [2] clause 9.8.2.2).

10) may include an <anyExt> element containing an <xr-app-device-capability> element to indicate an XR application device capability information. In the <xr-app-device-capability> element, the SDDM-C may include:

   i) a <media-codec> child element set to the media codec information (H.264, H.265);

   ii) a <media-resolution> child element set to the media resolution information in pixels;

   iii) a <media-frame-rate> child element set to the media frame rate information; and

   iv) a <media-fov> child element set to the media field of view information in degrees. In the <media-fov> child element, the SDDM-C shall include:

      A) a <horizontal-fov> child element specifying the horizontal field of view information; and

B) a <vertical-fov> child element specifying the vertical field of view information; and

NOTE 2: The XR application device capability is used for the SEALDD enabled bandwidth control for different VAL users (see 3GPP TS 23.433 [2] clause 9.8.2.1).

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <establishment-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <establishment-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD regular transmission connection establishment request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error;

ii) may include a <traffic-descriptor-info> element specifying the information of the traffic. In the <traffic-descriptor-info> element, the SDDM-C may include:

A) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

B) a <port-number >child element specifying the identity of the port number of the traffic;

C) a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and

D) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

iii) may include an <anyExt> element containing either a <bat-period-adapt-cap> element to indicate the BAT and periodicity adaptation capability of the SDDM-C or a <transmission-assist-info> element specifying a transmission assistance information.

In the <transmission-assist-info> element, the SDDM-C:

A) shall include at least one of the following child elements:

I) <bat> child element specifying the arrival time of the first packet of the data burst; and

II) a <periodicity> child element specifying the time period between the start of two bursts;

B) if the <bat> element is included, may include a <bat-window> child element. In the <bat-window> element the SDDM-C shall include:

I) <start-time> child element indicating the acceptable earliest arrival time of the first packet of the data burst; and

II) the <stop-time> child element indicating the acceptable latest arrival time of the first packet of the data burst; and

C) if the <bat>, <bat-window> and <periodicity>elements are included, may include a <periodicity-range> child element specifying the periodicity range. In the <periodicity-range> element the SDDM-C shall include:

I) a <lower-bound> child element set to the lower bound of the periodicity and an <upper-bound> child element set to the upper bound of the periodicity of the start two bursts; or

II) a <periodicity-value-list> child element with one or more <periodicity-value> child elements set to the acceptable periodicity value; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.2.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <establishment-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <establishment-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD regular transmission connection establishment request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error;

ii) may include a <traffic-descriptor-info> element specifying the information of the traffic. In the <traffic-descriptor-info> element, the SDDM-S may include:

A) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

B) a <port-number>child element specifying the identity of the port number of the traffic;

C) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

D) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

iii) may include a <expiry-time> element set to a time that triggers the re-connection from SDDM-C when bandwidth limit check is failed; and

iv) may include a <traffic-transmission-bandwidth> element indicating suggested traffic transmission bandwidth to be used by SDDM-C; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

The SDDM-S sends an SEALDD regular transmission connection establishment request when it needs to request a regular SEALDD connection establishment towards an SDDM-C, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <establishment-req> element in the <data-delivery-info> root element which:

1) shall include a <requestor-id> element set to the identity of the SDDM-S, e.g. FQDN, URI;

2) shall include a <sealdd-flow-id> element set to the identity of the SEALDD flow used by the SDDM-C and SDDM-S to identify the application traffic;

3) shall include a <endpoint-id> element set to the information of the endpoint of the selected VAL server from which the SEALDD regular transmission connection establishment request has to be sent;

4) may include a <sealdd-communication-lifetime> element set to the information of the data delivery communication lifetime;

5) may include a <traffic-descriptor-info> element specifying the information of the traffic. In the <traffic-descriptor-info> element, the SDDM-S may include:

i) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

ii) a <port-number >child element specifying the identity of the port number of the traffic;

iii) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

iv) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

6) may include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user or the identity of the SDDM-S acting as the VAL UE; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.2.3 SDDM client CoAP procedure

In order to request an SEALDD regular transmission connection establishment to the SDDM-S, the SDDM-C shall send a CoAP POST request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.1.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req";

c) shall include an "EstablishmentRequest" object:

1) shall include a "requestorId" attribute set to identity of the SDDM-C, e.g. unique client identifier;

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

3) shall include a "serverId" attribute set to the information of the VAL server;

4) shall include an "endpointId" attribute set to the information of the endpoint of the selected VAL server to which the SDMM regular transmission connection establishment request has to be sent;

5) may include a "valServiceId" attribute set to the VAL service identity of the vertical application;

6) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

7) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

8) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic;

9) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic;

10) may include a "valUserId" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request; and

11) may include a "batPeriodAdaptCap" attribute to indicate a BAT and periodicity adaptation capability or a "transmisAssistInfo" attribute specifying a transmission assistance information. In the "transmisAssistInfo" attribute the SDDM-C:

   i) shall include at least one of the following attributes:

      A) a "bat" attribute specifying the arrival time of the first packet of the data burst; and

      B) a "periodicity" attribute specifying the time period between the start of two bursts;

   ii) if the "bat" attribute is included, may include a "batWindow" attribute containing the acceptable earliest and latest arrival time of the first packet of the data burst; and

   iii) if the "bat", "batWindow" and "periodicity" attributes are included, may include a "periodRange" attribute specifying the periodicity range. In the "periodRange" attribute the SDDM-C shall include:

      A) a "lowerBound" attribute set to the lower bound of the periodicity and an "upperBound" attribute set to the upper bound of the periodicity of the start two bursts; or

      B) a "periodicityValues" attribute set to the acceptable periodicity values;

12) may include an "l4sSupportingCapability" element set to the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based congestion control); and

NOTE 1: The L4S support capability is used for the SEALDD enabled congestion control for VAL applications (see 3GPP TS 23.433 [2] clause 9.8.2.2).

13) may include an "xrAppDevCap" attribute to indicate an XR application device capability information. In the "xrAppDevCap" attribute, the SDDM-C may include:

   i) a "mediaCodec" attribute to indicate the media codec information (H.264, H.265);

   ii) a "mediaResolution" attribute to indicate the media resolution information in pixels;

   iii) a "mediaFrameRate" attribute to indicate the media frame rate information; and

   iv) a "mediaFov" attribute to indicate the media field of view information in degrees. In the "mediaFov" attribute, the SDDM-C shall include:

      A) a "horizontalFov" attribute to indicate the horizontal field of view information; and

      B) a "verticalFov" attribute to indicate the vertical field of view information; and

NOTE 2: The XR application device capability is used for the SEALDD enabled bandwidth control for different VAL users (see 3GPP TS 23.433 [2] clause 9.8.2.1).

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.3.1.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req", and

b) an "EstablishmentRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-res";

b) shall attempt to create the SDDM regular transmission connection resource pointed at by the CoAP URI with the content of "EstablishmentRequest" object received in the request and:

1) if successfully created, shall include an "EstablishmentResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success";

ii) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

iii) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

iv) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic;

v) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

vi) may include a "batPeriodAdaptCap" attribute to indicate a BAT and periodicity adaptation capability or a "transmisAssistInfo" attribute specifying a transmission assistance information. In the "transmisAssistInfo" attribute the SDDM-C:

A) shall include at least one of the following attributes:

I) a "bat" attribute specifying the arrival time of the first packet of the data burst; and

II) a "periodicity" attribute specifying the time period between the start of two bursts;

B) if the "bat" attribute is included, may include a "batWindow" attribute containing the acceptable earliest and latest arrival time of the first packet of the data burst; and

C) if the "bat", "batWindow" and "periodicity" attributes are included, may include a "periodRange" attribute specifying the periodicity range. In the "periodRange" attribute the SDDM-C shall include:

I) a "lowerBound" attribute set to the lower bound of the periodicity and an "upperBound" attribute set to the upper bound of the periodicity of the start two bursts; or

II) a "periodicityValues" attribute set to the acceptable periodicity values;

2) otherwise, shall include an "EstablishmentResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.2.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.3.1.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req", and

b) an "EstablishmentRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-res";

b) shall attempt to create the SDDM regular transmission connection resource pointed at by the CoAP URI with the content of "EstablishmentRequest" object received in the request and:

1) if successfully created, shall include an "EstablishmentResponse" object in the CoAP POST 2.01 (Created) response message;

   i) shall include a "result" attribute set to "success";

   ii) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

   iii) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

   iv) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

   v) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; or

2) otherwise, shall include an "EstablishmentResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-C.

In order to request an SDDM regular transmission connection establishment to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.4.1.1 with:

   1) the "apiRoot" set to the SDDM-C URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req";

c) shall include an "EstablishmentRequest" object:

   1) shall include a "requestorId" attribute set to the identity of the SDDM-S, e.g. FQDN, URI;

   2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

   3) shall include an "endpointId" attribute set to the information of the endpoint of the selected VAL server to which the SDMM regular transmission connection establishment request has to be sent;

   4) shall include a "sealddCommunicationLifetime" attribute set to the information of the data delivery communication lifetime;

   5) may include a "valServiceId" attribute set to the VAL service identity of the vertical application;

   6) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

   7) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

   8) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic;

   9) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

   10) may include a "valUserId" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.3 SEALDD enabled signalling transmission connection release procedure

7.2.3.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data transmission connection release request when it needs to release an established SEALDD connection towards an SDDM-S, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-req> element in the <data-delivery-info> root element which:

   1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C; and

   2) shall include a <sealdd-flow-id> element set to the identity of the SEALDD flow used by the SDDM-S and SDDM-C to identify the application traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-rsp> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data transmission connection release request operation; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.3.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD data transmission connection release request when it needs to release an established SEALDD connection towards an SDDM-C, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-req> element in the <data-delivery-info> root element which:

   1) shall include a <server-id> element set to the information of the SDDM-S; and

2) shall include a <sealdd-flow-id> element set to the identity of the SEALDD flow used by the SDDM-S and SDDM-C to identify the application traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection release, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; or

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <release-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD regular transmission connection release request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. SEALDD policy mismatch; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.3.3 SDDM client CoAP procedure

In order to request the release of an SEALDD regular data transmission connection to the SDDM-S, the SDDM-C shall send a CoAP DELETE request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP DELETE request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.1.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=release-req";

c) shall include a "ReleaseRequest" object:

1) shall include a "sealClientId" attribute set to the identity of the SDDM-C; and

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

Upon receiving a CoAP DELETE request where the CoAP URI of the CoAP DELETE request identifies the release resource as specified in clause A.3.1.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=release-req", and

b) a "ReleaseRequest" object;

the SDDM-C shall generate a CoAP DELETE response according to IETF RFC 7252 [14]. In the CoAP DELETE response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor";

b) shall attempt to release the SDDM regular transmission connection resource pointed at by the CoAP URI with the content of "ReleaseRequest" object received in the request and:

   1) if successfully release, shall use the CoAP DELETE 2.02 (Deleted) response message; or

   2) otherwise, shall include an error response in the CoAP DELETE response as specified in clause A.3.1.2.2.3.2; and

c) shall send the CoAP DELETE response towards the SDDM-S.

7.2.3.4 SDDM server CoAP procedure

Upon receiving a CoAP DELETE request where the CoAP URI of the CoAP DELETE request identifies the release resource as specified in clause A.4.1.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=release-req", and

b) a "ReleasetRequest" object;

the SDDM-S shall generate a CoAP DELETE response according to IETF RFC 7252 [14]. In the CoAP DELETE response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor";

b) shall attempt to release the SDDM regular transmission connection resource pointed at by the CoAP URI with the content of "ReleaseRequest" object received in the request and:

   1) if successfully created, shall use the CoAP DELETE 2.02 (Deleted) response message; or

   2) otherwise, shall include an error response in the CoAP DELETE response as specified in clause A.4.1.2.2.3.2; and

c) shall send the CoAP DELETE response towards the SDDM-C.

In order to request the release of an SDDM regular data transmission connection to the SDDM-C, the SDDM-S shall send a CoAP DELETE request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP DELETE request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.1.1 with:

   1) the "apiRoot" set to the SDDM-C URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=release-req";

c) shall include an "ReleaseRequest" object:

   1) shall include a "serverId" attribute set to the identity of the SDDM-S; and

   2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.4 SEALDD enabled E2E redundant transmission path establishment procedure

7.2.4.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD URLLC transmission connection establishment request when it needs to request an SEALDD URLLC transmission connection establishment, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <URLLC-establishment-req> element in the <data-delivery-info> root element which:

   1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C;

   2) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

   3) may include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request;

   4) may include a <server-id> element set to the information of the endpoint of the selected VAL server to which the SDDM URLLC transmission connection establishment request has to be sent;

   5) may include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

   6) may include a <traffic-descriptor-info> element specifying the information of the traffic of the redundant SEALDD transmission connection. In the <traffic-descriptor-info> element, the SDDM-C may include:

      i) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

      ii) a <port-number> child element specifying the identity of the port number of the traffic;

      iii) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

      iv) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

   7) may include an <anyExt> element containing either a <bat-period-adapt-cap> element to indicate the BAT and periodicity adaptation capability of the SDDM-C or a <transmission-assist-info> element specifying a transmission assistance information.

      In the <transmission-assist-info> element, the SDDM-C:

      i) shall include at least one of the following child elements:

         A) <bat> child element specifying the arrival time of the first packet of the data burst; and

         B) a <periodicity> child element specifying the time period between the start of two bursts;

      ii) if the <bat> element is included, may include a <bat-window> child element. In the <bat-window> element the SDDM-C shall include:

         A) <start-time> child element indicating the acceptable earliest arrival time of the first packet of the data burst; and

         B) the <stop-time> child element indicating the acceptable latest arrival time of the first packet of the data burst; and

      iii) if the <bat>, <bat-window> and <periodicity>elements are included, may include a <periodicity-range> child element specifying the periodicity range. In the <periodicity-range> element the SDDM-C shall include:

A) a <lower-bound> child element set to the lower bound of the periodicity and an <upper-bound> child element set to the upper bound of the periodicity of the start two bursts; or

B) a <periodicity-value-list> child element with one or more <periodicity-value> child elements set to the acceptable periodicity value; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.4.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-establishment-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

1) if the identity of the sender of the received HTTP POST request is not authorized to request URLLC transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; or

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-establishment-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD URLLC transmission connection establishment request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error; and

ii) may include a <traffic-descriptor-info> element specifying the information of the traffic of the redundant SEALDD transmission connection. In the <traffic-descriptor-info> element, the SDDM-S may include:

A) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

B) a <port-number>child element specifying the identity of the port number of the traffic;

C) a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and

D) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.4.3 SDDM client CoAP procedure

In order to request an SEADD URLLC transmission connection establishment to the SDDM-S, the SDDM-C shall send a CoAP POST request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.2.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-req";

c) shall include a "URLLCEstablishmentRequest" object:

1) shall include a "sealClientId" attribute set of the identity of the SDDM-C;

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

3) shall include a "valTgtUe" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request;

4) may include a "serverId" attribute set to the information of the VAL server;

5) may include a "valServiceId" attribute set to the identity of the VAL service of the vertical application;

6) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

7) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

8) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

9) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

10) may include a "batPeriodAdaptCap" attribute to indicate a BAT and periodicity adaptation capability or a "transmisAssistInfo" attribute specifying a transmission assistance information. In the "transmisAssistInfo" attribute the SDDM-C:

i) shall include at least one of the following attributes:

A) a "bat" attribute specifying the arrival time of the first packet of the data burst; and

B) a "periodicity" attribute specifying the time period between the start of two bursts;

ii) if the "bat" attribute is included, may include a "batWindow" attribute containing the acceptable earliest and latest arrival time of the first packet of the data burst; and

iii) if the "bat", "batWindow" and "periodicity" attributes are included, may include a "periodRange" attribute specifying the periodicity range. In the "periodRange" attribute the SDDM-C shall include:

A) a "lowerBound" attribute set to the lower bound of the periodicity and an "upperBound" attribute set to the upper bound of the periodicity of the start two bursts; or

B) a "periodicityValues" attribute set to the acceptable periodicity values;

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.4.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.4.2.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-req", and

b) a "URLLCEstablishmentRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-res";

b) shall attempt to create the URLLC transmission connection resource pointed at by the CoAP URI with the content of "URLLCEstablishmentRequest" object received in the request and:

1) if successfully created, shall include a "URLLCEstablishmentResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success";

ii) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

iii) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

iv) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

v) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; or

2) otherwise, shall include a "URLLCEstablishmentResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response as specified in clause A.4.2.2.2.3.1; and

c) shall send the CoAP POST response towards the SDDM-C.

7.2.5 SEALDD enabled E2E redundant transmission path release procedure

7.2.5.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD URLLC transmission connection release request when it needs to release an established SEALDD URLLC transmission connection towards an SDDM-S, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-req> element in the <data-delivery-info> root element which:

1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C; and

2) shall include a <sealdd-flow-id> element set to the identity of the SEALDD flow used by the SDDM-S and SDDM-C to identify the application traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.5.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection release, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD URLLC transmission connection release request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. SEALDD policy mismatch; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.5.3 SDDM client CoAP procedure

In order to request the release of an SEALDD URLLC transmission connection to the SDDM-S, the SDDM-C shall send a CoAP DELETE request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP DELETE request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.2.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req";

c) shall include a "URLLCReleaseRequest" object:

1) shall include a "sealClientId" attribute set to the identity of the SDDM-C; and

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.5.4 SDDM server CoAP procedure

Upon receiving a CoAP DELETE request where the CoAP URI of the CoAP DELETE request identifies the release resource as specified in clause A.4.2.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req", and

b) a "URLLCReleaseRequest" object;

the SDDM-S shall generate a CoAP DELETE response according to IETF RFC 7252 [14]. In the CoAP DELETE response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req";

b) shall attempt to release the SDDM URLLC transmission connection resource pointed at by the CoAP URI with the content of "URLLCReleaseRequest" object received in the request and:

1) if successfully created, shall use the CoAP DELETE 2.02 (Deleted) response message; or

2) otherwise, shall include an error response in the CoAP DELETE response as specified in clause A.4.2.2.2.3.3; and

c) shall send the CoAP DELETE response towards the SDDM-C.

7.2.6 SEALDD enabled E2E redundant transmission path connection update procedure

7.2.6.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD URLLC transmission connection update request when it needs to request an SEALDD URLLC transmission connection update, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <URLLC-update-req> element in the <data-delivery-info> root element which:

1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C;

2) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

2) may include a <server-id> element set to the information of the endpoint of the selected VAL server to which the SDDM URLLC transmission connection establishment request has to be sent;

3) may include a <VAL-service-id> element set to the VAL service identity of the vertical application;

4) may include a <traffic-descriptor-info> element specifying the information of the traffic of the redundant SEALDD transmission connection. In the <traffic-descriptor-info> element, the SDDM-C may include:

i) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

ii) a <port-number> child element specifying the identity of the port number of the traffic;

iii) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

iv) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.6.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-deliverydata-delivery-info+xml MIME body with a <URLLC-update-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-deliverydata-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-deliverydata-delivery-info+xml MIME body with a <URLLC-update-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD URLLC transmission connection update request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.6.3 SDDM client CoAP procedure

In order to request an SEALDD URLLC transmission connection update to the SDDM-S, the SDDM-C shall send a CoAP PUT request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP PUT request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.2.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-update-req";

c) shall include a "URLLCUpdateRequest" object:

1) shall include a "sealClientId" attribute set of the identity of the SDDM-C;

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

3) may include a "serverId" attribute set to the information of the VAL server;

4) may include a "valServiceId" attribute set to the identity of the VAL service of the vertical application;

5) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

6) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

7) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

8) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.6.4 SDDM server CoAP procedure

Upon receiving a CoAP PUT request where the CoAP URI of the CoAP PUT request identifies the resource to be updated as specified in clause A.4.2.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-update-req"; and

b) a "URLLCUpdateRequest" object;

the SDDM-S shall generate a CoAP PUT response according to IETF RFC 7252 [14]. In the CoAP PUT response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-update-res";

b) shall attempt to update the URLLC transmission connection resource pointed at by the CoAP URI with the content of "URLLCUpdateRequest" object received in the request and:

   1) if successfully updated, shall include a "URLLCUpdateResponse" object in the CoAP PUT 2.04 (Changed) response message;

      i) shall include a "result" attribute set to "success"; or

   2) otherwise, shall include a "URLLCUpdateResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP PUT response as specified in clause A.4.2.2.2.3.2; and

c) shall send the CoAP PUT response towards the SDDM-C.

7.2.7 SEALDD server discovery and selection procedure

When the VAL client sends an SEALDD request to the SDDM-C, the SDDM-C may need to discover and select the appropriate SDDM-S for the associated vertical application. After that, the VAL server is discovered and selected along with the associated SDDM-S so that the SDDM-C gets the address of the SDDM-S.

In an edge data network (EDN), the SDDM-C can use edge applications over 3GPP services (see clause 5) to obtain the EES, which supports the SDDM-S and the VAL server, and after that to obtain the SDDM-S address and the VAL server address.

NOTE 1: The VAL server acts as an EAS in an EDN and registers to the EES with the associated SDDM-S address as EAS endpoint in the EAS profile (see 3GPP TS 23.433 [2] clause 9.4.3.2). The Eecs_ServiceProvisioning service to obtain the EES, which supports the SDDM-S and the VAL sever, and the Eees_EASDiscovery service to obtain the SDDM-S address and the VAL server address are specified in clause 7.2 and clause 5.3 of 3GPP TS 24.558 [8] respectively.

In a non EDN, the SDDM-C can obtain the SDDM-S address and the VAL server address from the VAL client or from the NAS.

NOTE 2: ECS address provisioning over NAS to get ECS configuration information and EAS discovery to get EAS information are specified in 3GPP TS 24.501 [5].

NOTE 3: The VAL client can use DNS query mechanism or vertical application (e.g. V2X) layer signalling mechanism to obtain the SDDM-S address and the VAL server address. The VAL client can provide the address information to the SDDM-C.

NOTE 4: DNS query mechanism and vertical application layer signalling mechanism are out of scope of the present document.

7.2.8 SEALDD enabled data storage creation procedure

7.2.8.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data storage creation request when it needs to request the creation of data storage to the SDDM-S, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <data-storage-creation-req> element in the <data-delivery-info> root element which:

1) shall include a <application-data> element set to the application data needed to be stored;

2) may include a <access-control-policy> element set to the control policy for the requested data access from other consumers (e.g. SDDM-C, VAL server, other SDDM-S);

3) may include a <expiry-time> element set to the expiration time of the data to be stored; and

4) may include a <status-information-req> element set to the information of the stored data to be tracked or monitored by the SDDM-S (e.g. statistics of the stored data; indications of how often the stored data is accessed or managed) for corresponding notifications; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.8.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-creation-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-creation-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data storage creation request operation; and

ii) may include a <data-identifier> element set to the identity of the stored data; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.8.3 SDDM client CoAP procedure

In order to request an SEALDD data storage creation to the SDDM-S, the SDDM-C shall send a CoAP POST request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-req";

c) shall include a "DataStorageCreationRequest" object:

1) shall include an "applicationData" attribute set to the application data needed to be stored;

2) may include an "accessControlPolicy" attribute set to the control policy for the requested data access from other consumers (e.g. SDDM-C, VAL server, other SDDM-S);

3) may include an "expiryTime" attribute set to the expiration time of the data to be stored;

4) may include a "statusInformationReq" attribute set to the information of the stored data to be tracked or monitored by the SDDM-S (e.g. statistics of the stored data; indications of how often the stored data is accessed or managed) for corresponding notifications; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.8.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the creation of a data storage resource as specified in clause A.4.3.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-req", and

b) a "DataStorageCreationRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-res";

b) shall attempt to create the SDDM data creation storage resource pointed at by the CoAP URI with the content of "DataStorageCreationRequest" object received in the request and:

1) if successfully created, shall include a "DataStorageCreationResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success"; and

ii) shall include a "dataIdentifier" attribute specifying the identity of the stored data; or

2) otherwise, shall include a "DataStorageCreationResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-C.

7.2.9 SEALDD enabled data storage reservation procedure

7.2.9.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data storage reservation request when it needs to request the reservation of data storage to the SDDM-S, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <data-storage-reservation-req> element in the <data-delivery-info> root element which:

1) shall include a <VAL-service-id> element set to the VAL service identity of the vertical application;

2) may include a <data-length> element set to the data length to be stored; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.9.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-reservation-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-reservation-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data storage reservation request operation; and

ii) may include a <address> element set to the reserved address for data storage; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.9.3 SDDM client CoAP procedure

In order to request an SEALDD data storage reservation to the SDDM-S, the SDDM-C shall send a CoAP POST request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-reservation-req";

c) shall include a "DataStorageReservationRequest" object:

1) shall include a "valServiceId" attribute set to the identity of the VAL service of the vertical application;

2) may include a "dataLength" attribute set to the data length to be stored; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.9.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the creation of a data storage resource as specified in clause A.4.3.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-reservation-req", and

b) a "DataStorageReservationRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-reservation-res";

b) shall attempt to create the SDDM data creation storage resource pointed at by the CoAP URI with the content of "DataStorageReservationRequest" object received in the request and:

   1) if successfully created, shall include a "DataStorageReservationResponse" object in the CoAP POST 2.01 (Created) response message;

      i) shall include a "result" attribute set to "success"; and

      ii) shall include an "address" attribute specifying the reserved address for data storage; or

   2) otherwise, shall include a "DataStorageReservationResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-C.

7.2.10 SEALDD enabled data storage notification procedure

7.2.10.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-status-notification> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21];

b) may communicate the received data storage notification information to the VAL client; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.10.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD data storage notification when it needs to provide the SDDM-C with the collected management or storage status information of the stored data. The SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C:

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <data-storage-status-notification > element in the <data-delivery-info> root element which:

1) shall include a <data-identifier> element set to the identity of the stored data; and

2) shall include a <status-information-rsp> element set to the information of the stored data to be tracked or monitored by the SDDM-S (e.g. statistics of the stored data, indications of how often the stored data is accessed or managed), of the stored data requested by using the SEALDD data storage creation request as described in clause 7.2.7.1; and

NOTE: Push notification service can be used to send HTTP POST request to the client. Details about the push notification service is out of scope this specification.

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.10.3 SDDM client CoAP procedure

In order for an SDDM-C to get notifications about information of an SDDM data storage resource, the SDDM-C shall first send a CoAP FETCH request message used to observe an SDDM data storage resource as specified in clause A.4.3.2.2.3.5, and containing:

a) a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) an "observe" option set to the value "0" (register);

c) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification";

d) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req", and

e) a "DataStorageMgtRequest" object;

1) shall include a "dataIdentifier" data type set to the identity of the observed stored data.

Upon receiving a CoAP FETCH 2.05 (Content) response (as specified in IETF RFC 8132 [17]) to a CoAP FETCH request message used to observe an SDDM data storage resource as specified in clause A.4.3.2.2.3.5, and containing:

a) an "observe" option;

b) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification", and

c) a "DataStorageStatusNotification" object;

NOTE: The SDDM-C can communicate the received data storage notification information to the VAL client.

In order for an SDDM-C to stop getting notifications about information of an SDDM data storage resource, the SDDM-C shall send a CoAP FETCH request message as specified in clause A.4.3.2.2.3.5, and containing:

a) a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) an "observe" option set to the value "1" (deregister);

c) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req", and

d) a "DataStorageMgtRequest" object;

1) shall include a "dataIdentifier" data type set to the identity of the observed stored data.

7.2.10.4 SDDM server CoAP procedure

Upon reception of a CoAP FETCH request message containing:

a) an "observe" option set to the value "0" (register);

b) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification";

c) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req"; and

d) a "DataStorageMgtRequest" object,

the SDDM-S shall provide an SEALDD data storage notification in order to notify an SDDM-C about information of an SDDM data storage resource. The SDDM-S shall send a CoAP FETCH response (as specified in IETF RFC 8132 [17]) message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP FETCH response, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification";

b) shall include a "DataStorageStatusNotification" object in the CoAP FETCH 2.05 (Content) response message; and

c) shall send the CoAP FETCH response towards the SDDM-C.

7.2.11 SEALDD enabled data storage query procedure

7.2.11.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data storage query request when it needs to query stored data in the SDDM-S, the SDDM-C shall send an HTTP GET request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP GET request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <data-storage-query-req> element in the <data-delivery-info> root element which:

   1) shall include a <data-identifier> element set to the identity of the stored data which is queried; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.11.2 SDDM server HTTP procedure

Upon receiving an HTTP GET request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-query-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP GET request as specified in clause 7.2.1.1; and

   1) if the identity of the sender of the received HTTP GET request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP GET request and shall skip rest of the steps;

   2) shall support handling an HTTP GET request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "GET Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-query-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data storage query request operation;

ii) shall include a <data-identifier> element set to the identity of the stored data which is queried; and

iii) may include a <application-data> element set to the application data queried; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.11.3 SDDM client CoAP procedure

In order to query an SDDM data storage resource, the SDDM-C shall send a CoAP GET request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP GET request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with:

1) the "apiRoot" set to the SDDM-S URI; and

2) the "data-identifier" query option is set to the identity of the stored data which is queried; and

b) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.11.4 SDDM server CoAP procedure

Upon receiving a CoAP GET request where the CoAP URI of the CoAP GET request identifies the creation of a data storage resource as specified in clause A.4.3.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor", and

b) a "data-identifier" query option;

the SDDM-S shall generate a CoAP GET response according to IETF RFC 7252 [14]. In the CoAP GET response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-data-storage-query-res";

b) shall attempt to create the SDDM data creation storage resource pointed at by the CoAP URI with the content of "DataStorageQueryRequest" object received in the request and:

1) if successfully created, shall include a "DataStorageQueryResponse" object in the CoAP GET 2.05 (Content) response message:

i) shall include a "result" attribute set to "success";

ii) shall include a "dataIdentifier" attribute specifying the identity of the stored data; and

iii) may include an "applicationData" attribute set to the application data queried; or

2) otherwise, shall include a "DataStorageQueryResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP GET response; and

c) shall send the CoAP GET response towards the SDDM-C.

7.2.12 SEALDD enabled data storage management procedure

7.2.12.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data storage management request when it needs to request management of the stored data in the SDDM-S such as to update, refresh, or delete the stored data, the SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <data-storage-mgt-req> element in the <data-delivery-info> root element which:

   1) shall include a <data-identifier> element set to the identity of the stored data which is requested to be managed;

   2) shall include a <operation> element set to the operation to be performed such as to update, refresh, or delete the stored data; and

   3) may include an <application-data> element set to the application data needed to be updated if the operation to be performed is to update the stored data; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.12.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-mgt-req> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

   1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

   2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <data-storage-mgt-rsp> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data storage query request operation;

      ii) shall include a <data-identifier> element set to the identity of the stored data which is queried; and

      iii) may include a <application-data> element set to the application data managed according to the operation requested on the stored data; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.12.3 SDDM client CoAP procedure

In order to request an SEALDD data storage management request to the SDDM-S, the SDDM-C shall send:

a) a CoAP PUT request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14] when it needs to request update of the stored data; or

b) a CoAP DELETE request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14] when it needs to request delete of the stored data.

In the CoAP PUT request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req";

c) shall include a "DataStorageMgtRequest" object:

1) shall include a "dataIdentifier" attribute set to the identity of the stored data which is requested to be managed;

2) shall include an "applicationData" attribute set to the application data needed to be stored; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

In the CoAP DELETE request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.3.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req";

c) shall include a "DataStorageMgtRequest" object:

1) shall include a "dataIdentifier" attribute set to the identity of the stored data which is requested to be managed; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.12.4 SDDM server CoAP procedure

Upon receiving a CoAP PUT request or a CoAP DELETE request where the CoAP URI of the CoAP PUT request or the CoAP DELETE request identifies the resource to be updated as specified in clause A.4.3.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req", and

b) a "DataStorageMgtRequest" object;

the SDDM-S shall generate either a CoAP PUT response or a CoAP DELETE response according to IETF RFC 7252 [14]. In either the CoAP PUT response message or the CoAP DELETE message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req";

b) if the received message is a CoAP PUT request:

1) shall attempt to update the SDDM data storage resource pointed at by the CoAP URI with the content of "DataStorageMgtRequest" object received in the CoAP PUT request and:

i) if successfully updated, shall use the CoAP PUT 2.04 (Changed) response message; or

ii) otherwise, shall include an error response in the CoAP PUT response as specified in clause A.4.3.2.2.3.2; and

iii) shall send the CoAP PUT response towards the SDDM-C; or

b) if the received message is a CoAP DELETE request:

1) shall attempt to release the SDDM data storage resource pointed at by the CoAP URI with the content of "DataStorageMgtRequest" object received in the CoAP DELETE request and:

i) if successfully created, shall use the CoAP DELETE 2.02 (Deleted) response message; or

ii) otherwise, shall include an error response in the CoAP DELETE response as specified in clause A.3.2.2.2.3.2; and

iii) shall send the CoAP DELETE response towards the SDDM-C.

7.2.13 SEALDD server relocation procedure

The SDDM-S can be relocated because of either SDDM-C mobility or SDDM-S load re-balancing (see 3GPP TS 23.433 [2] clause 9.6).

NOTE 1: SEALDD server relocation is specified in 3GPP TS 29.548 [9] as SDD_DDContext service.

In an edge data network (EDN), the SDDM-C can use edge applications over 3GPP services (see clause 5) to discover the new SDDM-S. The SDDM-C can obtain the new SDDM-S address by using the SEALDD server discovery and selection procedure described in clause 7.2.7.

NOTE 2: The VAL server acts as an EAS in an EDN and it registers to the EES with the associated SDDM-S address as EAS endpoint in the EAS profile (see 3GPP TS 23.433 [2] clause 9.6.2.2). The SDDM-C mobility triggers the execution of an application context relocation (ACR) procedure or the VAL server triggers ACR due to load re-balancing. The Eees_ACREvents service and the Eees_AppContextRelocation service are specified in 3GPP TS 24.558 [8] and 3GPP TS 29.558 [10].

In a non EDN, the SDDM-C can obtain the new SDDM-S address from the VAL client or from the NAS. After that the SDDM-C can establish a new SEALDD communication channel including the old communication channel information. The SDDM-S can discover an equivalent SDDM-S (e.g. using DNS query mechanism).

NOTE 3: The VAL client can use DNS query mechanism or vertical application (e.g. V2X) layer signalling mechanism to obtain the new SDDM-S address. The VAL client can provide the address information to the SDDM-C.

NOTE 4: DNS query mechanism and vertical application layer signalling mechanism are out of scope of the present document.

NOTE 5: The SDDM-C and vertical applications can receive one or more EAS rediscovery indication(s) from the NAS as specified in 3GPP TS 24.501 [5] and 3GPP TS 24.008 [4].

At SEALDD server relocation procedure the old SDDM-S may stop the downlink data transmission towards the SDDM-C before pushing the SEALDD context to the new SDDM-S in order to allow for service continuity on a packet-level granularity. In this case, content breakpoint information is provided by the old SDDM-S to the new SDDM-C during the data delivery (DD) context push procedure (see 3GPP TS 29.548 [9]). When the SDDM-C connects to the new SDDM-S, the new SDDM-S sends downlink traffic to the SDDM-C using the sequence number of the last transmitted data packet before the downlink data transmission stopped.

NOTE 6: The SDD_DDContext API supports the provisioning of the content breakpoint information, which includes sequence number (e.g. TCP packet sequence number) of the last transmitted data packet, during the DD context push procedure is as specified in 3GPP TS 29.548 [9].

7.2.14 SEALDD enabled data transmission quality measurement subscription procedure

7.2.14.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <measurements-subscription-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <measurements-subscription-rsp> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data transmission quality measurement subscription request operation; and

      ii) may include a <expiry-time> element specifying the expiration time of the subscription. This element shall be included when the SEALDD data transmission quality measurement subscription request operation is "success", otherwise this element shall be ignored by the SDDM-S; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.14.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD data transmission quality measurement subscription request when it needs to request to carry out data transmission quality measurement towards an SDDM-C, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <measurements-subscription-req> element in the <data-delivery-info> root element which:

   1) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S;

   2) shall include a <measurement-requirement-list> element specifying measurement requirement information. In the <measurement-requirement-list> element, the SDDM-S:

      i) shall include a <measurement-id> child element set to measurement identifiers, e.g. latency, bitrate, jitter, delay difference, flow alignment;

      ii) may include a <reporting-frequency> child element set to reporting frequency of measurement results (e.g. "periodic", "now"). If not present, it implies periodic reporting;

      iii) may include a <reporting-periodicity> child element set to the reporting periodicity if the reporting frequency is periodic. This child element shall be included when the reporting frequency of a measurement identifier is "periodic";

iv) may include a <measurement-window> child element set to the measurement period window for transmission quality measurements;

v) may include a <expiry-time> child element set to the expiration time of the measurement;

vi) may include a <sealdd-policy> child element specifying quality guarantee policies associated with the SEALDD connection. In the <sealdd-policy> element, the SDDM-S:

A) shall include a <quality-guarantee-policy> child element set to the measurement threshold to be measured for the quality guarantee; and

B) may include an <anyExt> element containing a <non-3gpp-access-policy> child element set to the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement; and

vii) may include a <reporting-criteria> child element set to the criteria for reporting measurement results, e.g. if the latency or bitrate reaches below or above a certain value. It also includes a unique identifier for each criterion of more than one criterion is specified; and

viii) may include an <anyExt> element containing a <flow-alignment-reporting-criteria-list> child element set to the criteria for reporting flow alignment measurements results e.g. if the flow alignment buffering reaches below or above a certain value for a certain amount of time. It also includes a unique identifier for each criteria if more than one criteria is specified; and

3) may include a <measurement-conditions> element set to the temporal conditions, spatial conditions or both; and

4) may include an <anyExt> element containing a <multi-modal-sealdd-flow-info> child element which may include:

i) a <sealdd-multi-modal-flow-id> child element set to the identity of the multi-modal SEALDD flows associated with the SEALDD multi-modal connection and used by the SDDM-C and SDDM-S to identify the multi-modal traffic for the measurement; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.14.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.3.2.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req", and

b) a "MeasurementsSubscriptionRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-res";

b) shall attempt to create the SDDM data transmission quality measurement resource pointed at by the CoAP URI with the content of "MeasurementsSubscriptionRequest" object received in the request and:

1) if successfully created, shall include a "MeasurementsSubscriptionResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success"; and

ii) may include an "expiryTime" attribute specifying the expiration time of the subscription; or

2) otherwise, shall include a "MeasurementsSubscriptionResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.14.4 SDDM server CoAP procedure

In order to request an SEALDD data transmission quality measurement subscription establishment to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.2.1 with the "apiRoot" set to the SDDM-C URI:

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req";

c) shall include a "MeasurementsSubscriptionRequest" object:

1) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

2) shall include a "measurementId" attribute set to the measurement identifiers, e.g. latency, bitrate, jitter, delay difference, flow alignment;

3) may include a "reportingFrequency" attribute set to reporting frequency of measurement results (e.g. "periodic", "now"). If not present, it implies periodic reporting;

4) may include a "reportingPeriodicity" attribute set to the reporting periodicity if the reporting frequency is periodic. This attribute shall be included when the reporting frequency of a measurement identifier is "periodic";

5) may include a "measurementWindow" attribute set to the measurement period window for transmission quality measurements;

6) may include an "expiryTime" attribute set to the expiration time of the measurement;

7) may include a "sealddPolicy" object specifying quality guarantee policies associated with the SEALDD connection;

8) may include a "reportingCriteria" attribute set to the criteria for reporting measurement results, e.g. if the latency or bitrate reaches below or above a certain value. It also includes a unique identifier for each criterion of more than one criteria is specified;

9) may include a "sealddMultiModalFlowId" attribute set to the identity of the multi-modal SDDM flows associated with the SEALDD multi-modal connection and used by the SDDM-C and SDDM-S to identify application traffic to be measured;

10) may include a "flowAlignmentReportingCriteriaList" attribute set to the criteria for reporting flow alignment measurements results e.g. if the flow alignment buffering reaches below or above a certain value for a certain amount of time. It also includes a unique identifier for each criteria if more than one criteria is specified;

11) may include a "measurementConditions" object specifying the temporal conditions, spatial conditions or both; and

12) may include a "non3gppAccessPolicy" attribute specifying the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.15 SEALDD enabled data transmission quality measurement notification procedure

7.2.15.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD data transmission quality measurement notification when it needs to provide the SDDM-S with transmission quality measurements. The SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <measurements-notification> element in the <data-delivery-info> root element which:

1) shall include a <measurement-requirement-notify-list> element specifying measurement requirement information. In the <measurement-requirement-notify-list> element, the SDDM-S:

i) shall include a <measurement-id> child element set to measurement identifiers, e.g. latency, bitrate, jitter, delay difference, flow alignment;

ii) may include an <identity-measurements> child element which shall include one of the following elements:

A) a <VAL-ue-id-list> element with one or more <VAL-ue-id> child elements set to the identities of the VAL UEs for whom SEALDD measurement applies. For multiple VAL UEs reporting granularity set to individual UE, the associated measurement values are for individual VAL UE; or

B) a <VAL-group-id> element set to the identity of the VAL group for whom SEALDD measurement applies for which the associated measurement values are aggregation for all VAL UEs or the VAL UE group;

iii) may include a <average-measurement-value> child element set to the average measurement value of measurement results;

iv) may include a <minimum-measurement-value> child element set to the minimum measurement value of measurement results;

v) may include a <maximum-measurement-value> child element set to the maximum measurement value of measurement results;

vi) may include a <standard-deviation-measurement-value> child element set to standard deviation measurement value of measurement results;

vii) may include a <kpercentile-measurement-value> child element set to the kpercentile measurement value of measurement results;

viii) may include a <measurement-period> child element set to the measurement period;

ix) may include a <timestamp> child element set to the timestamp of measurement results; and

x) may include an <anyExt> element containing a <non-3gpp-access-measurement-list> child element set to the measurements of the non-3GPP access. In the <non-3gpp-access-measurement-list> element the SDDM-C shall include one or more <non-3gpp-access-measurement> child elements which:

A) may contain a <measured-non-3gpp-access> element representing an identity of the measured non-3GPP access and shall include an <ssid> or <bssid> element; and

B) shall contain a <signal-strength-values> element containing one or more <measured-value> element.

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.15.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <measurements-notification> element included in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

   1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and

   2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. The SDDM-S shall communicate the received data transmission quality measurement results (e.g. latency, jitter, bitrate) to the VAL server by using the SDD_TransmissionQualityMeasurement service as specified in 3GPP TS 29.548 [9]; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.15.3 SDDM client CoAP procedure

Upon reception of a CoAP FETCH request message containing:

a) an "observe" option set to the value "0" (register);

b) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-notification";

c) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req"; and

d) a "MeasurementsSubscriptionRequest" object,

the SDDM-C shall provide an SALDD data transmission quality measurement to the SDDM-S, the SDDM-C shall send a CoAP FETCH response message to the SDDM-S according to procedures specified in IETF RFC 8132 [17] in response to a CoAP FETCH request message used to observe an an SDDM data storage resource as specified in clause A.3.2.2.2.3.2. In the CoAP FETCH response, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.3.2.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-notification";

c) shall include a "MeasurementNotification" object:

   1) shall include a "measurementId" attribute set to the measurement identifiers, e.g. latency, bitrate, jitter, delay difference, flow alignment;

   2) may include a "valUeIdList" attribute set to the identities of the VAL UEs for whom SEALDD measurement applies. For a single VAL UE, this attribute can be omitted and the associated measurement values are for the single VAL UE. For multiple VAL UEs with reporting granularity set to individual UE, the associated measurement values are for individual VAL UE. For multiple VAL UEs with reporting granularity set to VAL UE group or all VAL UEs, the associated measurement values are aggregation for all VAL UEs or the VAL UE group;

3) may include an "averageMeasurementValue" attribute set to the average measurement value of measurement results;

4) may include a "maximumMeasurementValue" attribute set to the maximum measurement value of measurement results;

5) may include a "minimumMeasurementValue" attribute set to the minimum measurement value of measurement results;

6) may include a "standardDeviationMeasurementValue" attribute set to the standard deviation measurement value of measurement results;

7) may include a "kPercentileMeasurementValue" attribute set to the kpercentile measurement value of measurement results;

8) may include a "measurementPeriod" attribute set to the measurement period;

9) may include a "timeStamp" attribute set to the timestamp of measurement results; and

10) may include a "non3gppAccessMeasurements" attribute to indicate measurement results for the requested non-3GPP access measurement policies; and

d) shall send the CoAP FETCH response towards the SDDM-S.

7.2.15.4 SDDM server CoAP procedure

In order for an SDDM-S to get data transmission quality measurement of an SDDM regular data transmission connection, the SDDM-S shall first send a CoAP FETCH request message (as specified in IETF RFC 8132 [17]) used to observe an SDDM data storage resource as specified in clause A.3.2.2.2.3.2, and containing:

a) a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.2.1;

b) an "observe" option set to the value "0" (register);

c) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-notification";

d) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req", and

e) a "MeasurementsSubscriptionRequest" object;

1) shall include a "sealddFlowiId" data type set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

2) shall include a "measurementId" attribute set to the measurement identifiers, e.g. latency, bitrate, jitter.

Upon receiving a CoAP FETCH 2.05 (Content) response containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-notification", and

b) a "MeasurementNotification" object;

the SDDM-S shall communicate the received data transmission quality measurement results (e.g. latency, jitter, bitrate) to the VAL server by using the SDD_TransmissionQualityMeasurement service as specified in 3GPP TS 29.548 [9].

In order for an SDDM-S to stop data transmission quality measurement of an SDDM regular data transmission connection, the SDDM-S shall send a CoAP FETCH request message as specified in clause A.3.2.2.2.3.2, and containing:

a) an "observe" option set to the value "1" (deregister);

b) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req", and

c) a "MeasurementsSubscriptionRequest" object;

1) shall include a "sealddFlowiId" data type set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

2) shall include a "measurementId" attribute set to the measurement identifiers, e.g. latency, bitrate, jitter.

7.2.16 SEALDD enabled data transmission quality guarantee procedure

7.2.16.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <tx-quality-management-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <tx-quality-management-rsp> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD data transmission quality management request operation; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.16.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD data transmission quality management request when it needs to request to data transmission quality management towards an SDDM-C, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <tx-quality-management-req> element in the <data-delivery-info> root element which:

1) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S;

2) shall include a <tx-quality-management-action> element set to the data transmission quality guarantee action (e.g. redundant transmission path, re-establish transmission path, switch to backup transmission path) or optimization action (back to single transmission path, transmission parameter adjustment) that was triggered by an event (e.g. measurement threshold); and

3) if the <tx-quality-management-action> element indicates a transmission parameter adjustment, shall include an <anyExt> element that:

i) shall contain a <bat-offset-ul> element specifying the BAT offset for the uplink data; and

ii) if the <bat-offset-ul> element is included, may contain a <periodicity-ul> element specifying the adjusted periodicity for the uplink data; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.16.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.3.3.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=tx-quality-mgt-req"; and

b) a "TxQualityManagementRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=tx-quality-mgt-res";

b) shall attempt to create the SDDM data transmission quality guarantee resource pointed at by the CoAP URI with the content of "TxQualityManagementResquest" object received in the request and:

   1) if successfully created, shall include a "TxQualityManagementResponse" object in the CoAP POST 2.01 (Created) response message;

      i) shall include a "result" attribute set to "success"; or

   2) otherwise, shall include a "TxQualityManagementResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.16.4 SDDM server CoAP procedure

In order to request an SEALDD data transmission quality guarantee establishment to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.3.1 with the "apiRoot" set to the SDDM-C URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=tx-quality-mgt-req";

c) shall include a "TxQualityManagementRequest" object:

   1) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic; and

   2) shall include a "txQualityManagementAction" attribute set to the data transmission quality guarantee action (e.g. redundant transmission path, re-establish transmission path, switch to backup transmission path) or optimization action (back to single transmission path, transmission parameter adjustment) that was triggered by an event (e.g. measurement threshold);

d) if the "txQualityManagementAction" attribute indicates a transmission parameter adjustment:

   1) shall include a "batOffsetUl" attribute specifying the BAT offset for Uplink data; and

   2) may include a "periodicityUl" attribute specifying the adjusted periodicity for Uplink data; and

e) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.17 SEALDD enabled URLLC transmission connection deletion based on policy procedure

7.2.17.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1; and

   1) if the identity of the sender of the received HTTP POST request is not authorized to request signalling transmission connection release, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;

   2) shall support handling an HTTP POST request from an SDDM-S according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-rsp> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD URLLC transmission connection release request operation. If the result is "failure", in the <result> element, the SDDM-C may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.17.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD URLLC transmission connection release request when it needs to release an established SEALDD URLLC transmission connection towards an SDDM-C, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-release-req> element in the <data-delivery-info> root element which:

   1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C; and

   2) shall include a <sealdd-flow-id> element set to the identity of the SEALDD flow used by the SDDM-C and SDDM-S to identify the application traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.17.3 SDDM client CoAP procedure

Upon receiving a CoAP DELETE request where the CoAP URI of the CoAP DELETE request identifies the release resource as specified in clause A.3.5.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req", and

b) a "URLLCReleasetRequest" object;

the SDDM-C shall generate a CoAP DELETE response according to IETF RFC 7252 [14]. In the CoAP DELETE response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req";

b) shall attempt to release the SDDM URLLC transmission connection resource pointed at by the CoAP URI with the content of "URLLCReleaseRequest" object received in the request and:

   1) if successfully created, shall use the CoAP DELETE 2.02 (Deleted) response message; or

   2) otherwise, shall include an error response in the CoAP DELETE response as specified in clause A.4.2.2.2.3.3; and

c) shall send the CoAP DELETE response towards the SDDM-S.

7.2.17.4 SDDM server CoAP procedure

In order to request the release of an SEALDD URLLC transmission connection to the SDDM-C, the SDDM-S shall send a CoAP DELETE request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP DELETE request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.5.1 with;

   1) the "apiRoot" set to the SDDM-C URI; and

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req";

c) shall include a "URLLCReleaseRequest" object:

   1) shall include a "sealClientId" attribute set to the identity of the SDDM-C;

   2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-S and SDDM-C to identify the application traffic; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.18 SEALDD enabled URLLC transmission connection establishment based on policy procedure

7.2.18.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-establishment-req> element included in the <data-delivery-info> root element;

the SDDM-C:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

   1) if the identity of the sender of the received HTTP POST request is not authorized to request URLCC transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and

   2) shall support handling an HTTP POST request from an SDDM-S according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <URLLC-establishment-rsp> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD URLLC transmission connection establishment request operation. If the result is "failure", in the <result> element, the SDDM-C may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error;

      ii) may include a <traffic-descriptor-info> element specifying the information of the traffic of the redundant SEALDD transmission connection. In the <traffic-descriptor-info> element, the SDDM-C may include:

         A) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

         B) a <port-number>child element specifying the identity of the port number of the traffic;

         C) a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and

         D) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

      iii) may include an <anyExt> element containing a <traffic-transmission-bandwidth> element indicating suggested traffic transmission bandwidth to be used by SDDM-C; and

      iv) may include an <anyExt> element containing a <bat-period-adapt-cap> element to indicate a BAT and periodicity adaptation capability or a <transmission-assist-info> element specifying a transmission assistance information. In the <transmission-assist-info> element, the SDDM-C:

         A) a <bat> child element specifying the arrival time of the first packet of the data burst;

         B) a <periodicity> child element specifying the time period between the start of two bursts;

         C) if the <bat> element is included, may include a <bat-window> child element containing the acceptable earliest and latest arrival time of the first packet of the data burst; and

         D) if the <bat>, <bat-window> and <periodicity>elements are included, may include a <periodicity-range> child element specifying the periodicity range. In the <periodicity-range> element the SDDM-C shall include either a <lower-bound> child element set to the lower bound of the periodicity and an <upper-bound> child element set to the upper bound of the periodicity of the start two bursts or a <periodicity-value-list> child element with one or more <periodicity-value> child elements set to the acceptable periodicity value; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.18.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD URLLC transmission connection establishment request when it needs to request an SEALDD URLLC transmission connection establishment, the SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <URLLC-establishment-req> element in the <data-delivery-info> root element which:

1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C;

2) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-S and SDDM-C to identify the application traffic;

3) may include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and receiving the request;

4) may include a <server-id> element set to the information of the endpoint of the selected VAL server to which the SDDM URLLC transmission connection establishment request has to be sent;

5) may include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

6) may include a <traffic-descriptor-info> element specifying the information of the traffic of the redundant SEALDD transmission connection. In the <traffic-descriptor-info> element, the SDDM-S may include:

i) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

ii) a <port-number> child element specifying the identity of the port number of the traffic;

iii) a <URL> child element specifying the address of a given unique resource on the Web for the traffic;

iv) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.18.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.3.5.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-req", and

b) a "URLLCEstablishmentRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-res";

b) shall attempt to create the URLLC transmission connection resource pointed at by the CoAP URI with the content of "EstablishmentRequest" object received in the request and:

1) if successfully created, shall include a "URLLCEstablishmentResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success";

ii) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

iii) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

iv) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

v) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

vi) may include a "batPeriodAdaptCap" attribute to indicate a BAT and periodicity adaptation capability or a "transmisAssistInfo" attribute specifying a transmission assistance information. In the "transmisAssistInfo" attribute the SDDM-C:

A) shall include at least one of the following attributes:

I) a "bat" attribute specifying the arrival time of the first packet of the data burst; and

II) a "periodicity" attribute specifying the time period between the start of two bursts;

B) if the "bat" attribute is included, may include a "batWindow" attribute containing the acceptable earliest and latest arrival time of the first packet of the data burst; and

C) if the "bat", "batWindow" and "periodicity" attributes are included, may include a "periodRange" attribute specifying the periodicity range. In the "periodRange" attribute the SDDM-C shall include:

I) a "lowerBound" attribute set to the lower bound of the periodicity and an "upperBound" attribute set to the upper bound of the periodicity of the start two bursts; or

II) a "periodicityValues" attribute set to the acceptable periodicity values; or

2) otherwise, shall include a "URLLCEstablishmentResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response as specified in clause A.3.2.2.2.3.1; and

c) shall send the CoAP POST response towards the SDDM-C.

7.2.18.4 SDDM server CoAP procedure

In order to request an SEADD URLLC transmission connection establishment to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.5.1 with;

1) the "apiRoot" set to the SDDM-C URI; and

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-req";

c) shall include a "URLLCEstablishmentRequest" object:

1) shall include a "sealClientId" attribute set of the identity of the SDDM-C;

2) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-S and SDDM-S to identify the application traffic;

3) shall include a "valTgtUe" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and receiving the request;

4) may include a "serverId" attribute set to the information of the VAL server;

5) may include a "valServiceId" attribute set to the identity of the VAL service of the vertical application;

6) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

7) may include a"portNumber" attribute specifying the identity of the port number of the traffic;

8) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic;

9) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic; and

c) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.19 SEALDD enabled connection status reporting configuration subscription procedure

7.2.19.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <connection-status-configuration-req> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [18]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <connection-status-configuration-rsp> element within <anyExt> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD connection status reporting configuration request operation; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.19.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD connection status reporting configuration request when it needs to request connection status reporting configuration information from the SDDM-C. The SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [18]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [12];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <connection-status-configuration-req> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall contain a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

   2) may contain a <reporting-mode> element set to the mode of the reporting, i.e. periodic or event triggered. If the reporting mode is set to "periodic", the <reporting-mode> element:

      i) may contain a <reporting-interval> child element set to the reporting interval of the measurement results;

   3) may contain a <reporting-priority> element set to the priority of SEALDD client connection status for the requested SEALDD flow ID; and

   4) may contain a <non-3gpp-access-policy> element set to the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement.

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.19.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the resource as specified in clause A.3.4.1, and the CoAP POST request contains:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-configuration-req"; and

b) a "ConnectionStatusConfigurationRequest" object,

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-configuration-res";

b) shall attempt to create the SDDM connection status reporting configuration resource pointed at by the CoAP URI with the content of "ConnectionStatusConfigurationRequest" object received in the request and:

1) if successfully created, shall include a "ConnectionStatusConfigurationResponse" object in the CoAP POST 2.01 (Created) response message and:

i) shall include a "result" attribute set to "success"; or

2) otherwise, shall include a "ConnectionStatusConfigurationResponse" object with a "result" attribute set to "failure"; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.19.4 SDDM server CoAP procedure

In order to request an SEALDD connection status reporting configuration from the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.4.1 with:

1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-configuration-req";

c) shall include a "ConnectionStatusConfigurationRequest" object:

1) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

2) may include a "reportingMode" attribute set to the mode of the reporting;

3) if the reporting mode is included and indicates a periodic reporting mode, may include a "reportingInterval" attribute set to the reporting interval of the measurement results;

4) may include a "reportingPriority" attribute set to the priority of SEALDD client connection status for the requested SEALDD flow ID; and

5) may include a "non3gppAccessPolicy" attribute set to the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.20 Void

7.2.21 SEALDD enabled connection status reporting configuration notification procedure

7.2.21.1 SDDM client HTTP procedure

The SDDM-C sends a SEALDD connection status reporting notification when it needs to provide to the SDDM-S connection status reporting configuration. The SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <connection-status-notification> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall include a <client-connection-status> element specifying the status of the VAL UE, i.e. "reachable", "unreachable", or "sleeping";

   2) shall include a <access-usage> element indicating which access (3GPP or non-3GPP) is used for the SEALDD-UU data transmission;

   3) may include a <non-3gpp-access-measurement-list> element set to the measurements of the non-3GPP access. In the <non-3gpp-access-measurement-list> element the SDDM-C shall include one or more <non-3gpp-access-measurement> child elements which:

      i) may contain a <measured-non-3gpp-access> element representing an identity of the measured non-3GPP access and shall include an <ssid> or <bssid> element; and

      ii) shall contain a <signal-strength-value-list> element containing one or more <measured-value> elements; and

   4) if the <client-connection-status> element is set to "SLEEPING", may include a <sleeping-duration> element to indicate the duration the client connection status of the VAL client is set to sleeping, in units of microseconds; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.21.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <connection-status-notification> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

   1) if the identity of the sender of the received HTTP POST request is not authorized user, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and

   2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. The SDDM-S shall communicate to the VAL server the received connection status results by using the SDD_Transmission service as specified in 3GPP TS 29.548 [9]; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.21.3 SDDM client CoAP procedure

Upon reception of a CoAP FETCH request message containing:

a) an "observe" option set to the value "0" (register);

b) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-notification";

c) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-config-subsc"; and

d) a "ConnectionStatusConfigurationSubscription" object,

the SDDM-C shall provide an SEALDD connection status reporting notification to the SDDM-S within a CoAP FETCH 2.05 (Content) response (as specified in IETF RFC 8132 [17]). In the CoAP FETCH 2.05 (Content) response the SDDM-C:

a) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-notification";

b) shall include a "ConnectionStatusNotification" object containing:

1) a "clientConnectionStatus" attribute set to the status of the VAL UE, i.e. reachable, unreachable, or sleeping;

2) an "accessUsage" attribute indicating which access (3GPP or non-3GPP) is used for the SEALDD-UU data transmission;

3) a "non3gppAccessMeasurements" attribute to indicate measurement results for the requested non-3GPP access measurement policies; and

4) if the "clientConnectionStatus" attribute is set to "SLEEPING", may include a "sleepingDuration" attribute to indicate the duration the client connection status of the VAL client is set to sleeping, in units of microseconds; and

c) shall send CoAP FETCH 2.05 (Content) response towards the SDDM-S.

7.2.21.4 SDDM server CoAP procedure

To get an SEALDD connection status reporting notification from the SDDM-C, the SDDM-S shall generate a CoAP FETCH request (as specified in IETF RFC 8132 [17]) message containing:

a) a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.4.1 with the "apiRoot" set to the SDDM-C URI;

b) an "observe" option set to the value "0" (register);

c) an Accept option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-notification";

d) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-config-subsc"; and

e) a "ConnectionStatusConfigurationSubscription" object.

Upon receiving a CoAP FETCH 2.05 (Content) response containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-notification"; and

b) a "ConnectionStatusNotification" object,

the SDDM-S shall communicate the received connection status results to the VAL server by using the SDD_Transmission service as specified in 3GPP TS 29.548 [9].

To stop getting an SEALDD connection status reporting notifications from the SDDM-C, the SDDM-S shall generate a CoAP FETCH request (as specified in IETF RFC 8132 [17]) message containing:

a) a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.4.1 with the "apiRoot" set to the SDDM-C URI;

b) an "observe" option set to the value "1" (deregister);

c) a Content-Format option set to application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-config-subsc", and

d) a "ConnectionStatusConfigurationSubscription" object.

7.2.22 SEALDD enabled XR data transmission trigger procedure

7.2.22.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-trigger-req> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-trigger-rsp> element within <anyExt> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD XR transmission connection trigger request operation; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.22.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD XR transmission connection trigger request when it needs to trigger XR transmission connection operation towards an SDDM-C. The SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <xr-trigger-req> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall include a <requestor-id> element set to the identity of the SDDM-S, e.g. FQDN, URI;

   2) shall include a <VAL-ue-id-list> element with one or more <VAL-ue-id> child elements set to the identities of the VAL UEs for whom SEALDD XR transmission connection inform applies;

3) shall include a <operation> element set to the action for UE-to-UE direct communication (i.e. establishment, release); and

4) may include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.22.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request is set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.6.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-trigger-req", and

b) a "XRTriggerRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-trigger-res";

b) shall attempt to create the SDD multi-modal transmission connection resource pointed at by the CoAP URI with the content of "XRTriggerRequest" object received in the request and:

1) if successfully created, shall include a "XRTriggerResponse" object in the CoAP POST 2.01 (Created) response message;

i) shall include a "result" attribute set to "success"; or

2) otherwise, shall include a "XRTriggerResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.22.4 SDDM server CoAP procedure

In order to trigger an SEALDD XR transmission connection operation to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.6.1 with the "apiRoot" set to the SDDM-C URI:

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-trigger-req";

c) shall include a "XRTriggerRequest" object which:

1) shall include a "requestorId" attribute set to the identity of the SDDM-S, e.g. FQDN, URI;

2) shall include a "valUeIds" attribute set to the identities of the VAL UEs for whom SEALDD XR transmission connection inform applies;

3) shall include an "operation" attribute set to the action for UE-to-UE direct communication (i.e. establishment, release); and

4) may include a "valServiceId" attribute set to the VAL service identity of the vertical; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.23 SEALDD enabled XR data transmission inform procedure

7.2.23.1 SDDM client HTTP procedure

The SDDM-C sends a SEALDD XR transmission connection inform request when it needs to inform XR transmission connection status between two UEs to the SDDM-S. The SDDM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-inform-req> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall include a <requestor-id> element set to identity of the SDDM-C, e.g. unique client identifier;

   2) shall include a <VAL-ue-id-list> element with one or more <VAL-ue-id> child elements set to the identities of the VAL UEs for whom SEALDD XR transmission connection inform applies;

   3) shall include a <status> element set to the UE-to-UE direct communication status (i.e. established, released); and

   4) may include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [16].

7.2.23.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-inform-req> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

   1) if the identity of the sender of the received HTTP POST request is not authorized user, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and

   2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21] In the HTTP 200 (OK) response message, the SDDM-S:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

   2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-inform-rsp> element within <anyExt> element in the <data-delivery-info> root element which:

      i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD XR transmission connection inform request operation; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [16].

7.2.23.3 SDDM client CoAP procedure

In order to inform XR transmission connection status between two UEs to the SDDM-S, the SDDM-C shall send a CoAP POST request message to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.4.1 with the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-inform-req";

c) shall include a "XRInformRequest" object which:

   1) shall include a "requestorId" attribute set to identity of the SDDM-C, e.g. unique client identifier;

   2) shall include a "valUeIds" attribute set to the identities of the VAL UEs for whom SEALDD XR transmission connection inform applies;

   3) shall include a "status" attribute set to the UE-to-UE direct communication status (i.e. established, released); and

   4) may include a "valServiceId" attribute set to the VAL service identity of the vertical application; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.23.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request is set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.4.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-inform-req", and

b) a "XRInformRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-inform-rsp";

b) shall attempt to create the SDD multi-modal transmission connection resource pointed at by the CoAP URI with the content of "XRInformRequest" object received in the request and:

   1) if successfully created, shall include a "XRInformResponse" object in the CoAP POST 2.01 (Created) response message;

      i) shall include a "result" attribute set to "success"; or

   2) otherwise, shall include a "XRInformResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-C.

7.2.24 SEALDD enabled multi-modal data transmission establishment procedure

7.2.24.1 SDDM client HTTP procedure

The SDDM-C sends an SEALDD multi-modal transmission connection establishment request when it needs to request an SEALDD multi-modal transmission connection establishment, the SDDM-C generate an HTTP POST request according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request, the SDDM-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-S;

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-establishment-req> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall include a <sealdd-client-identity> element set to the identity of the SDDM-C;

   2) shall include a <sealdd-flows-info> element set to the information of the SEALDD flows used by the SDDM-S and SDDM-C to identify the application traffic. The <sealdd-flows-info>:

      i) shall include one or more <sealdd-flow-id> child elements set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal traffic; and

      ii) may include a <traffic-descriptor-info> child element specifying the information of traffic descriptors for the multi-modal traffic. In the <traffic-descriptor-info>, the SDDM-C may include:

         A) a <user-plane-address> child element specifying the identity of the IP address of the traffic;

         B) a <port-number> child element specifying the identity of the port number of the traffic;

         C) a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and

         D) a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic;

   3) may include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request;

   4) may include a <server-id> element set to the information of the endpoint of the selected VAL server to which the SEALDD multi-modal transmission connection establishment request has to be sent; and

   5) may include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.24.2 SDDM server HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-establishment-req> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 7.2.1.1 and:

   1) if the identity of the sender of the received HTTP POST request is not authorized to request SEALDD multi-modal transmission connection establishment, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; or

2) shall support handling an HTTP POST request from an SDDM-C according to procedures specified in IETF RFC 4825 [12] "POST Handling";

b) shall generate an HTTP 200 (OK) response message to the SDDM-C according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <xr-establishment-rsp> element within <anyExt> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD multi-modal transmission connection establishment request operation. If the result is "failure", in the <result> element, the SDDM-S may include a <cause> child element specifying the cause of the failure of the operation, e.g. VAL client error;

ii) if <result> element is set to "success", the <multi-modal-sealdd-flow-info> element shall be included and set to the information of the multi modal SEALDD flow used by the SDDM-S and SDDM-C. The <multi-modal-sealdd-flow-info> shall include:

A) a <sealdd-multi-modal-flow-id> child element set to the identity of the SEALDD flow used by the SDDM-C and SDDM-S to identify the multi-modal XR traffic; and

B) a <sealdd-flows-info> child element set to list of SEALDD flows used by the SDDM-S and SDDM-C:

I) shall include one or more <sealdd-flow-id> child elements set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal traffic; and

II) may include a <traffic-descriptor-info> child element specifying the information of traffic descriptors for the multi-modal traffic. The <traffic-descriptor-info> may include a <user-plane-address> child element specifying the identity of the IP address of the traffic; a <port-number> child element specifying the identity of the port number of the traffic; a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic; and

iii) if <result> element is set to "success", the <protocol-descriptor-info> element may be included and set to the information of the protocol of the VAL traffic. In the <protocol-descriptor-info> element, the SDDM-S:

A) may include a <header-ext-info> child element specifying the information of the header extension, e.g. RTP extension with PDU set. This child element is only included if the payload type is RTP. The<header-ext-info> element:

I) may include a <header-ext-type> child element set to the type of the header extension protocol (e.g, RTP, SRTP); and

II) may include a <header-ext-id> child element set to the identity of the header extension protocol with value from 1 to 255;

B) may include a <packetization-indication> child element set to packetization indication;

C) may include a <payload-type> child element set to the type of the payload, e.g. RTP, SRTP; and

D) may include a <payload-format> child element set to the format of the payload, e.g. H.264, H.265; and

c) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.24.3 SDDM client CoAP procedure

In order to request a SEALDD multi-modal transmission connection establishment to the SDDM-S, the SDDM-C shall generate a CoAP POST request to the SDDM-S according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-C:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-S as specified in clause A.4.4.1 with:

   1) the "apiRoot" set to the SDDM-S URI;

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-establishment-req"; and

c) shall include a "XREstablishmentRequest" object:

   1) shall include a "sealClientId" attribute set of the identity of the SDDM-C;

   2) shall include a "sealddFlowsInfos" attribute set to the list of the SDDM flow used by the SDDM-C and SDDM-S;

      i) shall include a "sealddFlowId" attribute set to the identity of the SDDM flows used by the SDDM-C and SDDM-S to identify the application traffic;

      ii) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

      iii) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

      iv) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

      v) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic;

   3) may include a "valTgtUe" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request;

   4) may include a "serverId" attribute set to the information of the VAL server; and

   5) may include a "valServiceId" attribute set to the identity of the VAL service of the vertical application.

The SDDM-C shall send the CoAP POST request to the SDDM-S protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.2.24.4 SDDM server CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request identifies the establishment resource as specified in clause A.4.4.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-establishment-req"; and

b) a "XREstablishmentRequest" object;

the SDDM-S shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response, the SDDM-S:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-establishment-res"; and

b) shall attempt to create the SDD multi-modal transmission connection resource pointed at by the CoAP URI with the content of "EstablishmentRequest" object received in the request and:

   1) if successfully created, shall include a "XREstablishmentResponse" object in the CoAP POST 2.01 (Created) response message:

      i) shall include a "result" attribute set to "success";

      ii) shall include a "sealddMultimodalFlow" attribute set to the information of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal service traffic;

         A) shall include a "sealddMultimodalFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal traffic; and

B) shall include a "sealddFlowsInfos" attribute set to the list of SDDM flows used by the SDDM-C and SDDM-S;

shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

may include a "portNumber" attribute specifying the identity of the port number of the traffic;

may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic;

iii) may include a "headerExtType" attribute specifying the header extension information;

iv) may include a "headerExtId" attribute specifying the header extension identity;

v) may include a "packetizationIndication" attribute specifying the packet indication information;

vi) may include a "payloadType" attribute specifying the payload type information; and

vii) may include a "payloadFormat" attribute specifying the payload format information; and

2) otherwise, shall include a "XR EstablishmentResponse" object with a "result" attribute set to "failure" and a "cause" attribute specifying the cause of the failure of the operation, e.g. VAL client error in the CoAP POST response as specified in clause A.4.4.2.2.3.1.

The SDDM-S shall send the CoAP POST response towards the SDDM-C.

7.2.25 SEALDD enabled policy configuration procedure

7.2.25.1 SDDM client HTTP procedure

Upon receiving an HTTP POST request containing:

a) an Accept header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

b) a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml"; and

c) an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <policy-configuration-req> element included within <anyExt> element in the <data-delivery-info> root element;

the SDDM-C:

a) shall generate an HTTP 200 (OK) response message to the SDDM-S according to IETF RFC 9110 [21]. In the HTTP 200 (OK) response message, the SDDM-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-data-delivery-info+xml";

2) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with a <policy-configuration-rsp> element within <anyExt> element in the <data-delivery-info> root element which:

i) shall include a <result> element set to "success" or "failure" indicating success or failure of the SEALDD XR transmission connection trigger request operation; and

ii) shall include a <configuration-id> element set to the identity of the SEALDD policy configuration; and

b) shall send the HTTP 200 (OK) response message as specified in IETF RFC 9110 [21].

7.2.25.2 SDDM server HTTP procedure

The SDDM-S sends an SEALDD policy configuration request when it needs to provide SEALDD client policy configuration toward an SDDM-C. The SDDM-S shall send an HTTP POST request message according to procedures specified in IETF RFC 9110 [21]. In the HTTP POST request message, the SDDM-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the SDDM-C.

b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13];

c) shall include an application/vnd.3gpp.seal-data-delivery-info+xml MIME body with an <policy-configuration-req> element within <anyExt> element in the <data-delivery-info> root element which:

   1) shall include a <requestor-id> element set to the identity of the SDDM-S, e.g. FQDN, URI;

   2) shall include a <VAL-service-id> element set to the VAL service identity of the vertical application; and

   3) shall include a <sealdd-flow-id> element set to the identity of the SDDM flow used by the SDDM-C and SDDM-S, a <multi-modal-sealdd-flow-info> element set to the information of the multi modal SEALDD flow used by the SDDM-S and SDDM-C, or both. If a <multi-modal-sealdd-flow-info> element is included, then the <multi-modal-sealdd-flow-info> shall include:

      i) a <sealdd-multi-modal-flow-id> child element set to the identity of the SEALDD flow used by the SDDM-C and SDDM-S to identify the multi-modal XR traffic; and

      ii) a <sealdd-flows-list> child element set to list of SEALDD flows used by the SDDM-S and SDDM-C:

         A) shall include one or more <sealdd-flow-id> child elements set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal traffic; and

         B) may include a <traffic-descriptor-info> child element specifying the information of traffic descriptors for the multi-modal traffic. The <traffic-descriptor-info> may include a <user-plane-address> child element specifying the identity of the IP address of the traffic; a <port-number> child element specifying the identity of the port number of the traffic; a <URL> child element specifying the address of a given unique resource on the Web for the traffic; and a <transport-layer-protocol> child element specifying the transport layer protocol for the traffic;

   4) may include a <VAL-ue-id-list> element with one or more <VAL-ue-id> child elements set to the identities of the VAL UEs for whom the SEALDD policy configuration request applies, and with a <configuration-id> element within <anyExt> element set to the identity of the SEALDD policy configuration;

   5) may include a <multi-modal-flows-alignment-policy> element that specifies multi-modal flows alignment policy. The <multi-modal-flows-alignment-policy> element shall include the following sub-elements:

      i) a <multi-modal-service-id> element set to the identity of the multi-modal service; and

      ii) a <flows-transmission-requirement> element that specifies flows transmission requirement. The <flows-transmission-requirement> element shall include the following sub-elements;

         A) a <delay-requirement> element that specifies the maximum tolerable time delay by which the multi-modal flows can be delayed; and

         B) a <max-align-time> element that specifies the maximum acceptable time duration for multi-modal traffic flow alignment;

   6) may include a <sealdd-ue-to-ue-policy> element that specifies UE-to-UE direct communication policy. The <sealdd-ue-to-ue-policy> element shall include the following sub-elements:

      i) a <proximity-thresholds> element that specifies the proximity thresholds for entering/leaving the UE-to-UE direct communication mode; and

      ii) a <qos-thresholds> element that specifies the QoS thresholds for entering/leaving the UE-to-UE direct communication mode; and

d) shall send the HTTP POST request as specified in IETF RFC 9110 [21].

7.2.25.3 SDDM client CoAP procedure

Upon receiving a CoAP POST request where the CoAP URI of the CoAP POST request is set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.7.1, and containing:

a) a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=policy-configuration-req", and

b) a "PolicyConfigRequest" object;

the SDDM-C shall generate a CoAP POST response according to IETF RFC 7252 [14]. In the CoAP POST response message, the SDDM-C:

a) shall include a Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=policy-configuration-res";

b) shall attempt to create the SDD multi-modal transmission connection resource pointed at by the CoAP URI with the content of "PolicyConfigRequest" object received in the request and:

   1) if successfully created, shall include a "PolicyconfigResponse" object in the CoAP POST 2.01 (Created) response message;

      i) shall include a "result" attribute set to "success"; and

      ii) shall include a "confgiurationId" attribute set to the identity of the SEALDD policy configuration; or

   2) otherwise, shall include a "PolicyConfigResponse" object with a "result" attribute set to "failure" in the CoAP POST response; and

c) shall send the CoAP POST response towards the SDDM-S.

7.2.25.4 SDDM server CoAP procedure

In order to trigger an an SEALDD policy configuration request SEALDD client policy configuration to the SDDM-C, the SDDM-S shall send a CoAP POST request message to the SDDM-C according to procedures specified in IETF RFC 7252 [14]. In the CoAP POST request, the SDDM-S:

a) shall include a CoAP URI set to the URI corresponding to the identity of the SDDM-C as specified in clause A.3.7.1 with the "apiRoot" set to the SDDM-C URI:

b) shall include Content-Format option set to "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=policy-configuration-req";

c) shall include a "PolicyConfigRequest" object which:

   1) shall include a "requestorId" attribute set to the identity of the SDDM-S, e.g. FQDN, URI;

   2) shall include a "valServiceId" attribute set to the VAL service identity of the vertical;

   3) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic, a "sealddMultimodalFlow" attribute set to the information of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal service traffic, or both. If a "sealddMultimodalFlow" attribute is included, then the "sealddMultimodalFlow" attribute shall include:

      i) shall include a "sealddMultimodalFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the multi-modal traffic; and

      ii) shall include a "sealddFlowsInfos" attribute set to the list of SDDM flows used by the SDDM-C and SDDM-S;

         A) shall include a "sealddFlowId" attribute set to the identity of the SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic;

         B) may include a "userPlaneAddress" attribute specifying the identity of the IP address of the traffic;

         C) may include a "portNumber" attribute specifying the identity of the port number of the traffic;

D) may include a "url" attribute specifying the address of a given unique resource on the Web for the traffic; and

E) may include a "transportLayerProtocol" attribute specifying the transport layer protocol for the traffic;

4) may include a "valTgtUe" attribute set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and receiving the request;

5) may include a "configurationId" attribute set to the identity of the SEALDD policy configuration;

6) may include an "multimodalFlowsAlignmentPolicy" attribute set to the action for UE-to-UE direct communication (i.e. establishment, release):

i) shall include a "multimodalServiceId" attribute set to the identity of the multi-modal service; and

ii) shall include a "flowsTransmissionReq" attribute that specifies flows transmission requirement of the multi-modal service:

A) shall include a "delayReq" attribute set to the maximum tolerable time delay by which the multi-modal flows can be delayed; and

B) shall include a "maxAlignTime" attribute set to the maximum acceptable time duration for multi-modal traffic flow alignment; and

7) may include a "sealddUeToUePol" attribute set to the VAL service identity of the vertical:

i) shall include a "proximityThresholds" attribute set to the proximity thresholds for entering/leaving the UE-to-UE direct communication mode; and

ii) shall include a "qosThresholds" attribute set to QoS thresholds for entering/leaving the UE-to-UE direct communication mode; and

d) shall send the request protected with the relevant ACE profile (OSCORE profile or DTLS profile) as described in 3GPP TS 24.547 [7].

7.3 Off-network procedures

The off-network procedures are out of scope of the present document in this release of the specification.

8 Coding

8.1 General

This clause specifies the coding to enable an SDDM-C and an SDDM-S to communicate.

8.2 Application unique ID

The AUID shall be set to the VAL service ID as specified in specific VAL service specification.

8.3 Structure

The data delivery management document shall conform to the XML schema described in clause 8.4.

The <data-delivery-info> element shall be the root element of the SEALDataDeliveryManagement document.

The <data-delivery-info> element shall include:

1) <establishment-req> element;
2) <establishment-rsp> element;
3) <release-req> element;
4) <release-rsp> element;
5) <URLLC-establishment-req> element;
6) <URLLC-establishment-rsq> element;
7) <URLLC-release-req> element;
8) <URLLC-release-rsp> element;
9) <URLLC-update-req> element;
10) <URLLC-update-rsp> element;
11) <data-storage-creation-req> element;
12) <data-storage-creation-rsp> element;
13) <data-storage-reservation-req> element;
14) <data-storage-reservation-rsp> element;
15) <data-storage-status-notification> element;
16) <measurements-subscription-req> element;
17) <measurements-subscription-rsp> element;
18) <data-storage-query-req> element;
19) <data-storage-query-rsp> element;
20) <data-storage-mgt-req> element;
21) <data-storage-mgt-rsp> element;
22) <measurements-notification> element;
23) <identity-measurements> element;

24) <tx-quality-management-req> element;

25) <tx-quality-management-rsp> element; and

26) <anyExt> element.

The <anyExt> element of the <data-delivery-info> element shall include:

1) <connection-status-configuration-req> element;

2) <connection-status-configuration-rsp> element;

3) <connection-status-notification> element;

4) <xr-trigger-req> element;

5) <xr-trigger-rsp> element;

6) <xr-inform-req> element;

7) <xr-inform-rsp> element;

8) <xr-establishment-req> element;

9) <xr-establishment-rsp> element;

10) <policy-configuration-req>; and

11) <policy-configuration-rsp>.

The <establishment-req> element:

a) shall include a <requestor-id> element;

b) shall include a <sealdd-flow-id> element;

c) shall include a <endpoint-id> element;

d) may include a <server-id> element;

e) may include a <VAL-service-id> element;

f) may include a <sealdd-communication-lifetime> element;

g) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

   1) a <user-plane-address> element;

   2) a <port-number> element;

   3) a <URL> element; or

   4) a <transport-layer-protocol> element;

h) may include an <identity> element; and

i) may include an <anyExt> element that may contain:

   1) an <l4s-supporting-capability> element;

      i) shall include a <ecn-marking> element that contains the following sub-elements:

         A) shall include a <supports-ect0> element;

         B) may include a <ect0-value> element;

         C) shall include <supports-ect1> element; and

         D) may include <ect1-value> element;

ii) shall include a <l4s-feedback-and-congestion-control> element that contains the following sub-elements:

A) shall include a <per-packet-ce-reporting> element;

B) may include a <feedback-interval> element;

C) may include a <max-feedback-frequency> element; and

D) may include a <protocol> element;

2) a <bat-period-adapt-cap> element;

3) a <transmission-assist-info> element; and

4) an <xr-app-device-capability> element;

i) may include a <media-codec> element;

ii) may include a <media-resolution> element;

iii) may include a <media-frame-rate> element; and

iv) may include a <media-fov> element which shall include the following sub-elements:

A) a <horizontal-fov> element; and

B) a <vertical-fov> element.

The <identity> element shall include one of the following:

a) a <VAL-user-id> element may include a <VAL-client-id> element; or

b) a <VAL-ue-id> element.

The <transmission-assist-info> element:

a) shall include at least one of the following sub-elements:

1) a <bat> element; and

2 a <periodicity> element;

b) may include a <bat-window> element; and

c) may include a <periodicity-range> element which shall include the following sub-elements:

1) a <lower-bound> element and an <upper-bound> element; or

2) a <periodicity-value-list> element which shall include one or more <periodicity-value> elements.

The <establishment-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element; and

b) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

1) a <user-plane-address> element;

2) a <port-number> element;

3) a <URL> element; or

4) a <transport-layer-protocol> element;

c) a <expiry-time> element;

d) a <traffic-transmission-bandwidth> element; and

e) may include an <anyExt> element that may contain:

1) a <bat-period-adapt-cap> element; and
2) a <transmission-assist-info> element.

The <transmission-assist-info> element:

a) shall include at least one of the following sub-elements:
   1) a <bat> element; and
   2 a <periodicity> element;
b) may include a <bat-window> element which shall include the following sub-elements:
   1) a <start-time> element indicating the acceptable earliest time of the first packet of the data burst; or
   2) a <stop-time> element indicating the acceptable latest arrival time of the first packet of the data burst; and
c) may include a <periodicity-range> element which shall include the following sub-elements:
   1) a <lower-bound> element and an <upper-bound> element; or
   2) a <periodicity-value-list> element which shall include one or more <periodicity-value> elements.

The <release-req> element:

a) shall include either a <server-id> element or a <sealdd-client-identity> element; and
b) shall include a <sealdd-flow-id> element.

The <release-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element.

The <URLLC-establishment-req> element:

a) shall include a <sealdd-client-identity> element;
b) shall include a <sealdd-flow-id> element;
c) may include a <identity> element;
d) may include a <server-id> element;
e) may include a <VAL-service-id> element; and
f) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:
   1) a <user-plane-address> element;
   2) a <port-number> element;
   3) a <URL> element; or
   4) a <transport-layer-protocol> element; and
e) may include an <anyExt> element that may contain:
   1) a <bat-period-adapt-cap> element; and
   2) a <transmission-assist-info> element.

The <identity> element shall include one of the following:

a) a <VAL-user-id> element may include a <VAL-client-id> element; or
b) a <VAL-ue-id> element.

The <URLLC-establishment-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element; and

b) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

1) a <user-plane-address> element;

2) a <port-number> element;

3) a <URL> element; or

4) a <transport-layer-protocol> element; and

c) may include an <anyExt> element containing:

1) a <traffic-transmission-bandwidth> element; and

2) a <bat-period-adapt-cap> element or a <transmission-assist-info> element.

The <URLLC-release-req> element:

a) shall include a <sealdd-client-identity> element; and

b) shall include a <sealdd-flow-id> element.

The <URLLC-release-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element.

The <URLLC-update-req> element:

a) shall include a <sealdd-client-identity> element;

b) shall include a <sealdd-flow-id> element;

c) may include a <server-id> element

d) may include a <VAL-service-id> element; and

e) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

1) a <user-plane-address> element;

2) a <port-number> element;

3) a <URL> element; or

4) a <transport-layer-protocol> element.

The <URLLC-update-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element.

The <data-storage-creation-req> element:

a) shall include a <application-data> element;

b) may include a <access-control-policy> element;

c) may include a <expiry-time> element; and

d) may include a <status-information-req> element which shall include at least one of the following sub-elements:

1) a <no-times-data-accessed> element; and

2) a <no-times-data-managed> element.

The <data-storage-creation-rsp> element:

a) shall include a <result> element; and

b) may include a <data-identifier> element.

The <data-storage-reservation-req> element:

a) shall include a <VAL-service-id> element;

b) may include a <data-length> element.

The <data-storage-reservation-rsp> element:

a) shall include a <result> element; and

b) may include a <address> element.

The <data-storage-status-notification> element:

a) shall include a <data-identifier> element; and

b) shall include a <status-information-rsp> element which shall include at least one of the following sub-elements:

1) a <no-times-data-accessed-value> element; and

2) a <no-times-data-managed-value> element.

The <data-storage-query-req> element:

a) shall include a <data-identifier> element.

The <data-storage-query-rsp> element:

a) shall include a <result> element;

b) shall include a <data-identifier> element; and

c) may include a <application-data> element.

The <data-storage-mgt-req> element:

a) shall include a <data-identifier> element;

b) shall include a <operation> element; and

c) may include a <application-data> element.

The <data-storage-mgt-rsp> element:

a) shall include a <result> element;

b) shall include a <data-identifier> element; and

c) may include a <application-data> element.

The <measurements-subscription-req> element:

a) shall include a <sealdd-flow-id> element;

b) shall include a <measurement-requirement-list> element which shall include at least one of the following sub-elements:

1) a <measurement-id> element;

2) a <reporting-frequency> element;

3) a <reporting-periodicity> element;

4) a <measurement-window> element;

5) a <expiry time > element;

6) a <sealdd-policy> element which shall include the following sub-elements:

i) a <quality-guarantee-policy> element; and

ii) an <anyExt> element containing a <non-3gpp-access-policy> element; and

7) a <reporting-criteria> element; and

8) an <anyExt> element containing a <flow-alignment-reporting-criteria-list> element; and

c) may include a <measurement-conditions> element; and

d) may include an <anyExt> element containing a <sealdd-multi-modal-flow-id> element.

The <measurements-subscription-rsp> element:

a) shall include a <result> element; and

b) may include a <expiry-time> element.

The <measurements-notification> element:

a) shall include a <measurement-requirement-notify-list> element which shall include at least one of the following sub-elements:

1) a <measurement-id> element;

2) an <identity-measurements> element;

3) a <average-measurement-value> element;

4) a <minimum-measurement-value> element;

5) a <maximum-measurement-value> element;

6) a <standard-deviation-measurement-value> element;

7) a <kpercentile-measurement-value> element;

8) a <measurement-period> element;

9) a <timestamp> element; and

10) an <anyExt> element containing a <non-3gpp-access-measurement-list> element which shall include one or more <non-3gpp-access-measurement> elements containing the following sub-elements:

i) a <measured-non-3gpp-access> element which shall include an <ssid> or <bssid> element; and

ii) a <signal-strength-values> element containing one or more <measured-value> elements.

The <identity-measurements> element shall include one of the following:

a) a <VAL-ue-id-list> element which shall include:

1) one or more <VAL-ue-id> elements: or

b) a <VAL-group-id> element.

The <tx-quality-management-req> element:

a) shall include a <sealdd-flow-id> element;

b) shall include a <tx-quality-management-action> element; and

c) may include an <anyExt> element that may include:

1) a <bat-offset-ul> element; and

2) a <periodicity-ul> element.

The <tx-quality-management-rsp> element:

a) shall include a <result> element.

The <connection-status-configuration-req> element:

a) shall include a <sealdd-flow-id> element;

b) may include a <reporting-mode> element which may include a <reporting-interval> sub-element;

c) may include a <reporting-priority> element; and

d) may include a <non-3gpp-access-policy> element.

The <connection-status-configuration-rsp> element:

a) shall include a <result> element.

The <connection-status-notification> element:

a) shall include a <client-connection-status> element;

b) shall include a <access-usage> element;

c) may include a <non-3gpp-access-measurement-list> element which shall include one or more <non-3gpp-access-measurement> elements containing the following sub-elements:

1) a <measured-non-3gpp-access> element which shall include an <ssid> or <bssid> element; and

2) a <signal-strength-values> element containing one or more <measured-value> elements; and

d) may include a <sleeping-duration> element.

The <xr-inform-req> element:

a) shall include a <requestor-id> element;

b) shall include a <VAL-ue-id-list> element which shall include:

1) one or more <VAL-ue-id> elements;

c) shall include a <status> element; and

d) may include a <VAL-service-id> element.

The <xr-inform-rsp> element:

a) shall include a <result> element.

The <xr-trigger-req> element:

a) shall include a <requestor-id> element;

b) shall include a <VAL-ue-id-list> element which shall include:

1) one or more <VAL-ue-id> elements;

c) shall include a <operation> element; and

d) may include a <VAL-service-id> element.

The <xr-trigger-rsp> element:

a) shall include a <result> element.

The <xr-establishment-req> element:

a) shall include a <sealdd-client-identity> element;

b) shall include a <sealdd-flows-info> element:

1) shall include one or more <sealdd-flow-id> elements which of them;

2) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

A) a <user-plane-address> element;

B) a <port-number> element;

C) a <URL> element; or

D) a <transport-layer-protocol> element;

c) may include an <identity> element;

d) may include a <server-id> element; and

e) may include a <service-id> element;

The <xr-establishment-rsp> element:

a) shall include a <result> element which may include a <cause> sub-element;

b) shall include a <sealdd-multi-modal-flow-info> element which shall include the following sub-elements:

1) a <sealdd-multi-modal-flow-id> element; and

2) a <sealdd-flows-info> element:

i) shall include one or more <sealdd-flow-id> elements which each of them:

A) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

I) <user-plane-address> element;

II) a <port-number> element;

III) a <URL> element; or

IV) a <transport-layer-protocol> element; and

c) may include a <protocol-descriptor-info> element which may include at least one of the following sub-elements:

1) a <header-ext-info> element;

i) a <header-ext-type> element; and

ii) a <header-ext-id> element;

2) a <packetization-indication> element;

3) a <payload-type> element; and

4) a <payload-format> element.

<policy-configuration-req> element contains the following sub-elements:

a) shall include a <requestor-id> element;

b) shall include a <VAL-service-id> element;

c) shall include at least one of the following sub-elements:

1) a <sealdd-flow-id> element; or

2) a <multi-modal-sealdd-flow-info> element which shall include the following sub-elements:

i) a <sealdd-multi-modal-flow-id> element; and

ii) a <sealdd-flows-list> element:

A) shall include one or more <sealdd-flow-id> elements which each of them:

I) may include a <traffic-descriptor-info> element which shall include at least one of the following sub-elements:

1) <user-plane-address> element;

2) a <port-number> element;

3) a <URL> element; or

4) a <transport-layer-protocol> element;

d) may include a <VAL-ue-id-list> element which:

1) shall include one or more <VAL-ue-id> elements; and

2) may include an <anyExt> element that shall contain:

i) a <configuration-id> element;

e) may include a <multi-modal-flows-alignment-policy> element which shall include the following sub-elements:

1) a <multi-modal-service-id> element; and

2) a <flows-transmission-requirement> element which shall include the following sub-elements:

i) a <delay-requirement> element; and

ii) a <max-align-time> element; and

f) may include a <sealdd-ue-to-ue-policy> element which shall include the following sub-elements:

1) a <proximity-thresholds> element which shall include at least one of the following sub-elements:

i) a <min-ue-to-ue-distance> element;

ii) a <avg-ue-to-ue-distance> element; or

iii) a <max-ue-to-ue-distance> element; and

2) a <qos-thresholds> element which shall include at least one of the following sub-elements:

i) a <min-latency> element;

ii) a <avg-latency> element;

iii) a <max-latency> element;

iv) a <min-bitrate> element;

v) a <avg-bitrate> element;

vi) a <max-bitrate> element;

vii) a <min-package-loss-rate> element;

viii) a <avg-package-loss-rate> element;

ix) a <min-package-loss-rate> element;

x) a <avg-package-error-rate> element;

xi) a <max-package-error-rate> element;

xii) a <max-package-error-rate> element;

xiii) a <min-jitter> element;

xiv) a <avg-jitter> element; or

xv) a <max-jitter> element.

The <policy-configuration-rsp> element:

a) shall include a <result> element; and

b) shall include a <configuration-id> element.

8.4 XML schema

8.4.1 General

This clause defines the XML schema for data delivery information.

8.4.2 XML schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:sealDataDeliveryInfo:1.0"
xmlns:sealdatadelivery="urn:3gpp:ns:sealDataDeliveryInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
<xs:annotation>
  <xs:documentation>
  3GPP - SDDM messages syntax based on 3GPP TS 24.543.
  </xs:documentation>
</xs:annotation>

<xs:import namespace="http://www.w3.org/XML/1998/namespace"
  schemaLocation="http://www.w3.org/2001/xml.xsd"/>
  <!-- the root element which contains the SEALDD protocol messages -->
  <xs:element name="data-delivery-info" id="DataDelivery">
    <xs:complexType>
      <xs:choice>
        <xs:element name="establishment-req" type="sealdatadelivery:tEstablishmentReqType"/>
        <xs:element name="establishment-rsp" type="sealdatadelivery:tEstablishmentRspType"/>
        <xs:element name="release-req" type="sealdatadelivery:tReleaseReqType"/>
        <xs:element name="release-rsp" type="sealdatadelivery:tReleaseRspType"/>
        <xs:element name="URLLC-establishment-req"
type="sealdatadelivery:tURLLCEstablishmentReqType"/>
        <xs:element name="URLLC-establishment-rsp"
type="sealdatadelivery:tURLLCEstablishmentRspType"/>
        <xs:element name="URLLC-release-req" type="sealdatadelivery:tURLLCReleaseReqType"/>
        <xs:element name="URLLC-release-rsp" type="sealdatadelivery:tURLLCReleaseRspType"/>
        <xs:element name="URLLC-update-req" type="sealdatadelivery:tURLLCUpdateReqType"/>
        <xs:element name="URLLC-update-rsp" type="sealdatadelivery:tURLLCUpdateRspType"/>
        <xs:element name="data-storage-creation-req"
type="sealdatadelivery:tDataStorageCreationReqType"/>
        <xs:element name="data-storage-creation-rsp"
type="sealdatadelivery:tDataStorageCreationRspType"/>
        <xs:element name="data-storage-reservation-req"
type="sealdatadelivery:tDataStorageReservationReqType"/>
        <xs:element name="data-storage-reservation-rsp"
type="sealdatadelivery:tDataStorageReservationRspType"/>
        <xs:element name="data-storage-status-notification"
type="sealdatadelivery:tDataStorageStatusNotificationType"/>
        <xs:element name="data-storage-query-req" type="sealdatadelivery:tDataStorageQueryReqType"/>
        <xs:element name="data-storage-query-rsp" type="sealdatadelivery:tDataStorageQueryRspType"/>
        <xs:element name="data-storage-mgt-req" type="sealdatadelivery:tDataStorageMgtReqType"/>
        <xs:element name="data-storage-mgt-rsp" type="sealdatadelivery:tDataStorageMgtRspType"/>
        <xs:element name="measurements-subscription-req"
type="sealdatadelivery:tMeasurementsSubscriptionReqType"/>
        <xs:element name="measurements-subscription-rsp"
type="sealdatadelivery:tMeasurementsSubscriptionRspType"/>
```

```
        <xs:element name="measurements-notification"
type="sealdatadelivery:tMeasurementsNotificationType"/>
        <xs:element name="tx-quality-management-req"
type="sealdatadelivery:tTxQualityManagementReqType"/>
        <xs:element name="tx-quality-management-rsp"
type="sealdatadelivery:tTxQualityManagementRspType"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs=  "unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      </xs:choice>
      <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
  </xs:element>

  <!-- The following elements are added for extensibility and to be placed in the anyExt element
above -->
  <xs:element name="connection-status-configuration-req"
type="sealdatadelivery:tConnectionStatusConfReqType"/>
  <xs:element name="connection-status-configuration-rsp"
type="sealdatadelivery:tConnectionStatusConfRspType"/>
  <xs:element name="xr-establishment-req" type="sealdatadelivery:tXREstablishmentReqType"/>
  <xs:element name="xr-establishment-rsp" type="sealdatadelivery:tXREstablishmentRspType"/>
  <xs:element name="connection-status-notification"
type="sealdatadelivery:tConnectionStatusNotificationType"/>
  <xs:element name="xr-trigger-req" type="sealdatadelivery:tXrTriggerReqType"/>
  <xs:element name="xr-trigger-rsp" type="sealdatadelivery:tXrTriggerRspType"/>
  <xs:element name="xr-inform-req" type="sealdatadelivery:tXrInformReqType"/>
  <xs:element name="xr-inform-rsp" type="sealdatadelivery:tXrInformRspType"/>
  <xs:element name="policy-configuration-req" type="sealdatadelivery:tPolicyConfReqType"/>
  <xs:element name="policy-configuration-rsp" type="sealdatadelivery:tPolicyConfRspType"/>

  <xs:complexType name="tEstablishmentReqType">
    <xs:sequence>
      <xs:element name="requestor-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="server-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="endpoint-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="sealdd-communication-lifetime" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="Identity" type="sealdatadelivery:tIdentityType" minOccurs="0"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <!-- The following elements are added for extensibility and to be placed in the anyExt element
above -->
  <xs:element name="l4s-supporting-capability" type="sealdatadelivery:
tL4sSupportingCapabilityType"/>
  <xs:element name="xr-app-device-capability" type="sealdatadelivery:tXrAppDeviceCapabilityType"/>

  <xs:simpleType name="tSealddFlowIdType">
    <xs:restriction base="xs:positiveInteger">
      <xs:minInclusive value="1"/>
    <xs:maxInclusive value="65535"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tIdentityType">
    <xs:choice>
      <xs:element name="VAL-user-id" type="sealdatadelivery:contentType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="VAL-ue-id" type="xs:string" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tTrafficDescriptorInfoType">
    <xs:sequence>
      <xs:element name="user-plane-address" type="xs:string" minOccurs="0" maxOccurs="1"/>
```

```
      <xs:element name="port-number" type="sealdatadelivery:tPortNumberType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="URL" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="transport-layer-protocol" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

    <xs:simpleType name="tPortNumberType">
      <xs:restriction base="xs:positiveInteger">
      <xs:minInclusive value="1"/>
      <xs:maxInclusive value="65535"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tL4sSupportingCapabilityType">
    <xs:sequence>
      <xs:element name="ecn-marking" type="sealdatadelivery:tEcnMarkingType"/>
      <xs:element name="l4s-feedback-and-congestion-control"
type="sealdatadelivery:tL4sFeedbackType"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <!-- ECN marking capability details -->
  <xs:complexType name="tEcnMarkingType">
    <xs:sequence>
      <xs:element name="supports-ect0" type="xs:boolean"/>
      <xs:element name="ect0-value" type="xs:string" minOccurs="0"/> <!-- non-standard value, e.g.
"0x01" -->
      <xs:element name="supports-ect1" type="xs:boolean"/>
      <xs:element name="ect1-value" type="xs:string" minOccurs="0"/> <!-- non-standard value, e.g.
"0x03" -->
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <!-- L4S per-packet CE feedback details -->
  <xs:complexType name="tL4sFeedbackType">
    <xs:sequence>
      <xs:element name="per-packet-ce-reporting" type="xs:boolean"/>
      <xs:element name="feedback-interval" type="xs:positiveInteger" minOccurs="0"/> <!-- e.g. how
often feedback is sent -->
      <xs:element name="max-feedback-frequency" type="xs:positiveInteger" minOccurs="0"/>
      <xs:element name="protocol" type="xs:string" minOccurs="0"/> <!-- e.g. "RTCP", "in-band" -->
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="tXrAppDeviceCapabilityType">
    <xs:sequence>
      <xs:element name="media-codec" type="sealdatadelivery:tMediaCodecType" minOccurs="0"/>
      <xs:element name="media-resolution" type="sealdatadelivery:tMediaResolutionType"
minOccurs="0"/>
      <xs:element name="media-frame-rate" type="xs:positiveInteger" minOccurs="0"/>
      <xs:element name="media-fov" type="sealdatadelivery:tMediaFovType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tMediaCodecType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="H_264"/>
      <xs:enumeration value="H_265"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tMediaResolutionType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="4320P"/>
      <xs:enumeration value="2160P"/>
      <xs:enumeration value="1440P"/>
```

```
      <xs:enumeration value="1080P"/>
      <xs:enumeration value="720P"/>
      <xs:enumeration value="480P"/>
      <xs:enumeration value="360P"/>
      <xs:enumeration value="240P"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tMediaFovType">
    <xs:sequence>
      <xs:element name="horizontal-fov" type="xs:positiveInteger"/>
      <xs:element name="vertical-fov" type="xs:positiveInteger"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tEstablishmentRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="expiry-time" type="xs:nonPositiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="traffic-transmission-bandwidth" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tResultType">
    <xs:sequence>
      <xs:element name="operation-result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
    <xs:element name="cause" type="sealdatadelivery:tCauseType" minOccurs="0" maxOccurs="1"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tOperationResultType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="success"/>
      <xs:enumeration value="failure"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tCauseType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="SEALDD policy mismatch"/>
      <xs:enumeration value="VAL client error"/>
      <xs:enumeration value="Other"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tReleaseReqType">
    <xs:sequence>
      <xs:element name="server-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-client-identity" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tReleaseRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
  </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCEstablishmentReqType">
```

```
    <xs:sequence>
      <xs:element name="sealdd-client-identity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="identity" type="sealdatadelivery:tIdentityType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="server-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="contentType">
    <xs:choice>
      <xs:element name="sealURI" type="xs:anyURI"/>
      <xs:element name="sealString" type="xs:string"/>
      <xs:element name="sealBoolean" type="xs:boolean"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCEstablishmentRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCReleaseReqType">
    <xs:sequence>
      <xs:element name="sealdd-client-identity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCReleaseRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
  </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCUpdateReqType">
    <xs:sequence>
      <xs:element name="sealdd-client-identity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="Identity" type="sealdatadelivery:tIdentityType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="server-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tURLLCUpdateRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
```

```
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageCreationReqType">
    <xs:sequence>
      <xs:element name="application-data" type="xs:hexBinary" minOccurs="1" maxOccurs="1"/>
      <xs:element name="access-control-policy" type="sealdatadelivery:tAccessControlPolicyType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="expiry-time" type="xs:nonPositiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="status-information-req" type="sealdatadelivery:tStatusInformationReqType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tStatusInformationReqType">
    <xs:sequence>
      <xs:element name="no-times-data-accessed" type="xs:boolean" minOccurs="0" maxOccurs="1"/>
      <xs:element name="no-times-data-managed" type="xs:boolean" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tAccessControlPolicyType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="SDDM-C"/>
      <xs:enumeration value="VAL-server"/>
      <xs:enumeration value="SDDM-S"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tDataStorageCreationRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="data-identifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageReservationReqType">
    <xs:sequence>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="data-length" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageReservationRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="address" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageStatusNotificationType">
    <xs:sequence>
      <xs:element name="data-identifier" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="status-information-rsp" type="sealdatadelivery:tStatusInformationRspType"
minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
  </xs:complexType>

  <xs:complexType name="tStatusInformationRspType">
    <xs:sequence>
      <xs:element name="no-times-data-accessed-value" type="xs:unsignedInt" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="no-times-data-managed-value" type="xs:unsignedInt" minOccurs="0"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageQueryReqType">
    <xs:sequence>
      <xs:element name="data-identifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageQueryRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="data-identifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="application-data" type="xs:hexBinary" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tDataStorageMgtReqType">
    <xs:sequence>
      <xs:element name="data-identifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="operation" type="sealdatadelivery:tOperationType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="application-data" type="xs:hexBinary" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tOperationType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="update"/>
      <xs:enumeration value="refresh"/>
      <xs:enumeration value="delete"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tDataStorageMgtRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="data-identifier" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="application-data" type="xs:hexBinary" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMeasurementsSubscriptionReqType">
    <xs:sequence>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="measurement-requirement-list"
type="sealdatadelivery:tMeasurementRequirementListType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="measurement-conditions" type="sealdatadelivery:tMeasurementConditionsType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
```

```
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <!-- The following elements are added for extensibility and to be placed in the anyExt element
above -->
  <xs:element name="sealdd-multi-modal-flow-id" type="sealdatadelivery:tSealddFlowIdType"
minOccurs="0" maxOccurs="1"/>
  <xs:element name="flow-alignment-reporting-criteria-list"
type="sealdatadelivery:tFlowAlignmentReportingCriteriaType" minOccurs="0" maxOccurs="1"/>

  <xs:complexType name="tMeasurementConditionsType">
    <xs:sequence>
      <xs:element name="temporal-conditions" type="sealdatadelivery:tTemporalConditionsType"
minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="spacial-conditions" type="sealdatadelivery:tSpatialConditionsType"
minOccurs="0" maxOccurs="unbounded"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tTemporalConditionsType">
    <xs:sequence>
      <xs:element name="time-range" type="sealdatadelivery:rangeType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="rangeType">
    <xs:sequence>
      <xs:element name="start-time" type="xs:dateTime" minOccurs="0"/>
      <xs:element name="end-time" type="xs:dateTime" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="tSpatialConditionsType">
    <xs:sequence>
      <xs:element name="PolygonArea" type="sealdatadelivery:tPolygonAreaType" minOccurs="0"/>
      <xs:element name="EllipsoidArcArea" type="sealdatadelivery:tEllipsoidArcType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="protectionType">
    <xs:restriction base="xs:string">
    <xs:enumeration value="Normal"/>
    <xs:enumeration value="Encrypted"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tPolygonAreaType">
    <xs:sequence>
      <xs:element name="Corner" type="sealdatadelivery:tPointCoordinateType" minOccurs="3"
maxOccurs="15"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tEllipsoidArcType">
    <xs:sequence>
      <xs:element name="Center" type="sealdatadelivery:tPointCoordinateType"/>
      <xs:element name="Radius" type="xs:nonNegativeInteger"/>
      <xs:element name="OffsetAngle" type="xs:unsignedByte"/>
      <xs:element name="IncludedAngle" type="xs:unsignedByte"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tPointCoordinateType">
    <xs:sequence>
```

```
      <xs:element name="longitude" type="sealdatadelivery:tCoordinateType"/>
      <xs:element name="latitude" type="sealdatadelivery:tCoordinateType"/>
      <xs:element name="altitude" type="sealdatadelivery:tCoordinateType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tCoordinateType">
    <xs:choice minOccurs="1" maxOccurs="1">
      <xs:element name="threebytes" type="sealdatadelivery:tThreeByteType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:attribute name="type" type="sealdatadelivery:protectionType"/>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tThreeByteType">
    <xs:restriction base="xs:integer">
      <xs:minInclusive value="0"/>
      <xs:maxInclusive value="16777215"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tMeasurementRequirementListType">
    <xs:sequence maxOccurs="unbounded">
      <xs:element name="measurement-requirement" type="sealdatadelivery:tMeasurementRequirementType"
minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="tMeasurementRequirementType">
    <xs:sequence>
      <xs:element name="measurement-id" type="sealdatadelivery:tMeasurementIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="reporting-frequency" type="sealdatadelivery:tReportingFrequencyType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="reporting-periodicity" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="measurement-window" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="expiry-time" type="xs:nonPositiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="sealdd-policy" type="sealdatadelivery:tSealddPolicyType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="reporting-criteria" type="sealdatadelivery:tReportingCriteriaType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tSealddPolicyType">
    <xs:sequence>
      <xs:element name="quality-guarantee-event" type="sealdatadelivery:tQualityGuaranteeEventType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="quality-guarantee-action" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tReportingFrequencyType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="periodic"/>
      <xs:enumeration value="now"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tMeasurementIdType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="latency"/>
      <xs:enumeration value="bitrate"/>
      <xs:enumeration value="jitter"/>
      <xs:enumeration value="packetloss"/>
```

```
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tQualityGuaranteeEventType">
    <xs:simpleContent>
      <xs:extension base="xs:integer">
        <xs:attribute name="TriggerEvent" type="xs:string" use="required"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>

  <xs:complexType name="tReportingCriteriaType">
    <xs:sequence>
      <xs:element name="latency-threshold-value" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="above-or-below-latency-threshold-value" type="xs:boolean" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="bitrate-threshold-value" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="above-or-below-bitrate-threshold-value" type="xs:boolean" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tFlowAlignmentReportingCriteriaType">
    <xs:sequence>
      <xs:element name="flow-alignment-reporting-criteria-identifier" type="xs:positiveInteger"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="buffering-threshold-value" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="above-or-below-buffering-threshold-value" type="xs:boolean" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMeasurementsSubscriptionRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="expiry-time" type="xs:nonPositiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMeasurementsNotificationType">
    <xs:sequence>
      <xs:element name="measurement-requirement-notify-list"
type="sealdatadelivery:tMeasurementRequirementNotifyListType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMeasurementRequirementNotifyListType">
    <xs:sequence>
      <xs:element name="measurement-id" type="sealdatadelivery:tMeasurementIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="identity-measurements" type="sealdatadelivery:tIdentityMeasurementsType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="average-measurement-value" type="xs:integer" minOccurs="0" maxOccurs="1"/>
      <xs:element name="minimum-measurement-value" type="xs:integer" minOccurs="0" maxOccurs="1"/>
      <xs:element name="maximum-measurement-value" type="xs:integer" minOccurs="0" maxOccurs="1"/>
      <xs:element name="standard-deviation-measurement-value" type="xs:integer" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="kpercentile-measurement-value" type="xs:integer" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="measurement-period" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="timestamp" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
  </xs:complexType>

  <xs:complexType name="tIdentityMeasurementsType">
    <xs:choice>
      <xs:element name="VAL-ue-id-list" type="sealdatadelivery:tValUeIdListType" minOccurs="0"/>
      <xs:element name="VAL-group-id" type="xs:string" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tValUeIdListType">
    <xs:choice>
      <xs:element name="VAL-ue-id" type="xs:string" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <!-- The following elements are added for extensibility and to be placed in the anyExt element
above -->
  <xs:element name="configuration-id" type="sealdatadelivery:tSealddFlowIdType"/>

  <xs:complexType name="tTxQualityManagementReqType">
    <xs:sequence>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="tx-quality-management-action" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>


  <xs:complexType name="tTxQualityManagementRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tOperationResultType" minOccurs="1"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tConnectionStatusConfReqType">
    <xs:sequence>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="reporting-mode" type="sealdatadelivery:tReportingModeType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="reporting-priority" type="sealdatadelivery:tReportingPriorityType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="non-3gpp-access-policy" type="sealdatadelivery:tNon3GPPAccessType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tReportingModeType">
    <xs:sequence>
      <xs:element name="reporting-mode-mode" type="sealdatadelivery:tReportingModeModeType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="reporting-interval" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tReportingModeModeType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="PERIODIC"/>
      <xs:enumeration value="EVENT_TRIGGERED"/>
```

```
      </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tReportingPriorityType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="LOW"/>
      <xs:enumeration value="HIGH"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tNon3GPPAccessType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="WLAN SSID"/>
      <xs:enumeration value="WLAN BSSID"/>
      <xs:enumeration value="LOCATION_BASED"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tConnectionStatusConfRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tXREstablishmentReqType">
    <xs:sequence>
      <xs:element name="sealdd-client-identity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flows-info" type="sealdatadelivery:tSealddFlowsInfoType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="Identity" type="sealdatadelivery:tIdentityType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="server-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tSealddFlowsInfoType">
    <xs:sequence>
      <xs:element name="sealdd-flow-info" type="sealdatadelivery:tSealddFlowInfoType" minOccurs="1"
maxOccurs="unbounded"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tSealddFlowInfoType">
    <xs:sequence >
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="traffic-descriptor-info" type="sealdatadelivery:tTrafficDescriptorInfoType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence >
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tXREstablishmentRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="multi-modal-sealdd-flow-info"
type="sealdatadelivery:tMultiModalSealddFlowInfoType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="protocol-descriptor-info"
type="sealdatadelivery:tProtocolDescriptorInfoType" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMultiModalSealddFlowInfoType">
```

```
    <xs:sequence >
      <xs:element name="sealdd-multi-modal-flow-id"
type="sealdatadelivery:tSealddMultiModalFlowIdType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flows-info" type="sealdatadelivery:tSealddFlowsInfoType"
minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence >
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tSealddMultiModalFlowIdType">
    <xs:restriction base="xs:positiveInteger">
      <xs:minInclusive value="1"/>
    <xs:maxInclusive value="65535"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tProtocolDescriptorInfoType">
    <xs:sequence >
      <xs:element name="header-ext-info" type="sealdatadelivery:tHeaderExtInfoType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="packetization-indication" type="xs:boolean" minOccurs="0" maxOccurs="1"/>
      <xs:element name="payload-type" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="payload-format" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence >
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tHeaderExtInfoType">
    <xs:sequence >
      <xs:element name="header-ext-type" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="header-ext-id" type="sealdatadelivery:tHeaderExtIdType" minOccurs="0"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence >
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tHeaderExtIdType">
    <xs:restriction base="xs:positiveInteger">
      <xs:minInclusive value="1"/>
    <xs:maxInclusive value="255"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tConnectionStatusNotificationType">
    <xs:sequence>
      <xs:element name="client-connection-status"
type="sealdatadelivery:tClientConnectionStatusType"/>
      <xs:element name="access-usage" type="sealdatadelivery:tAccessUsageType"/>
      <xs:element name="non-3gpp-access-measurement-list"
type="sealdatadelivery:tnon3gppAccessMeasurementListType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="sleeping-duration" type="sealdatadelivery:tUnsigned64bitInteger"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tClientConnectionStatusType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="REACHABLE"/>
      <xs:enumeration value="UNREACHABLE"/>
      <xs:enumeration value="SLEEPING"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tAccessUsageType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="3GPP_ACCESS"/>
      <xs:enumeration value="NON_3GPP_ACCESS"/>
    </xs:restriction>
  </xs:simpleType>
```

```
  <xs:complexType name="tnon3gppAccessMeasurementListType">
    <xs:sequence>
      <xs:element name="non-3gpp-access-measurement"
type="sealdatadelivery:tnon3gppAccessMeasurementType" minOccurs="1" maxOccurs="unbounded"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tnon3gppAccessMeasurementType">
    <xs:sequence>
      <xs:element name="measured-non-3gpp-access" type="sealdatadelivery:tMeasuredNon3gppAccessType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="signal-strength-values" type="sealdatadelivery:tSignalStrengthValuesType"
minOccurs="1" maxOccurs="unbounded"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMeasuredNon3gppAccessType">
   <xs:choice>
      <xs:element name="ssid" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="bssid" type="sealdatadelivery:tBssidType" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
   </xs:choice>
   <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tBssidType">
    <xs:restriction base="xs:string">
      <!—Example: 00:1A:2B:3C:4D:5E or 00-1A-2B-3C-4D-5E as per IEEE std -->
      <xs:pattern value="([0-9A-Fa-f]{2}([-:])){5}[0-9A-Fa-f]{2}"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tSignalStrengthValuesType">
    <xs:sequence>
      <xs:element name="measured-value" type="xs:NonNegativeInteger"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

<!-- The following elements are added for extensibility and to be placed in the anyExt element of
sealdatadelivery:tEstablishmentReqType, sealdatadelivery:tEstablishmentRspType,
sealdatadelivery:tURLLCEstablishmentReqType, sealdatadelivery:tURLLCEstablishmentRspType, start-->

  <xs:element name="bat-period-adapt-cap" type="xs:boolean"/>
  <xs:element name="transmission-assist-info" type="sealdatadelivery:tTransmissionAssistInfoType"/>

<!-- The following elements are added for extensibility and to be placed in the anyExt element of
sealdatadelivery:tEstablishmentReqType, sealdatadelivery:tEstablishmentRspType,
sealdatadelivery:tURLLCEstablishmentReqType, sealdatadelivery:tURLLCEstablishmentRspType, end-->

  <xs:complexType name="tTransmissionAssistInfoType">
    <xs:sequence>
      <xs:element name="bat" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="periodicity" type="sealdatadelivery:tUnsigned64bitInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="bat-window" type="sealdatadelivery:tBatWindowType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="periodicity-range" type="sealdatadelivery:tPeriodicityRangeType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tUnsigned64bitInteger">
    <xs:restriction base="xs:nonNegativeInteger">
      <xs:maxInclusive value="18446744073709551615"/>
    </xs:restriction>
  </xs:simpleType>
```

```
  <xs:complexType name="tBatWindowType">
    <xs:sequence>
      <xs:element name="start-time" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="stop-time" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tPeriodicityRangeType">
    <xs:sequence>
      <xs:element name="lower-bound" type="sealdatadelivery:tUnsigned64bitInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="upper-bound" type="sealdatadelivery:tUnsigned64bitInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="periodicity-value-list" type="sealdatadelivery:tPeriodicityValueListType"
minOccurs="0" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tPeriodicityValueListType">
    <xs:sequence maxOccurs="unbounded">
      <xs:element name="periodicity-value" type="sealdatadelivery:tUnsigned64bitInteger"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

<!-- The following elements are added for extensibility and to be placed in the anyExt element of
sealdatadelivery:tTxQualityManagementReqType, start-->

  <xs:element name="bat-offset-ul" type="xs:positiveInteger"/>
  <xs:element name="periodicity-ul" type="xs:positiveInteger"/>

<!-- The following elements are added for extensibility and to be placed in the anyExt element of
sealdatadelivery:tTxQualityManagementReqType, end-->

  <xs:complexType name="tXrInformReqType">
    <xs:sequence>
      <xs:element name="requestor-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-ue-id-list" type="sealdatadelivery:tValUeIdListType" minOccurs="1"/>
      <xs:element name="status" type="sealdatadelivery:tXrStatusType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tXrInformRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tXrTriggerReqType">
    <xs:sequence>
      <xs:element name="requestor-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-ue-id-list" type="sealdatadelivery:tValUeIdListType" minOccurs="1"/>
      <xs:element name="operation" type="sealdatadelivery:tXrOperationType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
```

```
  <xs:complexType name="tXrTriggerRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:simpleType name="tXrStatusType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="ESTABLISH"/>
      <xs:enumeration value="RELEASE"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="tXrOperationType">
    <xs:restriction base="xs:string">
      <xs:enumeration value="ESTABLISH"/>
      <xs:enumeration value="RELEASE"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="tPolicyConfReqType">
    <xs:sequence>
      <xs:element name="requestor-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-service-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="sealdd-flow-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="multi-modal-sealdd-flow-info"
type="sealdatadelivery:tMultiModalSealddFlowInfoType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="VAL-ue-id-list" type="sealdatadelivery:tValUeIdListType" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="multi-modal-flows-alignment-policy"
type="sealdatadelivery:tMultiModalAlignPolicyType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="sealdd-ue-to-ue-policy" type="sealdatadelivery:tSealddUeToUePolicyType"
minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tPolicyConfRspType">
    <xs:sequence>
      <xs:element name="result" type="sealdatadelivery:tResultType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="configuration-id" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tMultiModalAlignPolicyType">
    <xs:sequence>
      <xs:element name="multi-modal-service-id" type="sealdatadelivery:tSealddFlowIdType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="flows-transmission-requirement"
type="sealdatadelivery:tFlowTransRequirementType" minOccurs="1" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tFlowTransRequirementType">
    <xs:sequence>
      <xs:element name="delay-requirement" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="max-align-time" type="sealdatadelivery:tSealddFlowIdType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tSealddUeToUePolicyType">
    <xs:sequence>
```

```
      <xs:element name="proximity-thresholds" type="sealdatadelivery:tProximityThresholdsType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="qos-thresholds" type="sealdatadelivery:tQosThresholdsType" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tProximityThresholdsType">
    <xs:sequence>
      <xs:element name="min-ue-to-ue-distance" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="avg-ue-to-ue-distance" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="max-ue-to-ue-distance" type="xs:positiveInteger" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

  <xs:complexType name="tQosThresholdsType">
    <xs:sequence>
      <xs:annotation>
        <xs:documentation>
          For latency elements, milliseconds (ms).
        </xs:documentation>
      </xs:annotation>
      <xs:element name="min-latency" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="avg-latency" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="max-latency" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:annotation>
        <xs:documentation>
          For bitrate elements, bits per second (bps) (e.g. 64 = 64-bit).
        </xs:documentation>
      </xs:annotation>
      <xs:element name="min-bitrate" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="avg-bitrate" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="max-bitrate" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
      <xs:annotation>
        <xs:documentation>
          For package loss rate and package error rate elements, fractional rate between 0.0 and 1.0
(e.g. 0.01 = 1%).
        </xs:documentation>
      </xs:annotation>
      <xs:element name="min-package-loss-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="avg-package-loss-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="max-package-loss-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="min-package-error-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="avg-package-error-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:element name="max-package-error-rate" type="xs:unsignedInt" minOccurs="0" maxOccurs="1"/>
      <xs:annotation>
        <xs:documentation>
          For jitter elements, nanoseconds (ns). Zero value is allowed.
        </xs:documentation>
      </xs:annotation>
      <xs:element name="min-jitter" type="xs:nonNegativeInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="avg-jitter" type="xs:nonNegativeInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="max-jitter" type="xs:nonNegativeInteger" minOccurs="0" maxOccurs="1"/>
      <xs:element name="anyExt" type="sealdatadelivery:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>

<!-- XML attribute for any future extension -->
  <xs:complexType name="anyExtType">
    <xs:sequence>
      <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

</xs:schema>
```

8.5 Data semantics

The <data-delivery-info> element is the root element of the XML document. The <data-delivery-info> element contains the <establishment-req>, <establishment-rsp>, <release-req>, <release-rsp>, <URLLC-establishment-req>, <URLLC-establishment-rsq>, <URLLC-release-req>, <URLLC-release-rsp>, <URLLC-update-req>, <URLLC-update-rsp>, <data-storage-creation-req>, <data-storage-creation-rsp>, <data-storage-reservation-req>, <data-storage-reservation-rsp>, <data-storage-status-notification>, <measurements-subscription-req> , <measurements-subscription-rsp>, <data-storage-query-req>, <data-storage-query-rsp>, <data-storage-mgt-req>, <data-storage-mgt-rsp>, <measurements-notification>, <identity-measurements>, <tx-quality-management-req>, <tx-quality-management-rsp>, and <anyExt> element.

The <anyExt> element contains elements defined by future versions of the present document.

The <anyExt> element of the <data-delivery-info> element contains <connection-status-configuration-req>, <connection-status-configuration-rsp>, <connection-status-notification>, <xr-trigger-req>, <xr-trigger-rsp> , <xr-inform-req>, <xr-inform-rsp>, <xr-establishment-req>, <xr-establishment-rsp> sub-elements, <policy-configuration-req>, and <policy-configuration-rsp>.

<establishment-req> element contains the following sub-elements:

a) <requestor-id>, a mandatory element. This element contains a string set to either the entity of the SDDM-S (e.g. FQDN, URI) or the entity of the SDDM-C (e.g. unique client identifier).

b) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535specifying the identity of the SEALDD flow.

c) <endpoint-id>, a mandatory element specifying the endpoint of a selected VAL server.

d) <server-id>, an optional element specifying the VAL server.

e) <sealdd-communication-lifetime>, an optional element specifying the data delivery communication lifetime in milliseconds.

f) <VAL-service-id>, an optional element specifying the VAL service identity of the vertical application.

g) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

   1) a <user-plane-address> element set to user plane IP address used for the traffic;

   2) a <port-number> element set to the port number for the traffic;

   3) a <URL> element set to a text format that specifies how to access the resource on the Internet for the traffic; or

   4) a <transport-layer-protocol> element set to the transport protocol used for the traffic (e.g. TCP, UDP).

h) <identity>, an optional element set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and performing the request or the SDDM-S that performs the request.

i) <anyExt>, an optional element that contains:

   1) <l4s-supporting-capability>, an optional element set to the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based congestion control) that contains the following sub-elements:

      i) <ecn-marking>, a mandatory element specifying the ECN marking capability details that contains the following sub-elements:

         A) <supports-ect0>, a mandatory element indicating the ECT0 support. The value "1" indicates support of ECT0 (see IETF RFC 3168 [r3168]);

         B) <ect0-value>, an optional element that shall be a string set to value of ECT0 when non-standard values are used (see IETF RFC 3168 [r3168]);

         C) <supports-ect1>, a mandatory element indicating the ECT1 support. The value "1" indicates support of ECT0 (see IETF RFC 3168 [r3168]); and

D) <ect1-value>, an optional element that shall be a string set to value of ECT1 when non-standard values are used (see IETF RFC 3168 [r3168]); and

ii) <l4S-feedback-and-congestion-control>, a mandatory element specifying L4S feedback capability and L4S-based congestion control details that contains the following sub-elements:

A) <per-packet-ce-reporting>, a mandatory element indicating that the entity can report congestion-experienced (CE) indications on a per-packet basis. The value "1" indicates support of reporting congention experience (CE) on a per-packet basis;

B) <feedback-interval>, an optional element set to the time between feedback transmissions (how often they can report without overwhelming control channels);

C) <max-feedback-frequency>, an optional element set to the fastest rate at which feedback may be sent; and

D) <protocol>, an optional element that shall be a string set to the transport protocol (e.g. "RTCP", "in-band");

2) <bat-period-adapt-cap>, an optional element indicating the BAT and periodicity adaptation capability for uplink SEALDD traffic. The value "1" indicates support of the BAT and periodicity adaptation. If absent, it indicates no support of the BAT and periodicity adaptation;

3) <transmission-assist-info>, an optional element specifying a transmission assistance information for uplink SEALDD traffic that contains the following sub-elements:

i) <bat>, an optional element specifying the arrival time of the first packet of the data burst that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11];

ii) <periodicity>, an optional element specifying the time period between the start of two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer;

iii) <bat-window>, an optional element that contains the following sub-elements:

A) a <start-time> element set to the acceptable earliest arrival time of the first packet of the data burst (i.e. start time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; or

B) a <stop-time> element set to the acceptable latest arrival time of the first packet of the data burst (i.e. stop time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; and

iv) <periodicity-range>, an optional element specifying the periodicity range which may be included only if the <bat>, <bat-window> and <periodicity>elements are included and contains the following sub-elements:

A) a <lower-bound> element set to the lower bound of the periodicity and an <upper-bound> element set to the upper bound of the periodicity of the start two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer; or

B) a <periodicity-value-list> element with one or more <periodicity-value> child elements set to the acceptable periodicity value in units of microseconds and shall be defined as an unsigned 64-bit integer.

4) <xr-app-device-capability> that contains the following sub-elements:

i) <media-codec>, an optional element specifying the media codec information (H.264, H.265);

ii) <media-resolution>, an optional element specifying the media resolution information in pixels;

iii) <media-frame-rate>, an optional element specifying the media frame rate information and shall be defined as an unsigned 64-bit integer; and

iv) <media-fov>, an optional element specifying the media field of view information in degrees that contains the following sub-elements:

A) a <horizontal-fov> mandatory element set to the horizontal field of view information and shall be defined as an unsigned 64-bit integer; and

B) a <vertical-fov> mandatory element set to the vertical field of view information and shall be defined as an unsigned 64-bit integer.

<establishment-rsp> element contains the following sub-elements:

a) <result>, which includes a sub-element <operation-result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element set to the cause of the failure of the operation (e.g. VAL client error, SEALDD policy mismatch).

b) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

1) a <user-plane-address> element set to user plane IP address used for the traffic;

2) a <port-number> element set to the port number for the traffic;

3) a <URL> element set to a text format that specifies how to access the resource on the Internet for the traffic; or

4) a <transport-layer-protocol> element set to the transport protocol used for the traffic (e.g. TCP, UDP);

c) a <expiry-time> element set to a time in milliseconds that triggers the re-connection from either the SDDM-C or the SDDM-S when bandwidth limit check has failed;

d) a <traffic-transmission-bandwidth> element set to the suggested traffic transmission bandwidth to be used by either the SDDM-C or the SDDM-S; and

i) <anyExt>, an optional element that contains:

1) <bat-period-adapt-cap>, an optional element indicating the BAT and periodicity adaptation capability for uplink SEALDD traffic. The value "1" indicates support of the BAT and periodicity adaptation. If absent, it indicates no support of the BAT and periodicity adaptation; or

2) <transmission-assist-info>, an optional element specifying a transmission assistance information for uplink SEALDD traffic that contains the following sub-elements:

i) <bat>, an optional element specifying the arrival time of the first packet of the data burst that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11];

ii) <periodicity>, an optional element specifying the time period between the start of two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer;

iii) <bat-window>, an optional element that contains the following sub-elements:

A) a <start-time> element set to the acceptable earliest arrival time of the first packet of the data burst (i.e. start time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; or

B) a <stop-time> element set to the acceptable latest arrival time of the first packet of the data burst (i.e. stop time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; and

iv) <periodicity-range>, an optional element specifying the periodicity range which may be included only if the <bat>, <bat-window> and <periodicity>elements are included and contains the following sub-elements:

A) a <lower-bound> element set to the lower bound of the periodicity and an <upper-bound> element set to the upper bound of the periodicity of the start two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer; or

B) a <periodicity-value-list> element with one or more <periodicity-value> child elements set to the acceptable periodicity value in units of microseconds and shall be defined as an unsigned 64-bit integer.

<identity> element contains one of following sub-elements:

a) <VAL-user-id> element specifying the identity of the VAL user; or

b) <VAL-UE-id> element specifying the identity of the VAL UE.

<release-req> element contains the following sub-elements:

a) <server-id>, an optional element specifying the endpoint of a selected VAL server;

b) <sealdd-client-identity>, an optional element specifying the identity of the SDDM-C; and

c) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow.

<release-rsp> element contains the following sub-elements:

a) <result>, which includes a sub-element <operation-result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element set to the cause of the failure of the operation.

<URLLC-establishment-req> element contains the following sub-elements:

a) <sealdd-client-identity>, a mandatory element specifying the identity of the SDDM-C;

b) <sealdd-flow-id>, a mandatory. This element contains a positive integer in range 1 to 65535 element specifying the identity of the SEALDD flow;

c) <server-id>, an optional element specifying the endpoint of a selected VAL server;

d) <identity>, an optional set to the identity of the VAL user or the identity of the SDDM-C acting as the VAL UE and either performing the request or receiving the request;

e) <VAL-service-id>, an optional element specifying the VAL service identity of the vertical application; and

f) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

1) a <user-plane-address> element set to user plane IP address used for the traffic;

2) a <port-number> element set to the port number for the traffic;

3) a <URL> element set to a text format that specifies how to access the resource on the Internet for the traffic; or

4) a <transport-layer-protocol> element set to the transport protocol used for the traffic (e.g. TCP, UDP); and

e) <anyExt>, an optional element that contains:

1) <bat-period-adapt-cap>, an optional element indicating the BAT and periodicity adaptation capability for uplink SEALDD traffic. The value "1" indicates support of the BAT and periodicity adaptation. If absent, it indicates no support of the BAT and periodicity adaptation; or

2) <transmission-assist-info>, an optional element specifying a transmission assistance information for uplink SEALDD traffic that contains the following sub-elements:

i) <bat>, an optional element specifying the arrival time of the first packet of the data burst that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11];

ii) <periodicity>, an optional element specifying the time period between the start of two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer;

iii) <bat-window>, an optional element that contains the following sub-elements:

A) a <start-time> element set to the acceptable earliest arrival time of the first packet of the data burst (i.e. start time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; or

B) a <stop-time> element set to the acceptable latest arrival time of the first packet of the data burst (i.e. stop time of the time window) that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11]; and

iv) <periodicity-range>, an optional element specifying the periodicity range which may be included only if the <bat>, <bat-window> and <periodicity>elements are included and contains the following sub-elements:

A) a <lower-bound> element set to the lower bound of the periodicity and an <upper-bound> element set to the upper bound of the periodicity of the start two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer; or

B) a <periodicity-value-list> element with one or more <periodicity-value> child elements set to the acceptable periodicity value in units of microseconds and shall be defined as an unsigned 64-bit integer.

<URLLC-establishment-rsp> element contains the following sub-elements:

a) <result>, which includes a sub-element <operation-result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element set to the cause of the failure of the operation (e.g. SEALDD policy mismatch);

b) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

1) a <user-plane-address> element set to user plane IP address used for the traffic;

2) a <port-number> element set to the port number for the traffic;

3) a <URL> element set to a text format (URL) that specifies how to access the resource on the Internet for the traffic; or

4) a <transport-layer-protocol> element set to the transport protocol used for the traffic (e.g. TCP, UDP); and

c) <anyExt>, an optional element that contains:

1) <traffic-transmission-bandwidth>, an optional element set to the suggested traffic transmission bandwidth to be used by either the SDDM-C or the SDDM-S; and

2) <bat-period-adapt-cap>, an optional element indicating a BAT and periodicity adaptation capability or <transmission-assist-info>, an optional element specifying a transmission assistance information for uplink SEALDD traffic. The <transmission-assist-info> element contains the following sub-elements:

i) a <bat> element specifying the arrival time of the first packet of the data burst that shall be a string with a full-day and full-time format as defined in clause 5.6 of IETF RFC 3339 [11];

ii) a <periodicity> element specifying the time period between the start of two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer;

iii) a <bat-window>, element containing the acceptable earliest and latest arrival time of the first packet of the data burst which may be included only if the <bat> element is included; and

iv) a <periodicity-range>, element specifying the periodicity range which may be included only if the <bat>, <bat-window> and <periodicity>elements are included and contains the following sub-elements:

- a <lower-bound> element set to the lower bound of the periodicity and an <upper-bound> element set to the upper bound of the periodicity of the start two bursts in units of microseconds and shall be defined as an unsigned 64-bit integer; or

- a <periodicity-value-list> element with one or more <periodicity-value> child elements set to the acceptable periodicity value in units of microseconds and shall be defined as an unsigned 64-bit integer.

<URLLC-release-req> element contains the following sub-elements:

a) <sealdd-client-identity>, a mandatory element specifying the identity of the SDDM-C; and

c) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow.

<URLLC-release-rsp> element contains the following sub-elements:

a) <result>, which includes a sub-element <operation-result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element set to the cause of the failure of the operation.

<URLLC-update-req> element contains the following sub-elements:

a) <sealdd-client-identity>, a mandatory element specifying the identity of the SDDM-C;

b) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow;

c) <server-id>, an optional element specifying the endpoint of a selected VAL server;

d) <VAL-service-id>, an optional element specifying the VAL service identity of the vertical application; and

e) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

1) a <user-plane-address> element set to user plane IP address used for the traffic;

2) a <port-number> element set to the port number for the traffic;

3) a <URL> element set to a text format that specifies how to access the resource on the Internet for the traffic; or

4) a <transport-layer-protocol> element set to the transport protocol used for the traffic (e.g. TCP, UDP).

<URLLC-update-rsp> element contains the following sub-element:

a) <result>, which includes a sub-element <operation-result>,a mandatory element set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element set to the cause of the failure of the operation (e.g. SEALDD policy mismatch).

<data-storage-creation-req> element contains the following sub-elements:

a) <application-data>, a mandatory element that provides the application data in hexadecimal to be;

b) <access-control-policy>, an optional element set to the control policy for the requested data access from other consumers (i.e. SDDM-C, VAL-server, other SDDM-S);

c) <expiry-time>, an optional element set to the expiration time in minutes of the data to be stored; and

d) <status-information-req>, an optional element that contains one or more of the following sub-elements:

1) a <no-times-data-accessed> element that indicates whether information of how many times the stored data is accessed is requested for corresponding notifications; and

2) a <no-times-data-managed> element that indicates whether information of how many times the stored data is managed is requested for corresponding notifications.

<data-storage-creation-rsp> element contains the following sub-elements:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation; and

b) <data-identifier>, an optional element set to the identity of the stored data.

<data-storage-reservation-req> element contains the following sub-elements:

a) <VAL-service-id>, a mandatory element set to the VAL service identity of the vertical application; and

b) <data-length>, an optional element set to the data length in bytes to be stored;

<data-storage-reservation-rsp> contains the following sub-elements:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation; and

b) <address>, an optional element set to the reserved address for data storage.

<data-storage-status-notification> element contains the following sub-elements:

a) <data-identifier>, a mandatory element set to the identity of the stored data being notified; and

b) <status-information-rsp>, a mandatory element that contains one or more of the following sub-elements:

1) <no-times-data-accessed-value>, an optional element set to the value of how many times the stored data is accessed; and

2) <no-times-data-managed-value> an optional element set to the value of how many times the stored data is managed.

<data-storage-query-req> element contains the following sub-element:

a) <data-identifier>, a mandatory element set to the identity of the stored data which is requested to be queried.

<data-storage-query-rsp> contains the following sub-elements:

a) <result>, a mandatory element set to either set to "success" or "failure" indicating success or failure of the operation;

b) <dta-identifier>, a mandatory element set to the identity of the stored data which is queried; and

c) <application-data>, a mandatory element that provides the application data which is queried.

<data-storage-mgt-req> element contains the following sub-elements:

a) <data-identifier>, a mandatory element set to the identity of the stored data which is requested to be managed;

b) <operation>, a mandatory element set to the operation to be performed such as to "update", "refresh" or "delete" the stored data; and

c) <application-data>, an optional element that provides the application data in hexadecimal to be updated if the operation to be performed is to update the stored data.

<data-storage-mgt-rsp> element contains the following sub-elements:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation;

b) <data-identifier>, a mandatory element set to the identity of the stored data which is managed; and

c) <application-data>, an optional element that provides the application data which is managed.

<measurements-subscription-req> element contains the following sub-elements:

a) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow;

b) <measurement-conditions>, an optional element specifying the temporal conditions, spatial conditions or both for the measurements; and

c) <measurement-requirement-list>, a mandatory element that contains one or more of the <measurement-requirement> element which each contain the following sub-elements:

1) <measurement-id>, a mandatory element set to measurement identifiers "latency", "bitrate", "jitter" or "packet loss";

2) <reporting-frequency>, an optional element set to reporting frequency of measurement results "periodic", "now". If not present, it implies periodic reporting;

3) <reporting-periodicity>, an optional element set to the reporting periodicity in seconds if the reporting frequency is periodic. This child element shall be included when the <reporting-frequency> element is set to "periodic" or not present;

4) <measurement-window>, an optional element set to the measurement period window in milliseconds for transmission quality measurements;

5) <expiry time >, an optional element set to the expiration time in milliseconds of the measurement identifier;

6) <sealdd-policy>, an optional element that contains the following sub-elements:

   i) <quality-guarantee-policy>, a mandatory element set to the action to be performed "Redundant transmission path", "Re-establish transmission path", "Switch to backup transmission path" when the measurement event occurs, in order to meet the quality guarantee; and

   ii) <anyExt>, an optional element containing a <non-3gpp-access-policy> element set to the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement; and

7) <reporting-criteria>, an optional element set to the criteria for reporting measurement results that contains the following sub-elements:

   i) a <latency-threshold-value>, an optional element set to the latency threshold value for reporting measurements results in milliseconds;

   ii) a <above-or-below-latency-threshold-value>, an optional element specifying whether the criterion for reporting measurements results is based on reaching above the latency value indicated by the <latency-threshold-value> element or not. Value "1" indicates that the criterion for reporting measurements results is based on reaching above the latency value indicated by the <latency-threshold-value> element. Value "0" indicates that the criterion for reporting measurements results is based on reaching below the latency value indicated by the <latency-threshold-value> element;

   iii) a <bitrate-threshold-value> element set to the bitrate threshold value for reporting measurements results in Mbps;

   iv) a <above-or-below-bitrate-threshold-value>, an optional element specifying whether the criterion for reporting measurements results is based on reaching above the bitrate value indicated by the <bitrate-threshold-value> element or not. Value "1" indicates that the criterion for reporting measurements results is based on reaching above the bitrate value indicated by the <bitrate-threshold-value> element. Value "0" indicates that the criterion for reporting measurements results is based on reaching below the bitrate value indicated by the <bitrate-threshold-value> element; and

8) <anyExt>, an optional element containing <flow-alignment-reporting-criteria> an optional element set to the criteria for reporting flow alignment measurement results:

   i) a <flow-alignment-reporting-criteria-identifier> an optional element set to unique identifier for each criterion if more than one criterion is specified;

   ii) a <buffering-threshold-value>, an optional element set to the flow alignment buffering threshold value for reporting measurements results for flow alignment in milliseconds; and

   iii) a <above-or-below-buffering-threshold-value>, an optional element specifying whether the criterion for reporting measurements results, e.g. for flow alignment, is reaching above or below certain flow alignment buffering value indicated by the <buffering-threshold-value> element. Value "1" indicates that the flow alignment buffering reaches above a certain value for a certain amount of time indicated by the <buffering-threshold-value> element. Value "0" indicates that the flow alignment buffering reaches above a certain value for a certain amount of time indicated by the <buffering-threshold-value> element; and

d) <anyExt>, <sealdd-multi-modal-flow-id> an optional element specifying the identity of the multi-modal SEALDD flows.

<measurements-subscription-rsp> element contains the following sub-elements:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation; and

b) <expiry-time>, an optional element set to the expiration time in milliseconds of the measurement requested.

<measurements-notification> element contains the following sub-elements:

a) <measurement-requirement-notify-list>, a mandatory element that contains one or more of the following sub-elements:

1) a <measurement-id> element set to measurement identifiers "latency", "bitrate", "jitter" or "packet loss";

2) an <identity-measurements> element set to the identity of the VAL UE(s) or VAL user(s) under SEALDD measurement;

3) an <average-measurement-value> element set to the average measurement value of measurement results ("latency" is in milliseconds, "jitter" is in nanoseconds, "bitrate" is in Mbps, "packet loss" is in percentage of the number of packets that fail to reach their destination);

4) a <minimum-measurement-value> element set to the minimum measurement value of measurement results ("latency" is in milliseconds, "jitter" is in nanoseconds, "bitrate", is in Mbps, "packet loss" is in percentage of the number of packets that fail to reach their destination);

5) a <maximum-measurement-value> element set to the maximum measurement value of measurement results ("latency" is in milliseconds, "jitter" is in nanoseconds, "bitrate", is in Mbps, "packet loss" is in percentage of the number of packets that fail to reach their destination);

6) a <standard-deviation-measurement-value> element set to standard deviation measurement value of measurement results;

7) a <kpercentile-measurement-value> element set to the kpercentile measurement value of measurement results;

8) a <measurement-period> element set to the measurement period in seconds;

9) a <timestamp> element set to the timestamp in date and time of the measurement results with an offset from the UTC time; and

10) an <anyExt> element containing a <non-3gpp-access-measurement-list>, an optional element set to the measurements of the non-3GPP access. The <non-3gpp-access-measurement-list> element includes one or more <non-3gpp-access-measurement> elements containing:

i) a <measured-non-3gpp-access>, an optional element representing identity of the measured non-3GPP access. The <measured-non-3gpp-access> element shall include:

- an <ssid> element set to the SSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24]; or

- a <bssid> element set to the BSSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24]; and

ii) a <signal-strength-values>, a mandatory element containing one or more <measured-value> elements set to signal strength value (e.g. RSSI) for the measured non-3GPP access.

<identity-measurements> element contains one of following sub-elements:

<VAL-ue-id-list>, an optional element that contains the following sub-elements:

1) one or more <VAL-ue-id> , an optional element. Each <VAL-ue-id> element contains the identity of the VAL UE for whom SEALDD measurement applies. For multiple VAL UEs reporting granularity set to individual UE, the associated measurement values are for individual VAL UE; or

2) <VAL-group-id>, an optional element specifying the identity of the VAL group for whom SEALDD measurement applies for which the associated measurement values are aggregation for all VAL UEs or the VAL UE group; and

3) <anyExt>, an optional element.

NOTE 1: At least one <VAL-ue-id> element or the <VAL-group-id> element is included in the <identity-measurements> element (see clauses 7.2.15.1 and 8.3).

<tx-quality-management-req> element contains the following sub-elements:

a) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow;

b) <tx-quality-management-action>, a mandatory element set to the data transmission quality "Redundant transmission path", "Re-establish transmission path", "Switch to backup transmission path" or optimization action "Back to single transmission path", "Transmission parameter adjustment" that was triggered by an event (e.g. measurement threshold); and

NOTE 2: The strings allowed in <tx-quality-management-action> are case sensitive.

c) <anyExt>, an optional element that contains:

1) <bat-offset-ul>, an optional element specifying the BAT offset of the arrival time of the data burst in units of milliseconds for the uplink data and shall be defined as a positive integer; and

2) <periodicity-ul>, an optional element specifying the adjusted periodicity of the data bursts in units of milliseconds for the uplink data and shall be defined as a positive integer.

<tx-quality-management-rsp> element contains the following sub-element:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation.

<connection-status-notification> element contains the following sub-element:

a) <client-connection-status>, a mandatory element indicating the status of VAL UEs, set to "reachable", "unreachable", or "sleeping";

b) <access-usage>, a mandatory element indicating which access i.e. 3GPP or non-3GPP, is used for the SEALDD-UU data transmission; and

c) <non-3gpp-access-measurement-list>, an optional element set to the measurements of the non-3GPP access which includes one or more <non-3gpp-access-measurement> elements containing:

1) <measured-non-3gpp-access>, an optional element set to the identity of the measured non-3GPP access The <measured-non-3gpp-access> element shall include:

i) an <ssid> element set to the SSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24]; or

ii) a <bssid> element set to the BSSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24]; and

2) <signal-strength-values>, a mandatory element containing one or more:

i) <measured-value>, a mandatory element set to the signal strength value (e.g. RSSI value) defined as an NonNegativeInteger with a recommended range of 0 to 127 for the measured non-3GPP access; and

d) if the <client-connection-status> element is set to "SLEEPING", the <connection-status-notification> element may include <sleeping-duration>, an optional element to indicate the duration the client connection status of the VAL client is set to sleeping, in units of microseconds.

<connection-status-configuration-req> element contains the following sub-elements:

a) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow;

b) <reporting-mode>, an optional element set to either "PERIODIC" or "EVENT_TRIGGERED" indicating the mode of the reporting. If the mode is "PERIODIC", the <reporting-mode> element may contain a <reporting-interval> sub-element set to the reporting interval, specified in seconds, to the notification;

c) <reporting-priority>, an optional element indicating the priority of SEALDD client connection status for the requested SEALDD flow ID (e.g. "LOW" or "HIGH" priority); and

d) <non-3gpp-access-policy>, an optional element set to the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement.

<connection-status-configuration-rsp> element contains the following sub-element:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation.

<xr-inform-req> element contains the following sub-elements:

a) <requestor-id>, a mandatory element. This element contains a string set to the identity of the SDDM-C, e.g. unique client identifier;

b) <VAL-ue-id-list>, a mandatory element that contains one or more <VAL-ue-id> elements. Each <VAL-ue-id> element contains the identity of the VAL UE for whom SEALDD multi-modal transmission connection inform applies;

c) <status>, a mandatory element indicating the UE-to-UE direct communication status (i.e. established, released); and

d) <VAL-service-id>, an optional element set to the VAL service identity of the vertical application.

<xr-inform-rsp> element contains the following sub-element:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation.

<xr-trigger-req> element contains the following sub-elements:

a) <requestor-id>, a mandatory element. This element contains a string set to the identity of the SDDM-S, e.g. FQDN, URI;

b) <VAL-ue-id-list>, a mandatory element that contains the following sub-elements:

1) one or more <VAL-ue-id>, a mandatory element. Each <VAL-ue-id> element contains the identity of the VAL UE for whom SEALDD multi-modal transmission connection trigger applies; and

2) <anyExt>, an optional element;

c) <operation>, a mandatory element indicating the action for UE-to-UE direct communication (i.e. establishment, release); and

d) <VAL-service-id>, an optional element set to the VAL service identity of the vertical application.

<xr-trigger-rsp> element contains the following sub-element:

a) <result>, a mandatory element set to either "success" or "failure" indicating success or failure of the operation.

<xr-establishment-req> element contains the following sub-elements:

a) <sealdd-client-identity>, a mandatory element. This element contains a string specifying the identity of SDDM-C;

b) <sealdd-flows-info>, a mandatory element. This element contains a string specifying one or more <sealdd-flow-info> elements which each contains the following sub-elements:

1) a <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow; and

2) a <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains the following sub-elements:

i) a <user-plane-address> an optional element. This element contains a string set to user plane IP address used for the traffic;

ii) a <port-number> an optional element. This element contains a positive integer in range 1 to 65535 set to the port number for the traffic;

iii) a <URL> an optional element. This element contains a string set to a text format that specifies how to access the resource on the Internet for the traffic; or

iv) a <transport-layer-protocol> an optional element. This element contains a string set to the transport protocol used for the traffic (e.g. TCP, UDP);

c) <identity>, an optional element which includes <VAL-user-id> an optional element set to the identity of the VAL user or <VAL-ue-id> a string set to the identity of the SDDM-C acting as the VAL UE and performing the request or the SDDM-S that performs the request. <VAL-ue-id> contains either <sealURI> which is an anyURI, <sealString> a string, or <sealBoolean> a boolean sub-elements.

d) <server-id>, an optional element. This element contains a string specifying the endpoint of a selected VAL server; and

e) <VAL-service-id>, an optional element. This element contains a string specifying the VAL service identity of the vertical application.

<xr-establishment-rsp> element contains the following sub-elements:

a) <result>, which includes a sub-element <operation-result>, a mandatory element contains a string set to either "success" or "failure" indicating success or failure of the operation. If the result is "failure", the <result> element may contain a <cause> sub-element which is a string set to the cause of the failure of the operation (e.g. VAL client error, SEALDD policy mismatch). If the result is "success", <xr-establishment-rsp> shall contain the <sealdd-multi-modal-flow-info> and may contain the <protocol-descriptor-info>;

b) <sealdd-multi-modal-flow-info>, a mandatory element specifying the information of the multi-modal sealdd flow, that contains the following sub-elements:

1) a <sealdd-multi-modal-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the multi modal SEALDD flow; and

2) a <sealdd-flows-info> a mandatory element specifying one or more <sealdd-flow-info> elements, which each contains the following sub-elements:

i) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the sealdd flow; and

ii) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

- a <user-plane-address> an optional element. This element contains a string set to user plane IP address used for the traffic;

- a <port-number> an optional element. This element contains a positive integer in range 1 to 65535 set to the port number for the traffic;

- a <URL> an optional element. This element contains a string set to a text format that specifies how to access the resource on the Internet for the traffic; or

- a <transport-layer-protocol> an optional element. This element contains a string set to the transport protocol used for the traffic (e.g. TCP, UDP);

c) <protocol-descriptor-info>, an optional element specifying the information of the protocol that contains one or more of the following sub-elements:

1) a <header-ext-info> an optional element set to the header extension information used for the traffic;

i) <header-ext-type>, an optional element. This element contains a string specifying the type of the header extension protocol (e.g, RTP, SRTP); and

ii) <header-ext-id>, an optional element. This element contains a positive integer in range 1 to 255 specifying the identity of the header extension protocol;

2) a <packetization-indication> an optional element. This element contains a boolean indicating whether packetization is needed or not for the multi-modal sealdd flow traffic;

3) a <payload-type> an opional element. This element contains a string set to the type of the payload (e.g, RTP, SRTP); and

4) a <payload-format> an optional element. This element contains a string set to the format of the payload (e.g, H.264, H.265).

<policy-configuration-req> element contains the following sub-elements:

a) <requestor-id>, a mandatory element. This element contains a string set to the identity of the SDDM-S, e.g. FQDN, URI.

b) <VAL-service-id>, a mandatory element specifying the VAL service identity of the vertical application.

c) <sealdd-flow-id>, an optional element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow.

d) <sealdd-multi-modal-flow-info>, an optional element specifying the information of the multi-modal sealdd flow, that contains the following sub-elements:

1) a <sealdd-multi-modal-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the multi modal SEALDD flow; and

2) a <sealdd-flows-list> a mandatory element specifying one or more <sealdd-flow-info> elements, which contains the following sub-elements:

i) <sealdd-flow-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD flow; and

ii) <traffic-descriptor-info>, an optional element specifying the information of the traffic that contains one or more of the following sub-elements:

A) a <user-plane-address> an optional element. This element contains a string set to user plane IP address used for the traffic;

B) a <port-number> an optional element. This element contains a positive integer in range 1 to 65535 set to the port number for the traffic;

C) a <URL> an optional element. This element contains a string set to a text format that specifies how to access the resource on the Internet for the traffic; or

D) a <transport-layer-protocol> an optional element. This element contains a string set to the transport protocol used for the traffic (e.g. TCP, UDP);

NOTE 3: At least the <sealdd-flow-id> element or the <sealdd-multi-modal-flow-info>element is included in the <policy-configuration-req> element (see clauses 7.2.25.2 and 8.3).

e) <VAL-ue-id-list>, an optional element that contains the following sub-elements:

1) one or more <VAL-ue-id>, a mandatory element. Each <VAL-ue-id> element contains the identity of the VAL UE for whom an SEALDD policy configuration request applies; and

2) <anyExt>, an optional element that contains:

i) <configuration-id>, an optional element. This element contains a positive integer in range 1 to 65535 specifying the identity of the SEALDD policy configuration;

f) <multi-modal-flows-alignment-policy>, an optional element specifying multi-modal flows alignment policy, which contains the following sub-elements:

1) <multi-modal-service-id>, a mandatory element. This element contains a positive integer in range 1 to 65535 set to the identity of the multi-modal service; and

2) <flows-transmission-requirement>, a mandatory element that contains:

i) <delay-requirement>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the maximum tolerable time delay by which the multi-modal flows can be delayed in milliseconds; and

ii) <max-align-time>, a mandatory element. This element contains a positive integer in range 1 to 65535 specifying the maximum acceptable time duration for multi-modal traffic flow alignment in milliseconds;

g) <sealdd-ue-to-ue-policy>, an optional element specifying UE-to-UE direct communication policy, which contains the following sub-elements:

1) <proximity-thresholds>, a mandatory element specifying the proximity thresholds for entering/leaving the UE-to-UE direct communication mode that contains the at least of one of the following sub-elements:

i) <min-ue-to-ue-distance>, an optional element. This element contains a decimal specifying the threshold minimum linear distance between the UEs, expressed in units of meters;

ii) <avg-ue-to-ue-distance>, an optional element. This element contains a decimal specifying the threshold average linear distance between the UEs, expressed in units of meters; or

iii) <max-ue-to-ue-distance>, an optional element. This element contains a decimal specifying the threshold maximum linear distance between the UEs, expressed in units of meters; and

2) <qos-thresholds>, a mandatory element specifying the QoS thresholds for entering/leaving the UE-to-UE direct communication mode that contains one or more of the following sub-elements:

i) <min-latency>, an optional element. This element contains the minimum E2E latency in units of milliseconds;

ii) <avg-latency>, an optional element. This element contains the average E2E latency in units of milliseconds;

iii) <max-latency>, an optional elemen. This element contains the maximum E2E latency in units of milliseconds;

iv) <min-bitrate>, an optional element. This element contains the minimum E2E bit rate;

v) <avg-bitrate>, an optional element. This element contains the average E2E bit rate;

vi) <max-bitrate>, an optional element. This element contains the maximum E2E bit rate t;

vii) <min-package-loss-rate>, an optional element. This element contains the minimum E2E packet loss rate;

viii) <avg-package-loss-rate>, an optional element. This element contains the average E2E packet loss rate;

ix) <max-package-loss-rate>, an optional element. This element contains the maximum E2E packet loss rate;

x) <min-package-error-rate>, an optional element. This element contains the minimum E2E packet error rate;

xi) <avg-package-error-rate>, an optional element. This element contains the average E2E packet error rate;

xii) <max-package-error-rate>, an optional element. This element contains the maximum E2E packet error rate;

xiii) <min-jitter>, an optional element. This element contains the minimum E2E jitter in units of nanoseconds;

xiv) <avg-jitter>, an optional element. This element contains the averageE2E jitter in units of nanoseconds; or

xv) <max-jitter>, an optional element. This element contains the maximum E2E jitter in units of nanoseconds.

The <policy-configuration-rsp> element:

a) shall include a <result> element; and

b) shall include a <configuration-id> element.

8.6 MIME type

The MIME type for the DataDeliveryInfo document shall be "application/vnd.3gpp.seal-data-delivery-info+xml".

8.7 IANA registration template

Your Name:

<TS rapporteur name>

Your Email Address:

<TS rapporteur email address>

Media Type Name:

Application

Subtype name:

vnd.3gpp.seal-data-delivery-info+xml

Required parameters:

None

Optional parameters:

"charset" the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in section 9.1 of IETF RFC 7303.

Encoding considerations:

binary.

Security considerations:

Same as general security considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. In addition, this media type provides a format for exchanging information in HTTP. Hence, the security considerations from IETF RFC 2616 apply while exchanging information in HTTP.

The information transported in this media type does not include active or executable content.

This media type does not include provisions for directives that institute actions on a recipient's files or other resources.

This media type does not include provisions for directives that institute actions that, while not directly harmful to the recipient, may result in disclosure of information that either facilitates a subsequent attack or else violates a recipient's privacy in any way.

This media type does not employ compression.

Interoperability considerations:

Same as general interoperability considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. Any unknown XML elements and any unknown XML attributes are to be ignored by recipient of the MIME body.

Published specification:

3GPP TS 24.543 "Data Delivery Management - Service Enabler Architecture Layer for Verticals (SEAL)", available via https://www.3gpp.org/ftp/Specs/archive/24_series/24.543.

Applications which use this media type:

Applications supporting the SEAL Data delivery management as described in the published specification.

Fragment identifier considerations:

The handling in section 5 of IETF RFC 7303 applies.

Restrictions on usage:

None

Provisional registration? (standards tree only):

N/A

Additional information:

1. Deprecated alias names for this type: none
2. Magic number(s): none
3. File extension(s): none
4. Macintosh File Type Code(s): none
5. Object Identifier(s) or OID(s): none

Intended usage:

Common

Person to contact for further information:

- Name: <MCC name>
- Email: <MCC email address>
- Author/Change controller:
  i) Author: 3GPP CT1 Working Group/3GPP_TSG_CT_WG1@LIST.ETSI.ORG
  ii) Change controller: <MCC name>/<MCC email address>

Annex A (normative): CoAP resource representation and encoding

A.1 General

The information in this annex provides a normative description of CoAP resource representation and encoding.

The general rules for resource URI structure, cache usage, error handling, and common data types are described in clause C.1 of 3GPP TS 24.546 [6].

A.2 Data types applicable to multiple resource representations

A.2.1 General

This clause defines structured data types, simple data types, and enumerations that are applicable to several APIs defined for CoAP resource representations in the present specification.

A.2.2 Referenced structured data types

Table A.2.2.1 lists structured data types referenced by multiple CoAP resource representations and defined in other specifications.

Table A.2.2.1: Referenced structured data types

Data type	Reference	Description
ValTargetUe	3GPP TS 24.546 [6]	Information identifying a VAL user ID or VAL UE ID.
GeographicalCoordinates	3GPP TS 24.546 [6]	Information identifying geographical coordinates.
GeographicArea	3GPP TS 24.546 [6]	Information identifying a geographical area.

A.2.3 Referenced simple data types

Table A.2.3.1 lists simple datatypes referenced by multiple CoAP resource representations and defined in other specifications.

Table A.2.3.1: Referenced simple data types

Type name	Reference	Description
Uinteger	3GPP TS 24.546 [6]	Unsigned integer, i.e. only value 0 and values above 0 are permissible.
TimeOfDay	3GPP TS 24.546 [6]	String with format partial-time or full-time as defined in clause 5.6 of IETF RFC 3339 [11].
DateTime	3GPP TS 24.546 [6]	String in the standard format described by the "date-time" production in IETF RFC3339 [11].

A.2.4 Common structured data types

A.2.4.1 Type: EstablishmentResponse

Table A.2.4.1.1: Definition of type EstablishmentResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE 1).	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic (NOTE 2).	
portNumber	Uinteger	O	0..1	Identity of the port number of the traffic (NOTE 2).	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic (NOTE 2).	
batPeriodAdaptCap	boolean	O	0..1	Indicates a BAT and periodicity adaptation capability of the SEALDD client side. (NOTE 3, NOTE 4)	
transmisAssistInfo	TransmissionAssistInfo	O	0..1	Indicates a transmission assistance information for uplink SEALDD traffic. It includes a burst arrival time (BAT), BAT time window, periodicity, and periodicity range. (NOTE 3, NOTE 4)	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic (NOTE 2).	
NOTE 1: This attribute shall be included if result is set to "FAILURE". NOTE 2: This attribute may be included if result is set to "SUCCESS". NOTE 3: This attribute may only be included in the response to the server side initiated request. NOTE 4: The "batPeriodAdaptCap" attribute and "transmisAssistInfo" attribute are mutually exclusive.					

A.2.4.2 Type: EstablishmentRequest

Table A.2.4.2.1: Definition of type EstablishmentRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Identity of the requestor of the establishment request (NOTE 1).	
sealddflowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
endpointId	string	M	1	Identity of the endpoint of the selected VAL server to which the establishment request has to be sent.	
sealddCommunicationLifetime	Uinteger	O	0..1	Information of the data delivery communication lifetime in milliseconds (NOTE 2).	
valServiceId	string	O	0..1	Identity of the VAL service enabled by the SDD regular transmission connection.	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic.	
portNumber	Uinteger	O	0..1	Identity of the port number of the traffic.	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic.	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic.	
valTgtUe	ValTargetUe	O	0..1	VAL user to whom the establishment request is applied.	
l4sSupportingCapability	L4sSupportingCapability	O	0..1	Information of the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based congestion control).	
batPeriodAdaptCap	boolean	O	0..1	Indicates a BAT and periodicity adaptation capability of the SEALDD client side. (NOTE 3, NOTE 4)	
transmisAssistInfo	TransmissionAssistInfo	O	0..1	Indicates a transmission assistance information for uplink SEALDD traffic. It includes a burst arrival time (BAT), BAT time window, periodicity, and periodicity range. (NOTE 3, NOTE 4)	
xrAppDevCap	XrAppDevCapability	O	0..1	Indicates an XR application device capability information.	

NOTE 1: The requestorId attribute shall be set to either the entity of the SDDM-S or the entity of the SDDM-C.
NOTE 2: The sealddCommunicationLifetime attribute shall be included when the requesting entity is the SDDM-S. This attribute shall be included when the requesting entity is the SDDM-C.
NOTE 3: This attribute may only be included in the SDDM-C initiated request.
NOTE 4: The "batPeriodAdaptCap" attribute and "transmisAssistInfo" attribute are mutually exclusive.

A.2.4.3 Type: URLLCEstablishmentRequest

Table A.2.4.3.1: Definition of type URLLCEstablishmentRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealClientId	string	M	1	Identity of the SDDM-C of the URLLC establishment request.	
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and the SDDM-S to identify the application traffic.	
valTgtUe	ValTargetUe	M	1	VAL user to whom the establishment request is applied.	
serverId	ServerId	M	1	Identity of the VAL server.	
valServiceId	string	M	0..1	Identity of the VAL service enabled by the URLLC transmission connection.	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic.	
portNumber	Uinteger	O	0..1	Identity of the port number of the traffic.	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic.	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic.	
batPeriodAdaptCap	boolean	O	0..1	Indicates a BAT and periodicity adaptation capability of the SEALDD client side. (NOTE 1, NOTE 2)	
transmisAssistInfo	TransmissionAssistInfo	O	0..1	Indicates a transmission assistance information for uplink SEALDD traffic. It includes a burst arrival time (BAT), BAT time window, periodicity, and periodicity range. (NOTE 1, NOTE 2)	
NOTE 1: This attribute may only be included in the SDDM-C initiated request. NOTE 2: The "batPeriodAdaptCap" attribute and "transmisAssistInfo" attribute are mutually exclusive.					

A.2.4.4 Type: URLLCEstablishmentResponse

Table A.2.4.4.1: Definition of type URLLCEstablishmentResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE 1).	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic (NOTE 2).	
portNumber	Uinteger	O	0..1	Identity of the port number of the traffic (NOTE 2).	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic (NOTE 2).	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic (NOTE 2).	
batPeriodAdaptCap	boolean	O	0..1	Indicates a BAT and periodicity adaptation capability of the SEALDD client side. (NOTE 2, NOTE 3, NOTE 4)	
transmisAssistInfo	TransmissionAssistInfo	O	0..1	Indicates a transmission assistance information for uplink SEALDD traffic. It includes a burst arrival time (BAT), BAT time window, periodicity, and periodicity range. (NOTE 2, NOTE 3, NOTE 4)	
NOTE 1: This attribute shall be included if result is set to "failure". NOTE 2: This attribute may be included if result is set to "success". NOTE 3: This attribute may only be included in the response to the server side initiated request. NOTE 4: The "batPeriodAdaptCap" attribute and "transmisAssistInfo" attribute are mutually exclusive.					

A.2.4.5 Type: URLLCReleaseRequest

Table A.2.4.5.1: Definition of type URLLCReleaseRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealClientId	string	M	1	Identity of the requestor of the establishment request.	
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and the SDDM-S to identify the application traffic.	

A.2.4.6 Type: TransmissionAssistInfo

Table A.2.4.6.1: Definition of type TransmissionAssistInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
bat	DateTime	O	0..1	Indicates the arrival time of the first packet of the data burst.	
periodicity	Uinteger	O	0..1	Indicates the time period between the start of two bursts in units of microseconds. Unsigned 64-bit integer identifies a period of time in units of microseconds, i.e. 0 to (2^64)-1. Minimum = 0. Maximum = 18446744073709551615.	
batWindow	TimeWindow	O	0..1	Contains the acceptable earliest and latest arrival time of the first packet of the data burst. The start time contains the earliest arrival time, and the stop time contains the latest arrival time. (NOTE 1)	
periodRange	PeriodicityRange	O	0..1	Contains the acceptable time period range between the start of two bursts or the acceptable periodicity value(s). (NOTE 2)	
NOTE 1: This attribute may only be included if the "bat" attribute is included. NOTE 2: This attribute may only be included if the "bat", "periodicity" and "batWindow" attributes are included.					

A.2.4.7 Type: PeriodicityRange

Table A.2.4.7.1: Definition of type PeriodicityRange

Attribute name	Data type	P	Cardinality	Description	Applicability
lowerBound	Uinteger	C	0..1	Indicates the lower bound of the periodicity of the start two bursts in units of microseconds. Unsigned 64-bit integer identifies a period of time in units of microseconds, i.e. 0 to (2^64)-1. Minimum = 0. Maximum = 18446744073709551615. (NOTE)	
upperBound	Uinteger	C	0..1	Indicates the upper bound of the periodicity of the start two bursts in units of microseconds. Unsigned 64-bit integer identifies a period of time in units of microseconds, i.e. 0 to (2^64)-1. Minimum = 0. Maximum = 18446744073709551615. (NOTE)	
periodicityValues	array(Uinteger)	C	1..N	Contains the acceptable periodicity values in units of microseconds. (NOTE)	
NOTE: Either the "periodicityValues" attribute or both the "lowerBound" and "upperBound" attributes shall be included.					

A.2.4.8 Type: TimeWindow

Table A.2.4.8.1: Definition of type TimeWindow

Attribute name	Data type	P	Cardinality	Description	Applicability
startTime	DateTime	M	1	Indicates the start time of the time window.	
stopTime	DateTime	M	1	Indicates the stop time of the time window.	

A.2.4.9 Type: XrAppDevCapability

Table A.2.4.9.1: Definition of type XrAppDevCapability

Attribute name	Data type	P	Cardinality	Description	Applicability
mediaCodec	MediaCodec	O	0..1	Indicates media codec information.	
mediaResolution	MediaResolution	O	0..1	Indicates media resolution information in pixels.	
mediaFrameRate	Uinteger	O	0..1	Indicates the media frame rate information.	
mediaFov	MediaFov	O	0..1	Indicates the media Field of View information in degrees.	

A.2.4.10 Type: Non3gppAccessMeasurement

Table A.2.4.10.1: Definition of type Non3gppAccessMeasurement

Attribute name	Data type	P	Cardinality	Description	Applicability
measuredAccess	MeasuredNon3gppAccess	O	0..1	Identity of the measured non-3GPP access i.e. WLAN SSID or WLAN BSSID. (NOTE)	
signalStrengthValues	array(Uinteger)	M	1..N	List of signal strength values (e.g. RSSI) for the measured non-3GPP access.	
NOTE: This attribute is not present when the non-3GPP access measurement policy indicates "LOCATION_BASED" measurement.					

A.2.4.11 Type: MeasuredNon3gppAccess

Table A.2.4.11.2: Definition of type MeasuredNon3gppAccess

Attribute name	Data type	P	Cardinality	Description	Applicability
ssId	string	O	0..1	Contains the SSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24].	
bssId	string	O	0..1	Contains the BSSID of the access point to which the UE is attached, as specified in IEEE Std 802.11 [24].	

A.2.4.12 Type: L4sSupportingCapability

Table A.2.4.12.1: Definition of type L4sSupportingCapability

Attribute name	Data type	P	Cardinality	Description	Applicability
ecnMarking	EcnMarking	M	1	Contais the ECN marking.	
l4sFeedbackAndCongestionControl	L4sFeedbackAndCongestionControl	M	1	Contains the L4S feedback capability and L4S-based congestion control parameters.	

A.2.4.13 Type: EcnMarking

Table A.2.4.13.1: Definition of type EcnMarking

Attribute name	Data type	P	Cardinality	Description	Applicability
supportsEct0	boolean	M	1	Indicates the support of ECT0.	
ect0Value	string	O	0..1	Indicates the value of ECT0 when non-standard values are used (NOTE).	
supportsEct1	boolean	M	1	Indicates the support of ECT1.	
ect1Value	string	O	0..1	Indicates the value of ECT1 when non-standard values are used (NOTE).	
NOTE: This attribute may only be included if the corresponding support flag indicates the value "1" (true).					

A.2.4.14 Type: L4sFeedbackAndCongestionControl

Table A.2.4.14.1: Definition of type L4sFeedbackAndCongestionControl

Attribute name	Data type	P	Cardinality	Description	Applicability
perPacketCeReporting	boolean	M	1	Indicates that the entity can report congestion-experienced (CE) indications on a per-packet basis.	
feedbackInterval	Uinteger	O	0..1	Indicates the time between feedback transmissions (how often they can report without overwhelming control channels) (NOTE).	
maxFeedbackFrequency	Uinteger	O	0..1	Indicates the fastest rate at which feedback may be sent (NOTE).	
protocol	string	O	0..1	Indicates the transport protocol (e.g. "RTCP", "in-band") (NOTE).	
NOTE: This attribute may only be included if the "perPacketCeReporting" attribute indicates the value "1" (true).					

A.2.4.15 Type: MediaFOV

Table A.2.4.15.1: Definition of type MediaFOV

Attribute name	Data type	P	Cardinality	Description	Applicability
horizontalFov	Uinteger	M	1	Indicates the maximum horizontal field-of-view in degrees.	
verticalFov	Uinteger	M	1	Indicates the maximum vertical field-of-view in degrees.	

A.2.5 Common simple data types

Table A.2.5.1: Simple data types applicable to multiple CoAP resource representations

Type name	Description
ServerId	String representing a unique identifier of a VAL server.

A.2.6 Common enumerations

A.2.6.1 Void

A.2.6.2 Enumeration: ResultOp

Table A.2.6.2.1: ResultOp

Enumeration value	Description	Applicability
SUCCESS	Success of the operation.	
FAILURE	Failure of the operation.	

A.2.6.3 Enumeration: Cause

Table A.2.6.3.1: Cause

Enumeration value	Description	Applicability
VAL CLIENT ERROR	A VAL client error occurs.	
SEALDD POLICY MISMATCH	A SEALDD policy mismatch occurs.	
OTHER	Any other cause occurs than the ones defined in this table.	

A.2.6.4 Enumeration: Non3gppAccessPolicy

Table A.2.6.4.1: Non3gppAccessPolicy

Enumeration value	Description	Applicability
WLAN SSID	The non-3GPP access measurement policy is SSID based.	
WLAN BSSID	The non-3GPP access measurement policy is BSSID based.	
LOCATION_BASED	Indicates the location-based non-3GPP access measurement policy.	

A.2.6.5 Enumeration: MediaCodec

Table A.2.6.5.1: MediaCodec

Enumeration value	Description	Applicability
H_264	Indicates the H.264 codec information.	
H_265	Indicates the H.265 codec information.	

A.2.6.6 Enumeration: MediaResolution

Table A.2.6.6.1: MediaResolution

Enumeration value	Description	Applicability
4320P	Indicates the 4320p media resolution information.	
2160P	Indicates the 2160p media resolution information.	
1440P	Indicates the 1440p media resolution information.	
1080P	Indicates the 1080p media resolution information.	
720P	Indicates the 720p media resolution information.	
480P	Indicates the 480p media resolution information.	
360P	Indicates the 360p media resolution information.	
240P	Indicates the 240p media resolution information.	

A.3 Resource representation and APIs provided by SDDM-S

A.3.1 Sdd_RegularTransmissionConnection API

A.3.1.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.1.2.

A.3.1.2 Resources

A.3.1.2.1 Overview

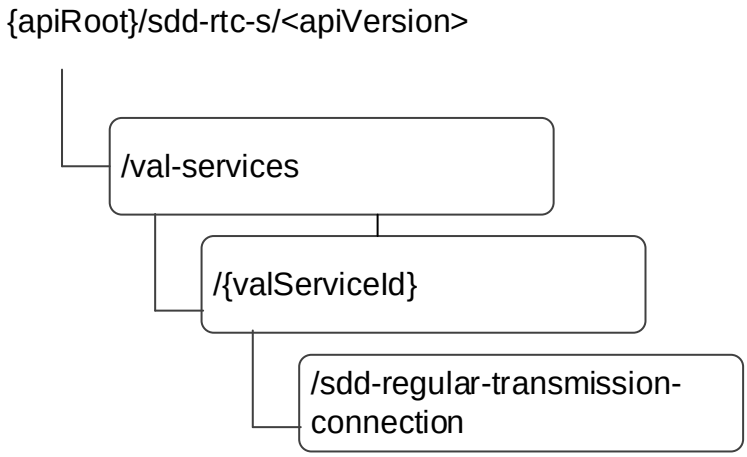

Figure A.3.1.2.1.1: Resource URI structure of the Sdd_RegularTransmissionConnection API provided by SDDM-S

Table A.3.1.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.1.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD Regular Transmission Connection	val-services/{valServiceId}/sdd-regular-transmission-connection	POST	Establish an SDDM regular transmission connection.
		DELETE	Release an SDDM regular transmission connection

A.3.1.2.2 Resource: SDD Regular Transmission Connection

A.3.1.2.2.1 Description

The SDD regular transmission connection resource represents an SDD regular transmission connection to be created at a given SDDM-S and SDDM-C.

A.3.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd-regular-transmission-connection**

This resource shall support the resource URI variables defined in the table A.3.1.2.2.2.1.

Table A.3.1.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.1.1.
valServiceId	string	Identifier of a VAL service.

A.3.1.2.2.3 Resource Standard Methods

A.3.1.2.2.3.1 POST

This operation allows to establish an SDDM regular transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.1.2.2.3.1.1 and A.3.1.2.2.3.1.2.

Table A.3.1.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
EstablishmentRequest	M	1	The information of request of establishment of an SDDM regular transmission connection.

Table A.3.1.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
EstablishmentResponse	M	1	2.01 Created	SDDM regular transmission connection created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.1.2.2.3.2 DELETE

This operation releases an SDDM regular transmission connection.

This method shall support the request data structures the data structure, request codes and response codes specified in table A.3.1.2.2.3.2.1 and A.3.1.2.2.3.2.2.

Table A.3.1.2.2.3.2.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
ReleaseRequest	M	1	The information of request of release of an SDDM regular transmission connection.

Table A.3.1.2.2.3.2.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM regular transmission connection released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.1.3 Data Model

A.3.1.3.1 General

Table A.3.1.3.1.1 specifies the data types defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-S.

Table A.3.1.3.1.1: SDD_RegularTransmissionConnection API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
EstablishmentResponse	A.2.4.1	Information identifying an SDD regular transmission connection establishment response.	
EstablishmentRequest	A.2.4.2.1	Information identifying an SDD regular transmission connection establishment request.	
PeriodicityRange	A.2.4.7	Contains the acceptable periodicity range or periodicity value(s).	
ReleaseRequest	A.3.1.3.2.3	Information identifying an SDD regular transmission connection release request.	
TimeWindow	A.2.4.8	Contains start time and stop time.	
TransmissionAssistInfo	A.2.4.6	Contains transmission assistance information for uplink SEALDD traffic.	
L4sSupportingCapability	A.2.4.12	Information identifying the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based congestion control).	

Table A.3.1.3.1.2 specifies the simple data types defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-S.

Table A.3.1.3.1.2: SDD_RegularTransmissionConnection API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.3.1.3.1.3 specifies the enumerations defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-S.

Table A.3.1.3.1.3: SDD_RegularTransmissionConnection API provided by SDDM-S specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.3.1.3.2 Structured data types

A.3.1.3.2.1 Void

A.3.1.3.2.2 Type: ReleaseRequest

Table A.3.1.3.2.2.1: Definition of type ReleaseRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
serverId	ServerId	M	1	Identity of the VAL server.	
sealddFflowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	

A.3.1.3.2.3 Void

A.3.1.3.2.4 Void

A.3.1.3.2.5 Void

A.3.1.3.3 Simple data types and enumerations

None.

A.3.1.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.1.5 CDDL Specification

A.3.1.5.1 Introduction

The data model described in clause A.3.1.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.1.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_RegularTransmissionConnection API provided by the SDDM-S data model.

A.3.1.5.2 CDDL document

```
;;; EstablishmentRequest
;;+ Represents a request for establishing an SDDM regular transmission connection.
EstablishmentRequest = {
 requestorId: tstr  ; when the requestor is the SDDM-C, e.g. unique client identifier, when the
requestor is the SDDM-S, e.g. FQDN or URI.
 sealddFlowId: Uinteger
 serverId: ServerId
 endpointId: tstr
 ? sealddCommunicationLifetime: Uinteger
 ? valServiceId: tstr
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 ? valTgtUe: ValTargetUe
 ? l4sSupportingCapability: L4sSupportingCapability
 ? xrAppDevCap: XrAppDevCapability
* tstr => any
}

;;; EstablishmentResponse
;;+ Represents a response of establishing an SDDM regular transmission connection.
```

```
EstablishmentResponse = {
 result: ResultOp
 ? cause: Cause
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? batAndPeriodicityCapability: bool
 ? transmisAssistInfo: TransmissionAssistInfo
 ? transportLayer: tstr
* tstr => any
}

;;; ReleaseRequest
;;+ Represents a request for releasing an SDDM regular transmission connection.
ReleaseRequest = {
 serverId: ServerId
 sealddFlowId: Uinteger
* tstr => any
}

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; ServerId
;;+ Represents information identifying a unique server.
ServerId = {
 serverId = tstr
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"

;;; TransmissionAssistInfo
;;+ Indicates a transmission assistance information for uplink SEALDD traffic.
TransmissionAssistInfo = {
 ? bat: DateTime
 ? periodicity: Uinteger
 ? batWindow: TimeWindow
 ? periodRange: PeriodicityRange
* tstr => any
}

;;; TimeWindow
;;+ Indicates the acceptable earliest and latest arrival time of the first packet of the data burst.
The start time contains the earliest acceptable arrival time, and the stop time contains the latest
acceptable arrival time.
TimeWindow= {
 ? startTime: DateTime
 ? stopTime: DateTime
* tstr => any
}

;;; PeriodicityRange
;;+ Indicates the acceptable time period range between the start of two bursts or the acceptable
periodicity value(s).
PeriodicityRange = {
 ? lowerBound: Uinteger
 ? upperBound: Uinteger
 ? periodicityValues: [* Uinteger]
* tstr => any
```

```
}
;;; L4sSupportingCapability
;;+ Indicates the L4S support capability (i.e. ECN identification, L4S feedback and L4S-based
congestion control).
L4sSupportCapability = {
 ecnMarking: EcnMarking
 l4sFeeedbackAndCongestionControl: L4sFeedbackAndCongestionControl
* tstr => any
}
;;; EcnMarking
;;+ Indicates the ECN marking.
EcnMarking = {
 supportsEct0: bool
 ? ect0Value: tstr
 supportsEct1: bool
 ? ect1Value: tstr
* tstr => any
}
;;; L4sFeedbackAndCongestionControl
;;+ Indicates the L4S feedback capability to report congestion-experienced (CE) and L4S-based
congestion control parameters.
L4sFeedback = {
 perPacketCeReporting: bool
 ? feedbackInterval: Uinteger      ; How often feedback is sent.
 ? maxFeedbackFrequency: Uinteger  ; The fastest rate at which feedback may be sent.
 ? protocol: tstr                ; Transport protocol e.g. "RTCP", "in-band".
* tstr => any
}
;;; XrAppDevCapability
;;+ Indicates the XR application device capability information.
XrAppDevCapability = {
 ? mediaCodec: MediaCodec
 ? mediaResolution: MediaResolution
 ? mediaFrameRate: Uinteger
 ? mediaFov: MediaFov
* tstr => any
}

;;; MediaCodec
;;+ Represents the media codec information.
MediaCodec = "H_264" / "H_265"/ tstr ; tstr value provides forward-compatibility with future
extensions to the enumeration but is not used to encode content defined in the present version of
this API.

;;; MediaResolution
;;+ Represents the media resolution information.
MediaResolution = "4320P" / "2160P" / "1440P" / "1080P" / "720P" / "480P" / "360P" / "240P"/ tstr ;
tstr value provides forward-compatibility with future extensions to the enumeration but is not used
to encode content defined in the present version of this API.

;;; MediaFov
;;+ Indicates the media field of view information.
MediaFov = {
 horizontalFov: Uinteger
 verticalFov: Uinteger
* tstr => any
}
```

A.3.1.6 Media Types

See clause A.5.

A.3.1.7 Void

A.3.1.8 Void

A.3.1.9 Void

A.3.1.10 Void

A.3.1.11 Void

A.3.2 Sdd_TransmissionQualityMeasurement API

A.3.2.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.2.2.

A.3.2.2 Resources

A.3.2.2.1 Overview

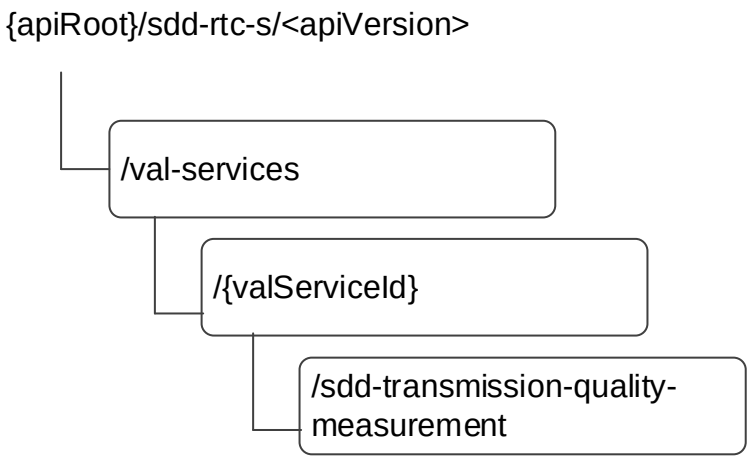

Figure A.3.2.2.1.1: Resource URI structure of the Sdd_TransmissionQualityMeasurement API provided by SDDM-S

Table A.3.2.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.2.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD Transmission Quality Measurement	val-services/{valServiceId}/sdd-transmission-quality-measurement	POST	Establish an SDDM data transmission quality measurement.
		FETCH	Observe SDDM data transmission quality measurement of the SDDM-C.
		DELETE	Releases an SDDM data transmission quality measurement.

A.3.2.2.2 Resource: SDD Transmission Quality Measurement

A.3.2.2.2.1 Description

The SDD transmission quality measurement resource allows an SDDM-C to manage an SDDM data transmission quality measurement of an SDDM-S.

A.3.2.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd--transmission-quality-measurement**

This resource shall support the resource URI variables defined in the table A.3.2.2.2.2.1.

Table A.3.2.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.2.1.
valServiceId	string	Identifier of a VAL service.

A.3.2.2.2.3 Resource Standard Methods

A.3.2.2.2.3.1 POST

This operation allows to establish an SDDM data transmission quality measurement.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.2.2.2.3.1.1 and A.3.2.2.2.3.1.2.

Table A.3.2.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
MeasurementsSubscriptionRequest	M	1	The information of request of establishment of an SDDM data transmission quality measurement.

Table A.3.2.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
MeasurementsSubscriptionResponse	M	1	2.01 Created	SDDM data transmission quality measurement created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.2.2.2.3.2 FETCH

This operation updates an SDDM data transmission quality measurement.

This method shall support the data structures, request codes and response codes specified in table A.3.2.2.2.3.2.0, A.3.2.2.2.3.2.1 and A.3.2.2.2.3.2.2.

Table A.3.2.2.2.3.2.0: Options supported by the FETCH Request on this resource

Name	Data type	P	Cardinality	Description
observe	Uinteger	O	0..1	When set to 0 (register) it extends the FETCH request to subscribe to the changes of this resource. When set to 1 (deregister) it cancels the subscription.
NOTE: Other request options also apply in accordance with normal CoAP procedures.				

Table A.3.2.2.2.3.2.1: Data structures supported by the FETCH Request payload on this resource

Data type	P	Cardinality	Description
MeasurementsSubscriptionReques	M	1	The identifier of an SDDM regular transmission connection to which SDDM datatransmission quality measurement are going to be performed.

Table A.3.2.2.2.3.2.2: Data structures supported by the FETCH Response payload on this resource

Data type	P	Cardinality	Response codes	Description
	M	1	2.05 Content	The information of SDDM data transmission quality measurement on the request from the SDDM-S.
NOTE: The mandatory CoAP error status codes for the PUT method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.2.2.2.3.3 DELETE

This operation releases an SDDM data transmission quality measurement.

This method shall support the request data structures the data structure, request codes and response codes specified in table A.3.2.2.2.3.3.1 and A.3.2.2.2.3.3.2.

Table A.3.2.2.2.3.3.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
n/a			The information of request of release of an SDDM data transmission quality measurement.

Table A.3.2.2.2.3.3.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM data transmission quality measurement released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.2.3 Data Model

A.3.2.3.1 General

Table A.3.2.3.1.1 specifies the data types defined specifically for the SDD_TransmissionQualityMeasurement API service provided by SDDM-S.

Table A.3.2.3.1.1: SDD_TransmissionQualityMeasurement API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
GeographicArea	A.2.2	Information identifying a geographical area.	
GeographicalCoordinates	A.2.2	Information identifying geographical coordinates.	
MeasurementsSubscriptionRequest	A.3.2.3.2.1	Information identifying an SDD data transmission quality measurement subscription establishment request.	
MeasurementsSubscriptionResponse	A.3.2.3.2.2	Information identifying an SDD data transmission quality measurement subscription establishment response.	
MeasurementNotification	A.3.2.3.2.3	Information identifying an SDD data transmission quality measurement notification.	
ReportingCriteria	A.3.2.3.2.4	Information of the criteria for reporting measurement results.	
MeasurementPeriod	A.3.2.3.2.5	Information of the measurement period.	
SpatialConditions	A.3.2.3.2.6	Information of the spatial conditions.	
MeasuredNon3gppAccess	A.2.4.11	Indicates identity of the measured non-3GPP access.	
Non3gppAccessMeasurement	A.2.4.10	Indicates the non-3GPP access measurement information report.	
Non3gppAccessPolicy	A.2.6.4	Indicates the non-3GPP access measurement policy.	

Table A.3.2.3.1.2 specifies the simple data types defined specifically for the SDD_TransmissionQualityMeasurement API service provided by SDDM-S.

Table A.3.2.3.1.2: SDD_TransmissionQualityMeasurement API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.

Table A.3.2.3.1.3 specifies the enumerations defined specifically for the SDD_TransmissionQualityMeasurement API service provided by SDDM-S.

Table A.3.2.3.1.3: SDD_TransmissionQualityMeasurement API provided by SDDM-S specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.3.2.3.2 Structured data types

A.3.2.3.2.1 Type: MeasurementsSubscriptionRequest

Table A.3.2.3.2.1.1: Definition of type MeasurementsSubscriptionRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
sealddMultiModalFlowId	Uinteger	O	0..1	Identity of the multi-modal SDDM flow used by the SDDM-C and SDDM-S to identify application traffic.	
measurementId	string	M	1	Identity of the measurement to be performed which is set to "LATENCY", "BITRATE", "JITTER", "PACKET LOSS", "DELAY DIFFERENCE", or "FLOW ALIGNMENT".	
reportingFrequency	string	O	0..1	Information of the reporting frequency of measurement results which is set to "PERIODIC" or "NOW".	
reportingPeriodicity	Uinteger	O	0..1	Identity of the reporting periodicity of measurement results in seconds (NOTE).	
measurementWindow	Uinteger	O	0..1	Identity of the measurement period window for transmission quality measurements in milliseconds.	
expiryTimer	Uinteger	O	0..1	Identity of the expiration time of the measurement in milliseconds.	
sealPolicy	string	O	0..1	Information of the quality guarantee policies associated with the SEALDD connection set to the action to be performed "REDUNDANT TRANSMISSION PATH", "RE-ESTABLISH TRANSMISSION PATH", "SWITCH TO BACKUP TRANSMISSION PATH" when the measurement event occurs.	
reportingCriteria	array(ReportingCriteria)	O	0..N	Information of the criteria for reporting measurement results, e.g. if the latency or bitrate reaches below or above a certain value. It also includes a unique identifier for each criterion of more than one criteria is specified.	
flowAlignmentReportingCriteriaList	array(FlowAlignmentReportingCriteria)	O	0..N	Information of the criteria for reporting flow alignment measurements results.	
measurementConditions	MeasurementConditions	O	0..1	Information of the temporal conditions, spatial conditions or both.	
valTgtUe	ValTargetUe	O	0..1	VAL user to whom the subscription request is applied.	
non3gppAccessPolicy	Non3gppAccessPolicy	O	0..1	Indicates the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement.	
NOTE: This attribute shall be included if reportingFrequency is set to "PERIODIC".					

A.3.2.3.2.2 Type: MeasurementsSubscriptionResponse

Table A.3.2.3.2.2.1: Definition of type MeasurementsSubscriptionResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE 1).	
expiryTime	DateTime	O	0..1	Information of the expiration time of the subscription (NOTE 2).	
NOTE 1: This attribute shall be included if result is set to "FAILURE". NOTE 2: This attribute may be included if result is set to "SUCCESS".					

A.3.2.3.2.3 Type: MeasurementNotification

Table A.3.2.3.2.3.1: Definition of type MeasurementNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
sealddMultiModalFlowId	Uinteger	O	0..1	Identity of the multi-modal SDDM flow used by the SDDM-C and SDDM-S to identify application traffic.	
measurementId	string	M	1	Identity of the measurement performed which is set to "LATENCY", "BITRATE", "JITTER", "PACKET LOSS", "DELAY DIFFERENCE", or "FLOW ALIGNMENT".	
valUeIdList	array(ValTargetUe)	O	0..N	Information of the identities of the VAL UEs or VAL users for whom SEALDD measurement applies. This attribute can be omitted and the associated measurement values are for the single VAL UE (NOTE).	
averageMeasurementValue	Uinteger	O	0..1	Information of average measurement value of measurement results. If measurementId is "LATENCY", "DELAY DIFFERENCE", or "FLOW ALIGNMENT", the value is in milliseconds. If measurementId is "JITTER", the value is in nanoseconds. If measurementId is "BITRATE", the value is in Mbps. If the measurementId is "PACKET LOSS", the value is in percentage of the number of packets that fail to reach their destination.	
maximumMeasurementValue	Uinteger	O	0..1	Information of the maximum measurement value of measurement results. If measurementId is "LATENCY", "DELAY DIFFERENCE", or "FLOW ALIGNMENT" the value is in milliseconds. If measurementId is "JITTER", the value is in nanoseconds. If measurementId is "BITRATE", the value is in Mbps. If the measurementId is "PACKET LOSS", the value is in percentage of the number of packets that fail to reach their destination.	
minimumMeasurementValue	Uinteger	O	0..1	Information of the minimum measurement value of measurement results. If measurementId is "LATENCY", "DELAY DIFFERENCE", or "FLOW ALIGNMENT", the value is in milliseconds. If measurementId is "JITTER", the value is in nanoseconds. If measurementId is "BITRATE", the value is in Mbps. If the measurementId is "PACKET LOSS", the value is in percentage of the number of packets that fail to reach their destination.	
standardDeviationMeasurementValue	Uinteger	O	0..1	Information of the standard deviation measurement value of measurement results.	
kPercentileMeasurementValue	Uinteger	O	0..1	Information of the kpercentile measurement value of measurement results.	
measurementPeriod	MeasurementPeriod	O	0..1	Information of the measurement period.	
timeStamp	TimeOfDay	O	0..1	Information of the timestamp of measurement results.	
non3gppAccessMeasurements	array(Non3gppAccessMeasurement)	O	1..N	Information of the non-3GPP access measurement information report.	
NOTE: This attribute can be omitted and the associated measurement values are for the single VAL UE.					

A.3.2.3.2.4 Type: ReportingCriteria

Table A.3.2.3.2.4.1: Definition of type ReportingCriteria

Attribute name	Data type	P	Cardinality	Description	Applicability
latency	LatencyValue	O	0..1	Identify whether the criterion for reporting measurements results is based on reaching above or below certain latency values (NOTE).	
bitrate	BitrateValue	O	0..1	Identify whether the criterion for reporting measurements results is based on reaching above or below certain bitrate value (NOTE).	
NOTE: At least one of these attributes shall be included.					

A.3.2.3.2.5 Type: LatencyValue

Table A.3.2.3.2.5.1: Definition of type LatencyValue

Attribute name	Data type	P	Cardinality	Description	Applicability
latencyThresholdValue	Uinteger	M	1	Information of the latency threshold value for reporting measurements results in milliseconds.	
aboveOrBelow	boolean	M	1	Identify whether the criterion for reporting measurements results is based on reaching above certain latency value. Value "true" indicates that the criterion for reporting measurements results is based on reaching above the latency value indicated by the latencyThresholdValue attribute. Value "false" indicates that the criterion for reporting measurements results is based on reaching below the latency value indicated by the latencyThresholdValue attribute.	

A.3.2.3.2.6 Type: BitrateValue

Table A.3.2.3.2.6.1: Definition of type BitrateValue

Attribute name	Data type	P	Cardinality	Description	Applicability
bitrateThresholdValue	Uinteger	M	1	Information of the bitrate threshold value for reporting measurements results in Mbps.	
aboveOrBelow	boolean	M	1	Identify whether the criterion for reporting measurements results is based on reaching above certain bitrate value. Value "true" indicates that the criterion for reporting measurements results is based on reaching above the bitrate value indicated by the bitrateThresholdValue attribute. Value "false" indicates that the criterion for reporting measurements results is based on reaching below the bitrate value indicated by the bitrateThresholdValue attribute.	

A.3.2.3.2.7 Type: MeasurementConditions

Table A.3.2.3.2.7.1: Definition of type MeasurementConditions

Attribute name	Data type	P	Cardinality	Description	Applicability
temporalConditions	MeasurementPeriod	O	0..1	Information of the temporal conditions set in time range (i.e. time-of-start and time-of-end) (NOTE).	
spatialConditions	SpatialConditions	O	0..1	Information of the spatial conditions (i.e. geographical area, geographical coordinates or both) (NOTE).	
NOTE: At least one of these attributes shall be included.					

A.3.2.3.2.8 Type: MeasurementPeriod

Table A.3.2.3.2.8.1: Definition of type MeasurementPeriod

Attribute name	Data type	P	Cardinality	Description	Applicability
timeStart	TimeOfDay	M	1	Information of the start of measurement period.	
timeEnd	TimeOfDay	M	1	Information of the end of measurement period.	

A.3.2.3.2.9 Type: SpatialConditions

Table A.3.2.3.2.9.1: Definition of type SpatialConditions

Attribute name	Data type	P	Cardinality	Description	Applicability
geographicAreaList	array(GeographicArea)	O	0..N	Information of specific geographical area list (NOTE).	
geoCoordinatesList	array(GeographicalCoordinates)	O	0..N	Information of specific geographical coordinates (NOTE).	
NOTE: At least one of these attributes shall be included.					

A.3.2.3.2.10 Type: FlowAlignmentReportingCriteria

Table A.3.2.3.2.10.1: Definition of type FlowAlignmentReportingCriteria

Attribute name	Data type	P	Cardinality	Description	Applicability
flowAlignmentReportingCriteriaIdentifier	Uinteger	O	0..1	Identify of the flow alignment reporting criteria to unique identifier for each criterion if more than one criterion is specified.	
bufferingThresholdValue	Uinteger	O	0..1	Information of the flow alignment buffering threshold value for reporting measurements results for flow alignment in milliseconds	
aboveOrBelowBufferingThresholdValue	boolean	O	0..1	Identify whether the criterion for reporting measurements results for flow alignment, is based on reaching above or below certain value indicated by the "bufferingThresholdValue". Value "true" indicates that the flow alignment buffering reaches above a certain value for a certain amount of time indicated by the "bufferingThresholdValue". Value "false" indicates that the flow alignment buffering reaches below a certain value for a certain amount of time indicated by the "bufferingThresholdValue".	
NOTE: At least one of these attributes shall be included.					

A.3.2.3.3 Simple data types and enumerations

None.

A.3.2.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.2.5 CDDL Specification

A.3.2.5.1 Introduction

The data model described in clause A.3.1.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.2.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_TransmissionQualityMeasurement API provided by the SDDM-S data model.

A.3.2.5.2 CDDL document

```
;;; MeasurementSubscriptionRequest
;;+ Represents a request for performing SDDM data transmission quality measurements.
MeasurementSubscriptionRequest = {
 sealddFlowId: Uinteger
 ? sealddMultiModalFlowId: Uinteger
 measurementId: tstr
 ? reportingFrequency: tstr
 ? reportingPeriodicity: Uinteger
 ? measurementWindow: Uinteger
 ? expiryTimer: Uinteger
 ? sealPolicy: tstr
 ? reportingCriteria: ReportingCriteria
 ? flowAlignmentReportingCriteriaList: FlowAlignmentReportingCriteria
 ? measurementConditions: MeasurementConditions
 ? valTgtUe: ValTargetUe
 ? non3gppAccessPolicy: Non3gppAccessPolicy
* tstr => any
```

```
}

;;; MeasurementSubscriptionResponse
;;+ Represents the response of a request for performing SDDM data transmission quality measurements.
MeasurementSubscriptionResponse = {
 result: ResultOp
 ? cause: Cause
 ? expiryTime: DateTime
* tstr => any
}

;;; MeasurementNotification
;;+ Represents the information of SDDM data transmission quality measurements of the SDDM-C.
MeasurementNotification = {
 sealddFlowId: Uinteger
 measurementId: tstr
 ? valUeIdList: [* ValTargetUe]
 ? averageMeasurementValue: Uinteger
 ? maximumMeasurementValue: Uinteger
 ? minimumMeasurementValue: Uinteger
 ? standardDeviationMeasurementValue: Uinteger
 ? kPercentileMeasurementValue: Uinteger
 ? measurementPeriod: MeasurementPeriod
 ? timeStamp: TimeOfDay
 ? non3gppAccessMeasurements: [* Non3gppAccessMeasurement]
* tstr => any
}

;;; ReportingCriteria
ReportingCriteria = {
 ? latency: LatencyValue
 ? bitrate: BitrateValue
* tstr => any
}

;;; FlowAlignmentReportingCriteria
FlowAlignmentReportingCriteria = {
 ? flowAlignmentReportingCriteriaIdentifier: Uinteger
 ? bufferingThresholdValue: Uinteger
 ? aboveOrBelowBufferingThresholdValue: bool
 * tstr => any

}

;;; LatencyValue
LatencyValue = {
 latencyThresholdValue: Uinteger
 aboveOrBelow: bool
}

;;; BitrateValue
BitrateValue = {
 bitrateThresholdValue: Uinteger
 aboveOrBelow: bool
}

;;; MeasurementConditions
MeasurementConditions = {
 ? temporalConditions: MeasurementPeriod
 ? spatialConditions: SpatialConditions
* tstr => any
}

MeasurementPeriod = {
 timeStart: TimeOfDay
 timeEnd: TimeOfDay
}

;;; SpatialConditons
SpatialConditions = {
 ? geographicAreaList: [* GeographicArea]
 ? geoCordinatesList: [*GeographicalCoordinates]
* tstr => any
}

;;; TimeOfDay
;;+ String with format partial-time or full-time as defined in clause 5.6 of IETF RFC 3339.
Examples, 20:15:00, 20:15:00-08:00 (for 8 hours behind UTC).
```

```
TimeOfDay = tstr

;;; Non3gppAccessMeasurement
;;+ Information of the non-3GPP access measurement information report.
Non3gppAccessMeasurement = {
 ? measuredAccess: MeasuredNon3gppAccess
 signalStrengthValues: [* Uinteger]
* tstr => any
}

;;; MeasuredNon3gppAccess
;;+ Identity of the measured non-3GPP access i.e. WLAN SSID or WLAN BSSID.
MeasuredNon3gppAccess = {
 ? ssId: tstr
 ? bssId: tstr
* tstr => any
}

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; GeographicArea
;;+ Geographic area specified by different shape.
GeographicArea = Point / PointUncertaintyCircle / PointUncertaintyEllipse / Polygon / PointAltitude
/ PointAltitudeUncertainty / EllipsoidArc

;;; GADShape
;;+ Common base type for GAD shapes.
GADShape = {
 shape: SupportedGADShapes
}

;;; Point
;;+ Ellipsoid Point.
Point = {
 ~GADShape
 point: GeographicalCoordinates
}

;;; PointUncertaintyCircle
;;+ Ellipsoid point with uncertainty circle.
PointUncertaintyCircle = {
 ~GADShape
 point: GeographicalCoordinates
 uncertainty: Uncertainty
* tstr => any
}

;;; PointUncertaintyEllipse
;;+ Ellipsoid point with uncertainty ellipse.
PointUncertaintyEllipse = {
 ~GADShape
 point: GeographicalCoordinates
 uncertaintyEllipse: UncertaintyEllipse
 confidence: Confidence
* tstr => any
}

;;; Polygon
;;+ Polygon.
Polygon = {
 ~GADShape
 pointList: PointList
}
```

```
;;; PointAltitude
;;+ Ellipsoid point with altitude.
PointAltitude = {
 ~GADShape
 point: GeographicalCoordinates
 altitude: Altitude
* tstr => any
}

;;; PointAltitudeUncertainty
;;+ Ellipsoid point with altitude and uncertainty ellipsoid.
PointAltitudeUncertainty = {
 ~GADShape
 point: GeographicalCoordinates
 altitude: Altitude
 uncertaintyEllipse: UncertaintyEllipse
 uncertaintyAltitude: Uncertainty
 confidence: Confidence
* tstr => any
}

;;; EllipsoidArc
;;+ Ellipsoid Arc.
EllipsoidArc = {
 ~GADShape
 point: GeographicalCoordinates
 innerRadius: InnerRadius
 uncertaintyRadius: Uncertainty
 offsetAngle: Angle
 includedAngle: Angle
 confidence: Confidence
* tstr => any
}

;;; GeographicalCoordinates
;;+ Geographical coordinates.
GeographicalCoordinates = {
 lon: -180.0..180.0
 lat: -90.0..90.0
}

;;; UncertaintyEllipse
;;+ Ellipse with uncertainty.
UncertaintyEllipse = {
 semiMajor: Uncertainty
 semiMinor: Uncertainty
 orientationMajor: Orientation
* tstr => any
}

;;; PointList
;;+ List of points.
PointList = [3*15 GeographicalCoordinates]

;;; Altitude
;;+ Indicates value of altitude.
Altitude = -32767.0..32767.0

;;; Angle
;;+ Indicates value of angle.
Angle = 0..360

;;; Uncertainty
;;+ Indicates value of uncertainty.
Uncertainty = float32 .ge 0

;;; Orientation
;;+ Indicates value of orientation angle.
Orientation = 0..180

;;; Confidence
;;+ Indicates value of confidence.
Confidence = 0..100

;;; InnerRadius
;;+ Indicates value of the inner radius.
InnerRadius = (0..327675) .and int32
```

```
;;; SupportedGADShapes
;;+ Indicates supported GAD shapes.
SupportedGADShapes = "POINT" / "POINT_UNCERTAINTY_CIRCLE" / "POINT_UNCERTAINTY_ELLIPSE" / "POLYGON"
/ "POINT_ALTITUDE" / "POINT_ALTITUDE_UNCERTAINTY" / "ELLIPSOID_ARC" /
"LOCAL_2D_POINT_UNCERTAINTY_ELLIPSE" / "LOCAL_3D_POINT_UNCERTAINTY_ELLIPSOID" / tstr

;;; Non3gppAccessPolicy
;;+ Represents the non-3GPP access measurement policy.
Non3gppAccessPolicy = "WLAN SSID" / "WLAN BSSID" / "LOCATION_BASED"

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"
```

A.3.2.6 Media Types

See clause A.5.

A.3.2.7 Void

A.3.2.8 Void

A.3.2.9 Void

A.3.3 Sdd_TransmissionQualityManagement API

A.3.3.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.3.2.

A.3.3.2 Resources

A.3.3.2.1 Overview

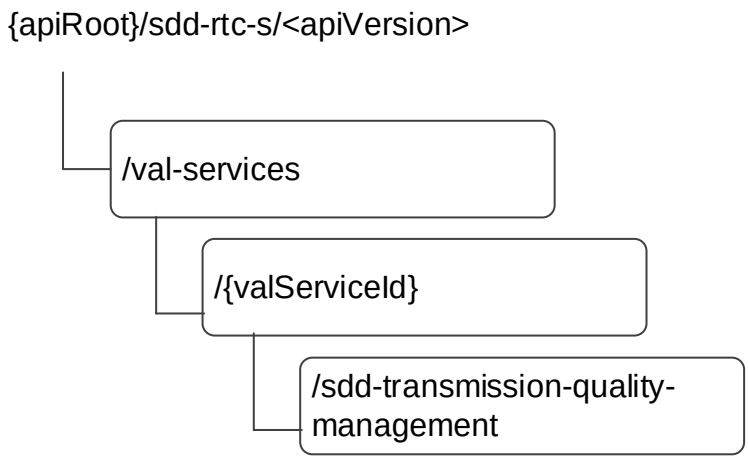

Figure A.3.3.2.1.1: Resource URI structure of the Sdd_TransmissionQualityManagement API provided by SDDM-S

Table A.3.3.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.3.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD Transmission Quality Management	val-services/{valServiceId}/sdd-transmission-quality-management	POST	Establish an SDDM data transmission quality management.
		DELETE	Releases an SDDM data transmission quality management.

A.3.3.2.2 Resource: SDD Transmission Quality Management

A.3.3.2.2.1 Description

The SDD transmission quality management resource allows an SDDM-C to manage an SDDM data transmission quality management of an SDDM-S.

A.3.3.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd--transmission-quality-management**

This resource shall support the resource URI variables defined in the table A.3.3.2.2.2.1.

Table A.3.3.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.3.1.
valServiceId	string	Identifier of a VAL service.

A.3.3.2.2.3 Resource Standard Methods

A.3.3.2.2.3.1 POST

This operation allows to establish an SDDM data transmission quality management.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.3.2.2.3.1.1 and A.3.3.2.2.3.1.2.

Table A.3.3.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
TxQualityManagementRequest	M	1	The information of request of establishment of an SDDM data transmission quality management.

Table A.3.3.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
TxQualityManagementResponse	M	1	2.01 Created	SDDM data transmission quality management created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.3.2.2.3.2 DELETE

This operation releases an SDDM data transmission quality management.

This method shall support the request data structures the data structure, request codes and response codes specified in table A.3.3.2.2.3.2.1 and A.3.3.2.2.3.2.2.

Table A.3.3.2.2.3.2.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
n/a			The information of request of release of an SDDM data transmission quality management.

Table A.3.3.2.2.3.2.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM data transmission quality management released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.3.3 Data Model

A.3.3.3.1 General

Table A.3.3.3.1.1 specifies the data types defined specifically for the SDD_TransmissionQualityManagement API service provided by SDDM-S.

Table A.3.3.3.1.1: SDD_TransmissionQualityManagement API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
TxQualityManagementRequest	A.3.3.3.2.1	Information identifying an SDD data transmission quality guarantee request.	
TxQualityManagementResponse	A.3.3.3.2.2	Information identifying an SDD data transmission quality guarantee response.	

Table A.3.3.3.1.2 specifies the simple data types defined specifically for the SDD_TransmissionQualityManagement API service provided by SDDM-S.

Table A.3.3.3.1.2: SDD_TransmissionQualityManagement API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.

Table A.3.3.3.1.3 specifies the enumerations defined specifically for the SDD_TransmissionQualityManagement API service provided by SDDM-S.

Table A.3.3.3.1.3: SDD_TransmissionQualityManagement API provided by SDDM-S specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.3.3.3.2 Structured data types

A.3.3.3.2.1 Type: TxQualityManagementRequest

Table A.3.3.3.2.2.1: Definition of type TxQualityManagementRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
txQualityManagementAction	string	M	1	Identity of the data transmission quality guarantee action to be performed (set to "REDUNDANT TRANSMISSION PATH", "RE-ESTABLISH TRANSMISSION PATH" or "SWITCH TO BACKUP TRANSMISSION PATH") or optimization action (set to "BACK TO SINGLE TRANSMISSION PATH" or "TRANSMISSION PARAMETER ADJUSTMENT") that was triggered by an event (e.g. measurement threshold)	
batOffsetUl	Uinteger	O	0..1	Indicates the BAT offset of the arrival time of the data burst in units of milliseconds for the uplink data. (NOTE 1)	
periodicityUl	Uinteger	O	0..1	Indicates the adjusted periodicity of the data bursts in units of milliseconds for the uplink data. (NOTE 2)	
NOTE 1: This attribute shall only be included if the txQualityManagementAction attribute is set to "TRANSMISSION PARAMETER ADJUSTMENT". NOTE 2: This attribute may only be included if the txQualityManagementAction attribute is set to "TRANSMISSION PARAMETER ADJUSTMENT" and "batOffsetUl" attribute is included.					

A.3.3.3.2.2 Type: TxQualityManagementResponse

Table A.3.3.3.2.2.1: Definition of type TxQualityManagementResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE).	
NOTE: This attribute shall be included if result is set to "FAILURE".					

A.3.3.3.3 Simple data types and enumerations

None.

A.3.3.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.3.5 CDDL Specification

A.3.3.5.1 Introduction

The data model described in clause A.3.3.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.3.5.2 uses the concise data definition language described in IETF RFC 8610 [18] and provides corresponding representation of the SDD_TransmissionQualityManagement API provided by the SDDM-S data model.

A.3.3.5.2 CDDL document

```
;;; TxQualityManagementRequest
;;+ Represents a request for performing SDDM data transmission quality management.
TxQualityManagementRequest = {
 sealddFlowId: Uinteger
 txQualityManagementAction: tstr
 ? batOffsetUl: Uinteger
 ? periodicityUl: Uinteger
* tstr => any
}

;;; TxQualityManagementResponse
;;+ Represents the response of a request for performing SDDM data transmission quality management.
TxQualityManagementResponse = {
 result: ResultOp
 ? cause: Cause
* tstr => any
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0
```

A.3.3.6 Media Types

See clause A.5.

A.3.3.7 Void

A.3.3.8 Void

A.3.4 Sdd_ConnectionStatusEvent API

A.3.4.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.4.2.

A.3.4.2 Resources

A.3.4.2.1 Overview

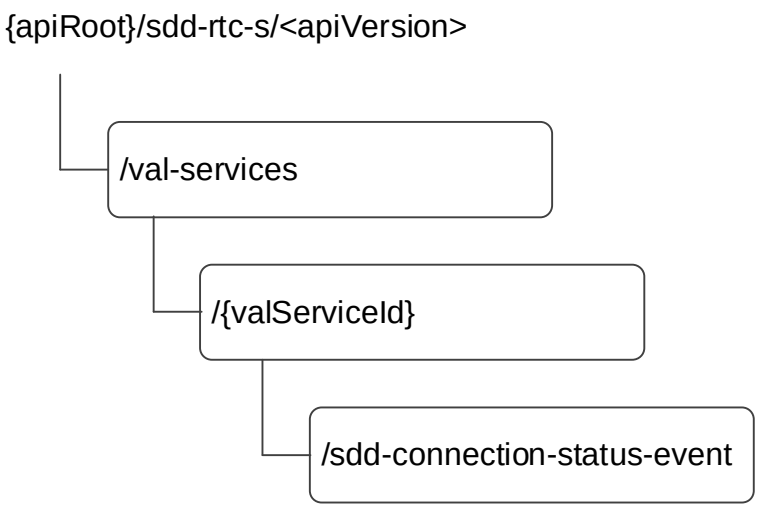

Figure A.3.4.2.1.1: Resource URI structure of the Sdd_ConnectionStatusEvent API provided by SDDM-S

Table A.3.4.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.4.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD Connection Status Event	val-services/{valServiceId}/sdd-connection-status-event	POST	Establish an SDDM connection status event.
		FETCH	Observe SDDM connection status reporting configuration of the SDDM-C.
		DELETE	Release an SDDM connection status event.

A.3.4.2.2 Resource: SDD Connection Status Event

A.3.4.2.2.1 Description

The SDD connection status event resource represents an SDD connection status event to be created at a given SDDM-C and SDDM-S.

A.3.4.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd-connection-status-event**

This resource shall support the resource URI variables defined in the table A.3.4.2.2.2.1.

Table A.3.4.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.4.1.
valServiceId	string	Identifier of a VAL service.

A.3.4.2.2.3 Resource Standard Methods

A.3.4.2.2.3.1 POST

This operation allows to establish an SDDM connection status event.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.4.2.2.3.1.1 and A.3.4.2.2.3.1.2.

Table A.3.4.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
ConnectionStatusConfigurationRequest	M	1	The information of request of establishment of an SDDM connection status event.

Table A.3.4.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
ConnectionStatusConfigurationResponse	M	1	2.01 Created	SDDM connection status event created successfully.
NOTE: The mandatory CoAP error status codes for the GET request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.4.2.2.3.2 DELETE

This operation releases an SDDM connection status event.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.4.2.2.3.2.1 and A.3.4.2.2.3.2.2.

Table A.3.4.2.2.3.2.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
n/a			The information of request of release of an SDDM connection status event.

Table A.3.4.2.2.3.2.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM connection event released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.4.2.2.3.3 FETCH

This operation provides an SDD connection status reporting notification.

This method shall support the data structures, request codes and response codes specified in table A.3.4.2.2.3.3.1, A.3.4.2.2.3.3.2 and A.3.4.2.2.3.3.3.

Table A.3.4.2.2.3.3.1: Options supported by the FETCH Request on this resource

Name	Data type	P	Cardinality	Description
observe	Uinteger	O	0..1	When set to 0 (register) it extends the FETCH request to subscribe to the changes of this resource. When set to 1 (deregister) it cancels the subscription.
NOTE: Other request options also apply in accordance with normal CoAP procedures.				

Table A.3.4.2.2.3.3.2: Data structures supported by the FETCH Request payload on this resource

Data type	P	Cardinality	Description
ConnectionStatusConfiguration Subscription	M	1	The identifier of SDDM connection status reporting configuration to which connection status reporting notification are going to be performed.

Table A.3.4.2.2.3.3.3: Data structures supported by the FETCH Response payload on this resource

Data type	P	Cardinality	Response codes	Description
ConnectionStatusNotification	M	1	2.05 Content	The SDDM-C connection status reporting information.
NOTE: The mandatory CoAP error status codes for the FETCH method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.4.3 Data Model

A.3.4.3.1 General

Table A.3.4.3.1.1 specifies the data types defined specifically for the SDD_ConnectionStatusEvent API service provided by SDDM-S.

Table A.3.4.3.1.1: SDD_ConnectionStatusEvent API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ConnectionStatus	A.3.4.3.3.2	Information identifying a connection status of VAL client.	
ConnectionStatusConfiguration Request	A.3.4.3.2.1	Information identifying an SDD connection status event request.	
ConnectionStatusConfiguration Response	A.3.4.3.2.2	Information identifying an SDD connection status event response.	
ConnectionStatusConfiguration Subscription	A.3.4.3.2.3	Information identifying an SDDM connection status reporting configuration.	
ConnectionStatusNotification	A.3.4.3.2.4	The SDDM-C connection status reporting information.	
MeasuredNon3gppAccess	A.2.4.11	Indicates identity of the measured non-3GPP access.	
Non3gppAccessMeasurement	A.2.4.10	Indicates the non-3GPP access measurement information report.	

Table A.3.4.3.1.2 specifies the simple data types defined specifically for the SDD_ConnectionStatusEvent API service provided by SDDM-S.

Table A.3.4.3.1.2: SDD_ConnectionStatusEvent API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.

Table A.3.4.3.1.3 specifies the enumerations defined specifically for the SDD_ConnectionStatusEvent API service provided by SDDM-S.

Table A.3.4.3.1.3: SDD_ConnectionStatusEvent API provided by SDDM-S specific enumeration

Data type	Section defined	Description
AccessUsage	A.3.4.3.3.4	Information identifying which access is used for the SEALDD-UU data transmission.
ReportingPriority	A.3.4.3.3.5	Indicates the priority of the reporting.
ReportingMode	A.3.4.3.3.3	Identifies the mode of the reporting.
ResultOp	A.2.6.2	Information identifying the result of an operation.

A.3.4.3.2 Structured data types

A.3.4.3.2.1 Type: ConnectionStatusConfigurationRequest

Table A.3.4.3.2.1.1: Definition of type ConnectionStatusConfigurationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
reportingMode	ReportingMode	O	0..1	Indicates the mode of the reporting. i.e. "PERIODIC" or "EVENT_TRIGGERED".	
reportingInterval	Uinteger	O	0..1	Indicates the reporting interval, in seconds, to report the notification (NOTE).	
reportingPriority	ReportingPriority	O	0..1	Indicates the priority of SEALDD client connection status for the requested SEALDD flow ID.	
non3gppAccessPolicy	Non3gppAccessPolicy	O	0..1	Indicates the non-3GPP access measurement policy, i.e. "WLAN SSID", "WLAN BSSID" or "LOCATION_BASED" measurement.	
NOTE: This attribute shall be included if the "reportingMode" attribute is set to "PERIODIC".					

A.3.4.3.2.2 Type: ConnectionStatusConfigurationResponse

Table A.3.4.3.2.2.1: Definition of type ConnectionStatusConfigurationResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the connection status request.	

A.3.4.3.2.3 Type: ConnectionStatusConfigurationSubscription

Table A.3.4.3.2.3.1: Definition of type ConnectionStatusConfigurationSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	

A.3.4.3.2.4 Type: ConnectionStatusNotification

Table A.3.4.3.2.4.1: Definition of type ConnectionStatusNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
clientConnectionStatus	ConnectionStatus	M	1	Indicates the connection status of the VAL client, i.e. reachable, unreachable, or sleeping.	
accessUsage	AccessUsage	M	1	Indicates which access is used for the SEALDD-UU data transmission.	
non3gppAccessMeasurements	array(Non3gppAccessMeasurement)	O	1..N	Information of the non-3GPP access measurement information report.	
sleepingDuration	Uinteger	O	0..1	Indicates the duration the client connection status of the VAL client is set to sleeping, in units of microseconds. (NOTE)	
NOTE: This attribute may only be included if the "clientConnectionStatus" is set to "SLEEPING".					

A.3.4.3.3 Simple data types and enumerations

A.3.4.3.3.1 Simple data types

Table A.3.4.3.3.1.1: Simple data types

Type Name	Type Definition	Description

A.3.4.3.3.2 Enumeration: ConnectionStatus

Table A.3.4.3.3.2.1: ConnectionStatus

Enumeration value	Description	Applicability
REACHABLE	Indicates that a VAL client is reachable.	
UNREACHABLE	Indicates that a VAL client is unreachable.	
SLEEPING	Indicates that a VAL client is sleeping.	

A.3.4.3.3.3 Enumeration: ReportingMode

The enumeration ReportingMode represents the type of the report mode. It shall comply with the provisions defined in table A.3.4.3.3.3.1.

Table A.3.4.3.3.3.1: Enumeration ReportingMode

Enumeration value	Description	Applicability
PERIODIC	Indicates the reporting mode of type periodic.	
EVENT_TRIGGERED	Indicates the reporting mode of type event triggered.	

A.3.4.3.3.4 Enumeration: AccessUsage

The enumeration AccessUsage represents type of used access. It shall comply with the provisions defined in table A.3.4.3.3.4.1.

Table A.3.4.3.3.4.1: Enumeration AccessUsage

Enumeration value	Description	Applicability
3GPP_ACCESS	Indicates the 3GPP access.	
NON_3GPP_ACCESS	Indicates the non-3GPP access.	

A.3.4.3.3.5 Enumeration: ReportingPriority

The enumeration ReportingPriority represents the priority of the SEALDD client connection status for the requested SEALDD flow ID. It shall comply with the provisions defined in table A.3.4.3.3.5.1.

Table A.3.4.3.3.5.1: Enumeration ReportingPriority

Enumeration value	Description	Applicability
LOW	Indicates the reporting priority is set to low.	
HIGH	Indicates the reporting priority is set to high.	

A.3.4.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.4.5 CDDL Specification

A.3.4.5.1 Introduction

The data model described in clause A.3.4.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.4.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_ConnectionStatusEvent API provided by the SDDM-S data model.

A.3.4.5.2 CDDL document

```
;;; ConnectionStatusConfigurationRequest
;;+ Represents a request for performing SDDM connection status reporting.
ConnectionStatusConfigurationRequest = {
 sealddFlowId: Uinteger
 ? reportingMode: ReportingMode
 ? reportingInterval: Uinteger
 ? reportingPriority: ReportingPriority
 ? non3gppAccessPolicy: Non3gppAccessPolicy
* tstr => any
}

;;; ConnectionStatusConfigurationResponse
;;+ Represents the response of a request for performing SDDM connection status reporting.
ConnectionStatusConfigurationResponse = {
 result: ResultOp
* tstr => any
}

;;; ConnectionStatusConfigurationSubscription
;;+ Represents a request for performing SDDM connection status reporting notification.
ConnectionStatusConfigurationSubscription = {
 sealddFlowId: Uinteger
* tstr => any
}

;;; ConnectionStatusNotification
;;+ Represents an SDDM connection status reporting notification.
ConnectionStatusNotification = {
 clientConnectionStatus: ConnectionStatus
 accessUsage: AccessUsage
 ? non3gppAccessMeasurements: [* Non3gppAccessMeasurement]
 ? sleepingDuration: Uinteger
```

```
* tstr => any
}

;;; Non3gppAccessMeasurement
;;+ Information of the non-3GPP access measurement information report.
Non3gppAccessMeasurement = {
 ? measuredAccess: MeasuredNon3gppAccess
 signalStrengthValues: [* Uinteger]
* tstr => any
}

;;; MeasuredNon3gppAccess
;;+ Identity of the measured non-3GPP access i.e. WLAN SSID or WLAN BSSID.
MeasuredNon3gppAccess = {
 ? ssId: tstr
 ? bssId: tstr
* tstr => any
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; ConnectionStatus
;;+ Represents the VAL client connection status.
ConnectionStatus = "REACHABLE" / "UNREACHABLE" / "SLEEPING"

;;; ReportingPriority
;;+ Indicates the priority of SEALDD client connection status for the requested SEALDD flow ID.
ReportingPriority = "LOW" / "HIGH"

;;; ReportingMode
;;+ Represents the mode of the reporting.
ReportingMode = "PERIODIC" / "EVENT_TRIGGERED"

;;; Non3gppAccessPolicy
;;+ Represents the non-3GPP access measurement policy.
Non3gppAccessPolicy = "WLAN SSID" / "WLAN BSSID" / "LOCATION_BASED"

;;; AccessUsage
;;+ Represents the type of the used access.
AccessUsage = "3GPP_ACCESS" / "NON_3GPP_ACCESS"

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0
```

A.3.4.6 Media Types

See clause A.5.

A.3.4.7 Void

A.3.4.8 Void

A.3.5 Sdd_URLLCTransmissionConnection API

A.3.5.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.5.2.

A.3.5.2 Resources

A.3.5.2.1 Overview

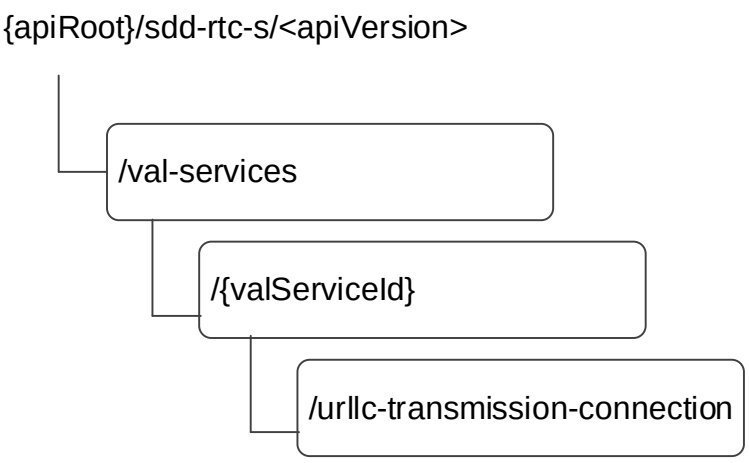

Figure A.3.5.2.1.1: Resource URI structure of the Sdd_URLLCTransmissionConnection API provided by SDDM-S

Table A.3.5.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.5.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
URLLC Transmission Connection	val-services/{valServiceId}/urllc-transmission-connection	POST	Establish a URLLC transmission connection.
		PUT	Update a URLLC transmission connection.
		DELETE	Releases a URLLC transmission connection.

A.3.5.2.2 Resource: URLLC Transmission Connection

A.3.5.2.2.1 Description

The URLLC transmission connection resource allows an SDDM-C to manage a URLCC transmission connection of an SDDM-S.

A.3.5.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s<apiVersion>/val-services/{valServiceId}/urllc-transmission-connection**

This resource shall support the resource URI variables defined in the table A.3.5.2.2.2.1.

Table A.3.5.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.5.1.
valServiceId	string	Identifier of a VAL service.

A.3.5.2.2.3 Resource Standard Methods

A.3.5.2.2.3.1 POST

This operation retrieves the allowed registration.

This method shall support the request data structures, request codes and response codes specified in table A.3.5.2.2.3.1.1 and A.3.5.2.2.3.1.2.

Table A.3.5.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
URLLCEstablishmentRequest	M	1	The information of request of establishment of an SDDM URLLC transmission connection.

Table A.3.5.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
URLLCEstablishmentResponse	M	1	2.01 Created	URLLC transmission connection created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.5.2.2.3.2 DELETE

This operation releases a URLLC transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.3.5.2.2.3.2.1 and A.3.5.2.2.3.2.2.

Table A.3.5.2.2.3.2.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
URLLCReleaseRequest	M	1	The information of request of release of a URLCC transmission connection.

Table A.3.5.2.2.3.2.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	URLLC transmission connection released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.3.5.3 Data Model

A.3.5.3.1 General

Table A.3.5.3.1.1 specifies the data types defined specifically for the SDD_URLLCTransmissionConnection API service provided by SDDM-S.

Table A.3.5.3.1.1: SDD_URLLCTransmissionConnection API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
PeriodicityRange	A.2.4.7	Contains the acceptable periodicity range or periodicity value(s).	
TimeWindow	A.2.4.8	Contains start time and stop time.	
TransmissionAssistInfo	A.2.4.6	Contains transmission assistance information for uplink SEALDD traffic.	
URLLCEstablishmentRequest	A.2.4.3	Information identifying a URLLC transmission connection establishment request.	
URLLCEstablishmentResponse	A.2.4.4	Information identifying a URLLC transmission connection establishment response.	
URLLCReleaseRequest	A.2.4.5	Information identifying a URLLC transmission connection release request.	

Table A.3.5.3.1.2 specifies the simple data types defined specifically for the SDD_URLLCTransmissionConnection API service provided by SDDM-S.

Table A.3.5.3.1.2: SDD_URLLCTransmissionConnection API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.3.5.3.1.3 specifies the enumerations defined specifically for the SDD_URLLCTransmissionConnection API service provided by SDDM-S.

Table A.3.5.3.1.3: SDD_URLLCTransmissionConnection API provided by SDDM-C specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.3.5.3.2 Structured data types

None.

A.3.5.3.3 Simple data types and enumerations

None.

A.3.5.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.5.5 CDDL Specification

A.3.5.5.1 Introduction

The data model described in clause A.3.3.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.3.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the Sdd_URLLCTransmissionConnection API provided by the SDDM-S data model.

A.3.5.5.2 CDDL document

```
;;; URLLCEstablishmentRequest
;;+ Represents a request for establishing a URLLC transmission connection.
URLLCEstablishmentRequest = {
 sealClientId: tstr
 sealFlowId: Uinteger
 valTgtUe: ValTargetUe
 serverId: ServerId
 valServiceId: tstr
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
* tstr => any
}

;;; URLLCEstablishmentResponse
;;+ Represents a response of establishing a URLLC transmission connection.
URLLCEstablishmentResponse = {
 result: ResultOp
 ? cause: Cause
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 ? batAndPeriodicityCapability: bool
 ? transmisAssistInfo: TransmissionAssistInfo
* tstr => any
}

;;; URLLCReleaseRequest
;;+ Represents a request for releasing a URLLC transmission connection.
ReleaseRequest = {
 sealClientId: tstr
 sealFlowId: Uinteger
* tstr => any
}

;;; TransmissionAssistInfo
;;+ Indicates a transmission assistance information for uplink SEALDD traffic.
TransmissionAssistInfo = {
 ? bat: DateTime
 ? periodicity: Uinteger
 ? batWindow: TimeWindow
 ? periodRange: PeriodicityRange
* tstr => any
}

;;; TimeWindow
;;+ Indicates the acceptable earliest and latest arrival time of the first packet of the data burst.
The start time contains the earliest acceptable arrival time, and the stop time contains the latest
acceptable arrival time.
TimeWindow = {
 ? startTime: DateTime
 ? stopTime: DateTime
}

;;; PeriodicityRange
;;+ Indicates the acceptable time period range between the start of two bursts or the acceptable
periodicity value(s).
PeriodicityRange = {
 ? lowerBound: Uinteger
 ? upperBound: Uinteger
 ? periodicityValues: [* Uinteger]
* tstr => any
}

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
```

```
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; ServerId
;;+ Represents information identifying a unique server.
ServerId = {
 serverId = tstr
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"
```

A.3.5.6 Media Types

See clause A.5.

A.3.6 Sdd_XRTransmissionConnnection API

A.3.6.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.6.2.

A.3.6.2 Resources

A.3.6.2.1 Overview

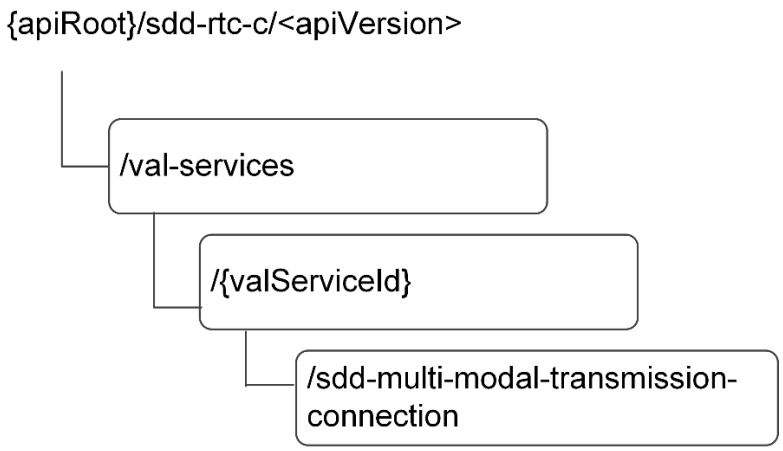

Figure A.3.6.2.1.1: Resource URI structure of the Sdd_XRTransmissionConnnection API provided by SDDM-S

Table A.3.6.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.6.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD multi-modal transmission connection	val-services/{valServiceId}/sdd-xr-transmission-connection	POST	Trigger an SDDM multi-modal transmission connection operation.

A.3.6.2.2 Resource: SDD multi-modal transmission connection

A.3.6.2.2.1 Description

The SDD multi-modal transmission connection resource represents an SDD multi-modal transmission connection to be created at a given SDDM-C and SDDM-S.

A.3.6.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd-xr-transmission-connection**

This resource shall support the resource URI variables defined in the table A.3.6.2.2.2.1.

Table A.3.6.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.6.1.
valServiceId	string	Identifier of a VAL service.

A.3.6.2.2.3 Resource Standard Methods

A.3.6.2.2.3.1 POST

This operation request triggering of an SDDM multi-modal transmission connection operation.

This method shall support the data structures, request codes and response codes specified in table A.3.6.2.2.3.1.1 and A.3.6.2.2.3.1.2.

Table A.3.6.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
XRTriggerRequest	1	1	The information of request SDDM XR transmission connection trigger.

Table A.3.6.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
XRTriggerResponse	1	1	2.01 Created	SDDM XR transmission connection trigger created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.6.3 Data Model

A.3.6.3.1 General

Table A.3.6.3.1.1 specifies the data types defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-S.

Table A.3.6.3.1.1: Sdd_XRTransmissionConnnection API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
XRTriggerRequest	A.3.6.3.2.1	Information identifying an SDDM XR transmission connection trigger request.	
XRTriggerResponse	A.3.6.3.2.2	Information identifying an SDDM XR transmission connection trigger response.	

Table A.3.6.3.1.2 specifies the simple data types defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-S.

Table A.3.6.3.1.2: Sdd_XRTransmissionConnnection API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.3.6.3.1.3 specifies the enumerations defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-S.

Table A.3.6.3.1.3: Sdd_XRTransmissionConnnection API provided by SDDM-S specific enumeration

Data type	Section defined	Description
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.
Operation	A.3.6.3.3.2	Information identifying the action for a UE-to-UE direct communication.
ResultOp	A.2.6.2	Information identifying the result of an operation.

A.3.6.3.2 Structured data types

A.3.6.3.2.1 Type: XRTriggerRequest

Table A.3.6.3.2.1.1: Definition of type XRTriggerRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Identity of the requestor of the XR transmission connection trigger. (NOTE)	
valUeIds	array(ValTargetUe)	M	1..N	Information of the identities of the VAL UEs or VAL users involved in the UE-to-UE direct communication.	
operation	Operation	M	1	Identifies the UE-to-UE direct communication operation.	
valServiceId	string	O	0..1	Identity of the VAL service enabled by the XR transmission connection.	
NOTE: This attribute shall be set to identity of the SDDM-S.					

A.3.6.3.2.2 Type: XRTriggerResponse

Table A.3.6.3.2.2.1: Definition of type XRTriggerResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the XR transmission connection trigger request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the XR transmission trigger request. (NOTE)	
NOTE: This attribute shall be included if result is set to "FAILURE".					

A.3.6.3.3 Simple data types and enumerations

A.3.6.3.3.1 Simple data types

Table A.3.6.3.3.1.1: Simple data types

Type Name	Type Definition	Description

A.3.6.3.3.2 Enumeration: Operation

Table A.3.6.3.3.2.1: Operation

Enumeration value	Description	Applicability
ESTABLISH	Indicates the establish action for the UE-to-UE direct communication.	
RELEASE	Indicates the establish action for the UE-to-UE direct communication.	

A.3.6.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.6.5 CDDL Specification

A.3.6.5.1 Introduction

The data model described in clause A.3.6.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.6.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the Sdd_XRTransmissionConnnection API provided by the SDDM-S data model.

A.3.6.5.2 CDDL document

```
;;; XRTriggerRequest
;;+ Represents a request for performing SDDM XR transmission connection trigger.
XRTriggerRequest = {
 requestorId: tstr  ; identity of the SDDM-S, e.g. FQDN or URI.
 valUeIds: [* ValTargetUe]
 operation: Operation
 ? valServiceId: tstr
* tstr => any
}

;;; XRTriggerResponse
;;+ Represents the response of a request for performing SDDM XR transmission connection trigger.
XRTriggerResponse = {
```

```
 result: ResultOp
 ? cause: Cause
* tstr => any
}

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; Operation
;;+ Identifies the UE-to-UE direct communication operation.
Operation = "ESTABLISH" / "RELEASE"

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"
```

A.3.6.6 Media Types

See clause A.5.

A.3.7 Sdd_PolicyConfiguration API

A.3.7.1 API URI

The CoAP URIs used in CoAP requests from SDDM-S towards the SDMM-C shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-s";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.3.7.2.

A.3.7.2 Resources

A.3.7.2.1 Overview

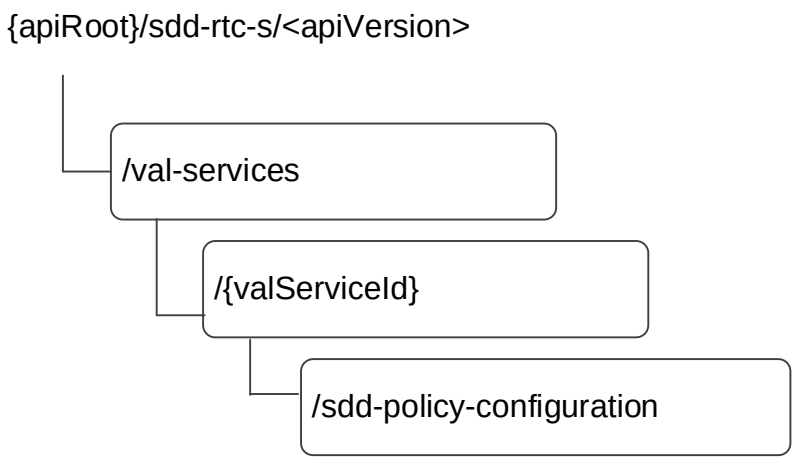

Figure A.3.7.2.1.1: Resource URI structure of the Sdd_PolicyConfiguration API provided by SDDM-S

Table A.3.7.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.3.7.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD policy configuration	val-services/{valServiceId}/sdd-policy-configuration	POST	Trigger an SDDM policy configuration operation.

A.3.7.2.2 Resource: SDD policy configuration

A.3.7.2.2.1 Description

The SDD XR transmission connection resource represents an SDD policy configuration to be created at a given SDDM-C and SDDM-S.

A.3.7.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-s/<apiVersion>/val-services/{valServiceId}/sdd-policy-configuration**

This resource shall support the resource URI variables defined in the table A.3.7.2.2.2.1.

Table A.3.7.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.3.7.1.
valServiceId	string	Identifier of a VAL service.

A.3.7.2.2.3 Resource Standard Methods

A.3.7.2.2.3.1 POST

This operation request triggering of an SDDM policy configuration operation.

This method shall support the data structures, request codes and response codes specified in table A.3.7.2.2.3.1.1 and A.3.7.2.2.3.1.2.

Table A.3.7.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
PolicyConfigRequest	1	1	The information of request SDDM policy configuration.

Table A.3.7.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
PolicyConfigResponse	1	1	2.01 Created	SDDM policy configuration created successfully.
NOTE: The mandatory CoAP error status codes for the POST Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.3.7.3 Data Model

A.3.7.3.1 General

Table A.3.7.3.1.1 specifies the data types defined specifically for the Sdd_PolicyConfiguration API service provided by SDDM-S.

Table A.3.7.3.1.1: Sdd_PolicyConfiguration API provided by SDDM-S specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
SealddMultimodalFlow	A.4.4.3.2.6	Information identifying a multi-modal SDDM flow used by the SDDM-C and SDDM-S to identify application traffic.	
PolicyConfigRequest	A.3.7.3.2.1	Information identifying an SDDM policy configuration request.	
PolicyConfigResponse	A.3.7.3.2.2	Information identifying an SDDM policy configuration response.	

Table A.3.7.3.1.2 specifies the simple data types defined specifically for the Sdd_PolicyConfiguration API service provided by SDDM-S.

Table A.3.7.3.1.2: Sdd_PolicyConfiguration API provided by SDDM-S specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.3.7.3.1.3 specifies the enumerations defined specifically for the Sdd_PolicyConfiguration API service provided by SDDM-S.

Table A.3.7.3.1.3: Sdd_PolicyConfiguration API provided by SDDM-S specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.

A.3.7.3.2 Structured data types

A.3.7.3.2.1 Type: PolicyConfigRequest

Table A.3.7.3.2.1.1: Definition of type PolicyConfigurationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Identity of the requestor of the policy configuration (NOTE 1).	
valServiceId	string	M	1	Identity of the VAL service for the policy configuration.	
sealddFlowId	Uinteger	C	0..1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic (NOTE 2).	
sealddMultimodalFlow	SealddMultiModalFlowInfo	C	0..1	Information of the multi-modal SDDM flow used by the SDDM-C and SDDM-S (NOTE 2).	
valTgtUe	ValTargetUe	O	0..1	VAL user to whom the policy configuration is applied.	
configurationId	Uinteger	O	0..1	Identity of policy configuration of a VAL user (NOTE 3).	
multimodalFlowsAlignmentPolicy	MultimodalFlowsAlignmentPolicy	O	0..1	Information of flows transmission requirement set to the identity of the multi-modal service.	
sealddUeToUePolicy	SealddUeToUePolicy	O	0..1	Information of proximity thresholds for entering/leaving the UE-to-UE direct communication mode.	
NOTE 1: This attribute shall be set to identity of the SDDM-S. NOTE 2: At least one of these attributes shall be included. NOTE 3: This attribute shall be included when the valTgtUe attribute is included.					

A.3.7.3.2.2 Type: PolicyConfigResponse

Table A.3.7.3.2.2.1: Definition of type PolicyConfigResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the XR transmission connection trigger request.	
configurationId	Uinteger	M	1	Identity of policy configuration of a VAL user	

A.3.7.3.2.3 Type: MultimodalFlowsAlignmentPolicy

Table A.3.7.3.2.3.1: Definition of type MultimodalFlowsAlignmentPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
multimodalServiceId	Uinteger	M	1	Identity of multi-modal service.	
flowsTransmissionReq	FlowsTransmissionReq	M	1	Information of flows transmission requirement including the delay requirement, maximum acceptable duration for traffic flow alignment.	

A.3.7.3.2.4 Type: FlowsTransmissionReq

Table A.3.7.3.2.4.1: Definition of type FlowsTransmissionReq

Attribute name	Data type	P	Cardinality	Description	Applicability
delayReq	Uinteger	M	1	Maximum tolerable time delay by which the multi-modal flows can be delayed in units of milliseconds.	
maxAligntime	Uinteger	M	1	maximum acceptable time duration for multi-modal traffic flow alignment in units of milliseconds.	

A.3.7.3.2.5 Type: SealddUeToUePolicy

Table A.3.7.3.2.5.1: Definition of type SealddUeToUePolicy

Attribute name	Data type	P	Cardinality	Description	Applicability
proximityThresholds	ProxymityThresholds	M	1	Information of the proximity thresholds for entering/leaving the UE-to-UE direct communication mode.	
qosThresholds	QoSThresholds	M	1	Information of the QoS thresholds for entering/leaving the UE-to-UE direct communication mode.	

A.3.7.3.2.6 Type: ProximityThresholds

Table A.3.7.3.2.6.1: Definition of type ProximityThresholds

Attribute name	Data type	P	Cardinality	Description	Applicability
minUeToUedist	number	C	0..1	Contains the threshold minimum linear distance between the UEs in units of meters (NOTE).	
avgUeToUedist	number	C	0..1	Contains the threshold average linear distance between the UEs in units of meters (NOTE).	
maxUeToUedist	number	C	0..1	Contains the threshold maximum linear distance between the UEs in units of meters (NOTE).	
NOTE: At least one of these attributes shall be present.					

A.3.7.3.2.7 Type: QoSThresholds

Table A.3.7.3.2.7.1: Definition of type QoSThresholds

Attribute name	Data type	P	Cardinality	Description	Applicability
minLatency	Uinteger	C	0..1	Contains the minimum E2E latency in units of milliseconds (NOTE).	
avgLatency	Uinteger	C	0..1	Contains the average E2E latency in units of milliseconds (NOTE).	
maxLatency	Uinteger	C	0..1	Contains the maximum E2E latency in units of milliseconds (NOTE).	
minBitRate	BitRate	C	0..1	Contains the minimum E2E bit rate (NOTE).	
avgBitRate	BitRate	C	0..1	Contains the average E2E bit rate (NOTE).	
maxBitRate	BitRate	C	0..1	Contains the maximum E2E bit rate (NOTE).	
minPackLossRate	PacketLossRate	C	0..1	Contains the minimum E2E packet loss rate (NOTE).	
avgPackLossRate	PacketLossRate	C	0..1	Contains the average E2E packet loss rate (NOTE).	
maxPackLossRate	PacketLossRate	C	0..1	Contains the maximum E2E packet loss rate (NOTE).	
minPackErrRate	PacketErrRate	C	0..1	Contains the minimum E2E packet error rate (NOTE).	
avgPackErrRate	PacketErrRate	C	0..1	Contains the average E2E packet error rate (NOTE).	
maxPackErrRate	PacketErrRate	C	0..1	Contains the maximum E2E packet error rate (NOTE).	
minJitter	Uint32	C	0..1	Contains the minimum E2E jitter in units of nanoseconds (NOTE).	
avgJitter	Uint32	C	0..1	Contains the average E2E jitter in units of nanoseconds (NOTE).	
maxJitter	Uint32	C	0..1	Contains the maximum E2E jitter in units of nanoseconds (NOTE).	
NOTE: At least one of these attributes shall be present.					

A.3.7.3.3 Simple data types and enumerations

A.3.7.3.3.1 Simple data types

Table A.3.7.3.3.1.1: Simple data types

Type Name	Type Definition	Description

A.3.7.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.3.7.5 CDDL Specification

A.3.7.5.1 Introduction

The data model described in clause A.3.7.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.3.7.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the Sdd_PolicyConfiguration API provided by the SDDM-S data model.

A.3.7.5.2 CDDL document

```
;;; PolicyConfigurationRequest
;;+ Represents a request for an SDDM policy configuration operation.
PolicyConfigurationRequest = {
 requestorId: tstr  ; when the requestor is the SDDM-C, e.g. unique client identifier, when the
requestor is the SDDM-S, e.g. FQDN or URI.
 valServiceId: tstr
 ? sealddFlowId: Uinteger
 ? sealddmultimodalFlow: SealddMultiModalFlowInfo
 ? valTgtUe: ValTargetUe
.? configurationId: Uinteger
 ? multimodalFlowsAlignmentPolicy: MultimodalFlowsAlignmentPolicy
 ? sealddUeToUePolicy: SealddUeToUePolicy
* tstr => any
}

;;; PolicyConfigurationResponse
;;+ Represents a response of a SDDM policy configuration request.
PolicyConfigurationResponse = {
 result: ResultOp
 configurationId: Uinteger
* tstr => any
}

;;; SealddFlowsInfo
;;+ Represents the information of the SDDM flows.
SealddFlowsInfo = {
 sealddFlowId: Uinteger
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 * tstr => any
}

;;; SealddMultiModalFlowInfo
;;+ Represents the information of the multi-modal SDDM flow.
SealddMultiModalFlowInfo = {
sealddMultimodalFlowId: Uinteger
 sealddFlowsInfos: SealddFlowsInfo
* tstr => any
}

;;; MultimodalFlowsAlignmentPolicy
;;+ Represents the information of flows transmission requirement set to the identity of the multi-
modal service.
MultimodalFlowsAlignmentPolicy = {
 multimodalServiceId: Uinteger
 flowsTransmissionReq: FlowsTransmissionReq
* tstr => any
}

;;; FlowsTransmissionReq
;;+ Represents the Information of flows transmission requirement including the delay requirement,
maximum acceptable duration for traffic flow alignment.
FlowsTransmissionReq = {
 delayReq: Uinteger
 maxAligntime: Uinteger
* tstr => any
}

;;; SealddUeToUePolicy
;;+ Represents the Information of the proximity thresholds for entering/leaving the UE-to-UE direct
communication mode.
SealddUeToUePolicy = {
 proximityThresholds: ProxymityThresholds
 qosThresholds: QoSThresholds
* tstr => any
}

;;; ProxymityThresholds
;;+ Represents the Information of proximity thresholds for entering/leaving the UE-to-UE direct
communication mode.
ProxymityThresholds = {
 ? minUeToUedist: float
 ? avgUeToUedist: float
 ? maxUeToUedist: float
```

```
* tstr => any
}

;;; QoSThresholds
;;+ Represents the Information of the QoS thresholds for entering/leaving the UE-to-UE direct
communication mode.
QoSThresholds = {
 ? minLatency: Uinteger    ; milliseconds (ms).
 ? avgLatency: Uinteger    ; milliseconds (ms).
 ? maxLatency: Uinteger    ; milliseconds (ms).
 ? minBitRate: Uinteger    ; bits per second (bps) (e.g. 64-bit).
 ? avgBitRate: Uinteger    ; bits per second (bps) (e.g. 64-bit).
 ? maxBitRate: Uinteger    ; bits per second (bps) (e.g. 64-bit).
 ? minPackLossRate: float  ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? avgPackLossRate: float  ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? maxPackLossRate: float  ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? minPackErrRate: float   ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? avgPackErrRate: float   ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? maxPackErrRate: float   ; fractional rate between 0.0 and 1.0 (e.g. 0.01 = 1%).
 ? minJitter: Uinteger     ; nanoseconds (ns).
 ? avgJitter: Uinteger     ; nanoseconds (ns).
 ? maxJitter: Uinteger     ; nanoseconds (ns).
 * tstr => any
}

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; ServerId
;;+ Represents information identifying a unique server.
ServerId = {
 serverId = tstr
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"
```

A.3.7.6 Media Types

See clause A.5.

A.4 Resource representation and APIs provided by SDDM-C

A.4.1 Sdd_RegularTransmissionConnection API

A.4.1.1 API URI

The CoAP URIs used in CoAP requests from SDDM-C towards the SDMM-S shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-c";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.4.1.2.

A.4.1.2 Resources

A.4.1.2.1 Overview

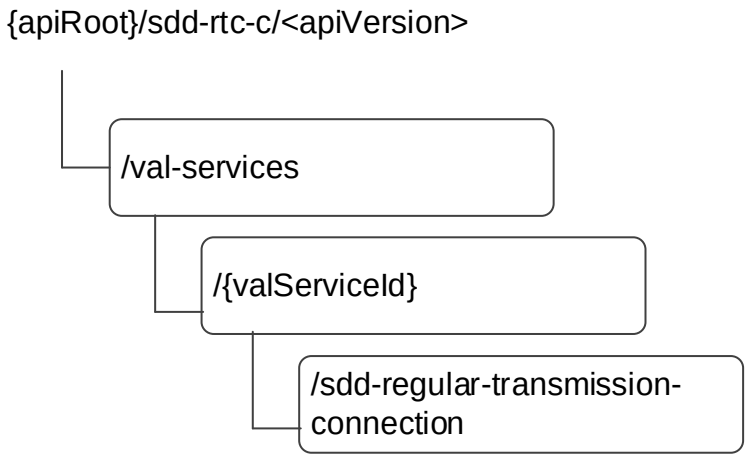

Figure A.4.1.2.1.1: Resource URI structure of the Sdd_RegularTransmissionConnection API provided by SDDM-C

Table A.4.1.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.4.1.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD Regular Transmission Connection	val-services/{valServiceId}/sdd-regular-transmission-connection	POST	Establish an SDDM regular transmission connection.
		DELETE	Release an SDDM regular transmission connection

A.4.1.2.2 Resource: SDD Regular Transmission Connection

A.4.1.2.2.1 Description

The SDD regular transmission connection resource represents an SDD regular transmission connection to be created at a given SDDM-C and SDDM-S.

The establishment request resource allows an SDDM-C to request the SDDM-S to establish an SDDM regular transmission.

A.4.1.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-c/<apiVersion>/val-services/{valServiceId}/sdd-regular-transmission-connection**

This resource shall support the resource URI variables defined in the table A.4.1.2.2.2.1.

Table A.4.1.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.4.1.1.
valServiceId	string	Identifier of a VAL service.

A.4.1.2.2.3 Resource Standard Methods

A.4.1.2.2.3.1 POST

This operation allows to establish an SDDM regular transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.1.2.2.3.1.1 and A.4.1.2.2.3.1.2.

Table A.4.1.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
EstablishmentRequest	M	1	The information of request of establishment of an SDDM regular transmission connection.

Table A.4.1.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
EstablishmentResponse	M	1	2.01 Created	SDDM regular transmission connection created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.1.2.2.3.2 DELETE

This operation releases an SDDM regular transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.1.2.2.3.2.1 and A.4.1.2.2.3.2.2.

Table A.4.1.2.2.3.2.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
ReleaseRequest	M	1	The information of request of release of an SDDM regular transmission connection.

Table A.4.1.2.2.3.2.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM regular transmission connection released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.1.3 Data Model

A.4.1.3.1 General

Table A.4.1.3.1.1 specifies the data types defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-C.

Table A.4.1.3.1.1: SDD_RegularTransmissionConnection API provided by SDDM-C specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
EstablishmentResponse	A.2.4.1	Information identifying an SDD regular transmission connection establishment response.	
EstablishmentRequest	A.2.4.2	Information identifying an SDD regular transmission connection establishment request.	
PeriodicityRange	A.2.4.6	Contains the acceptable periodicity range or periodicity value(s).	
ReleaseRequest	A.3.1.3.2.3	Information identifying an SDD regular transmission connection release request.	
TimeWindow	A.2.4.7	Contains start time and stop time.	
TransmissionAssistInfo	A.2.4.8	Contains transmission assistance information for uplink SEALDD traffic.	

Table A.4.1.3.1.2 specifies the simple data types defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-C.

Table A.4.1.3.1.2: SDD_RegularTransmissionConnection API provided by SDDM-C specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.4.1.3.1.3 specifies the enumerations defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-C.

Table A.4.1.3.1.3: SDD_RegularTransmissionConnection API provided by SDDM-C specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.4.1.3.2 Structured data types

A.4.1.3.2.1 Void

A.4.1.3.2.2 Type: ReleaseRequest

Table A.4.1.3.2.2.1: Definition of type ReleaseRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealClientId	string	M	1	Identity of the SDDM-C.	
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	

A.4.1.3.3 Simple data types and enumerations

None.

A.4.1.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.4.1.5 CDDL Specification

A.4.1.5.1 Introduction

The data model described in clause A.4.1.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.4.1.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_RegularTransmissionConnection API provided by the SDDM-C data model.

A.4.1.5.2 CDDL document

```
;;; EstablishmentRequest
;;+ Represents a request for establishing an SDDM regular transmission connection.
EstablishmentRequest = {
 requestorId: tstr  ; when the requestor is the SDDM-C, e.g. unique client identifier, when the
requestor is the SDDM-S, e.g. FQDN or URI.
 sealddFlowId: Uinteger
 serverId: ServerId
 endpointId: tstr
 ? valServiceId: tstr
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 ? valTgtUe: ValTargetUe
 ? batAndPeriodicityCapability: bool
 ? transmisAssistInfo: TransmissionAssistInfo
 * tstr => any
}

;;; EstablishmentResponse
;;+ Represents a response of establishing an SDDM regular transmission connection.
EstablishmentResponse = {
 result: ResultOp
 ? cause: Cause
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
* tstr => any
}
```

```
;;; ReleaseRequest
;;+ Represents a request for releasing an SDDM regular transmission connection.
ReleaseRequest = {
 sealClientId: tstr
 sealddFlowId: Uinteger
* tstr => any
}

;;; TransmissionAssistInfo
;;+ Indicates a transmission assistance information for uplink SEALDD traffic.
TransmissionAssistInfo = {
 ? bat: DateTime
 ? periodicity: Uinteger
 ? batWindow: TimeWindow
 ? periodRange: PeriodicityRange
* tstr => any
}

;;; TimeWindow
;;+ Indicates the acceptable earliest and latest arrival time of the first packet of the data burst.
The start time contains the earliest acceptable arrival time, and the stop time contains the latest
acceptable arrival time.
TimeWindow = {
 ? startTime: DateTime
 ? stopTime: DateTime
}

;;; PeriodicityRange
;;+ Indicates the acceptable time period range between the start of two bursts or the acceptable
periodicity value(s).
PeriodicityRange = {
 ? lowerBound: Uinteger
 ? upperBound: Uinteger
 ? periodicityValues: [* Uinteger]
* tstr => any
}

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; ServerId
;;+ Represents information identifying a unique server.
ServerId = {
 serverId = tstr
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"
```

A.4.1.6 Media Types

See clause A.3.1.6.

A.4.2 Sdd_URLLCTransmissionConnection API

A.4.2.1 API URI

The CoAP URIs used in CoAP requests from SDDM-C towards the SDMM-S shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-c";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.4.2.2.

A.4.2.2 Resources

A.4.2.2.1 Overview

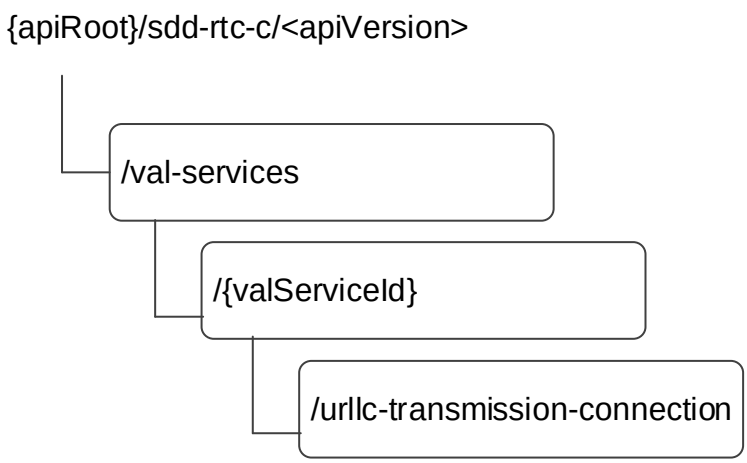

Figure A.4.2.2.1.1: Resource URI structure of the Sdd_URLLCTransmissionConnection API provided by SDDM-C

Table A.4.2.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.4.2.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
URLLC Transmission Connection	val-services/{valServiceId}/urllc-transmission-connection	POST	Establish a URLLC transmission connection.
		PUT	Update a URLLC transmission connection.
		DELETE	Releases a URLLC transmission connection.

A.4.2.2.2 Resource: URLLC Transmission Connection

A.4.2.2.2.1 Description

The URLLC transmission connection resource allows an SDDM-S to manage an URLLC transmission connection of an SDDM-C.

A.4.2.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-c/<apiVersion>/val-services/{valServiceId}/urllc-transmission-connection**

This resource shall support the resource URI variables defined in the table A.4.2.2.2.2.1.

Table A.4.1.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.4.2.1.
valServiceId	string	Identifier of a VAL service.

A.4.2.2.2.3 Resource Standard Methods

A.4.2.2.2.3.1 POST

This operation retrieves the allowed registration.

This method shall support the request data structures, request codes and response codes specified in table A.4.2.2.2.3.1.1 and A.4.2.2.2.3.1.2.

Table A.4.2.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
URLLCEstablishmentRequest	M	1	The information of request of establishment of an SDDM URLLC transmission connection.

Table A.4.2.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
URLLCEstablishmentResponse	M	1	2.01 Created	URLLC transmission connection created successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.2.2.2.3.2 PUT

This operation updates a URLLC transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.2.2.2.3.2.1 and A.4.2.2.2.3.2.2.

Table A.4.2.2.2.3.2.1: Data structures supported by the PUT Request payload on this resource

Data type	P	Cardinality	Description
URLLCUpdateRequest	M	1	The information of request of update a URLLC transmission connection.

Table A.4.2.2.2.3.2.1: Data structures supported by the PUT Response payload on this resource

Data type	P	Cardinality	Response codes	Description
URLLCUpdateResponse	M	1	2.04 Changed	URLLC transmission connection updated successfully.
NOTE: The mandatory CoAP error status codes for the PUT method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.2.2.2.3.3 DELETE

This operation releases a URLLC transmission connection.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.2.2.2.3.3.1 and A.4.2.2.2.3.3.2.

Table A.4.2.2.2.3.3.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
URLLCReleaseRequest	M	1	The information of request of release of an URLLC transmission connection.

Table A.4.2.2.2.3.3.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	URLLC transmission connection released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.2.3 Data Model

A.4.2.3.1 General

Table A.4.2.3.1.1 specifies the data types defined specifically for the SDD_URLLCTransmissionConnection API service provided by SDDM-C.

Table A.4.2.3.1.1: SDD_RegularTransmissionConnection API provided by SDDM-C specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
PeriodicityRange	A.2.4.7	Contains the acceptable periodicity range or periodicity value(s).	
TimeWindow	A.2.4.8	Contains start time and stop time.	
TransmissionAssistInfo	A.2.4.6	Contains transmission assistance information for uplink SEALDD traffic.	
URLLCEstablishmentRequest	A.2.4.3	Information identifying an SDD URLLC transmission connection establishment request.	
URLLCEstablishmentResponse	A.2.4.4	Information identifying an SDD URLLC transmission connection establishment response.	
URLLCUpdateRequest	A.4.2.3.2.3	Information identifying an SDD URLLC transmission connection update request.	
URLLCReleaseRequest	A.2.4.5	Information identifying an SDD URLLC transmission connection release request.	

Table A.4.2.3.1.2 specifies the simple data types defined specifically for the SDD_RegularTransmissionConnection API service provided by SDDM-C.

Table A.4.2.3.1.2: SDD_RegularTransmissionConnection API provided by SDDM-C specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.4.2.3.1.3 specifies the enumerations defined specifically for the SDD_URLLCTransmissionConnection API service provided by SDDM-C.

Table A.4.2.3.1.3: SDD_RegularTransmissionConnection API provided by SDDM-C specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.4.2.3.2 Structured data types

A.4.2.3.2.1 Void

A.4.2.3.2.2 Void

A.4.2.3.2.3 Type: URLLCUpdateRequest

Table A.4.2.3.2.1.3: Definition of type URLLCUpdateRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealClientId	string	M	1	Identity of the requestor of the URLLC establishment request.	
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and SDDM-S to identify the application traffic.	
valServiceId	string	O	1..N	Identity of the VAL services enabled by the SDD URLLC transmission connection.	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic.	
portNumrber	Uinteger	O	0..1	Identity of the port number of the traffic.	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic.	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic.	

A.4.2.3.2.4 Void

A.4.2.3.2.5 Type: URLLCUpdateResponse

Table A.4.2.3.2.5.1: Definition of type URLLCUpdateResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE).	
NOTE: This attribute shall be included if result is set to "failure".					

A.4.2.3.3 Simple data types and enumerations

None.

A.4.2.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.4.2.5 CDDL Specification

A.4.2.5.1 Introduction

The data model described in clause A.4.2.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.4.2.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_URLLCTransmissionConnection API provided by the SDDM-C data model.

A.4.2.5.2 CDDL document

```
;;; URLLCEstablishmentRequest
;;+ Represents a request for establishing a URLLC transmission connection.
URLLCEstablishmentRequest = {
 sealClientId: tstr
 sealddFlowId: Uinteger
 valTgtUe: ValTargetUe
 serverId: ServerId
 valServiceId: tstr
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 ? batAndPeriodicityCapability: bool
 ? transmisAssistInfo: TransmissionAssistInfo
 * tstr => any
}

;;; URLLCEstablishmentResponse
;;+ Represents a response of establishing a URLLC transmission connection.
URLLCEstablishmentResponse = {
 result: ResultOp
 ? cause: Cause
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
* tstr => any
}

;;; URLLCUpdateRequest
;;+ Represents a request for updating a URLLC transmission connection.
URLLCUpdateRequest = {
 sealClientId: tstr
 sealddFlowId: Uinteger
 ? valServiceId: tstr
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
* tstr => any
}

;;; URLLCReleaseRequest
;;+ Represents a request for releasing a URLLC transmission connection.
ReleaseRequest = {
 sealClientId: tstr
 sealddFlowId: Uinteger
* tstr => any
}

;;; TransmissionAssistInfo
;;+ Indicates a transmission assistance information for uplink SEALDD traffic.
TransmissionAssistInfo = {
 ? bat: DateTime
 ? periodicity: Uinteger
 ? batWindow: TimeWindow
 ? periodRange: PeriodicityRange
* tstr => any
}

;;; TimeWindow
;;+ Indicates the acceptable earliest and latest arrival time of the first packet of the data burst.
The start time contains the earliest acceptable arrival time, and the stop time contains the latest
acceptable arrival time.
TimeWindow = {
 ? startTime: DateTime
 ? stopTime: DateTime
}

;;; PeriodicityRange
;;+ Indicates the acceptable time period range between the start of two bursts or the acceptable
periodicity value(s).
PeriodicityRange = {
 ? lowerBound: Uinteger
 ? upperBound: Uinteger
 ? periodicityValues: [* Uinteger]
```

```
* tstr => any
}

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; ServerId
;;+ Represents information identifying a unique server.
ServerId = {
serverId = tstr
}
;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"
```

A.4.2.6 Media Types

See clause A.5.

A.4.2.7 Void

A.4.2.8 Void

A.4.2.9 Void

A.4.2.10 Void

A.4.2.11 Void

A.4.3 Sdd_DataStorage API

A.4.3.1 API URI

The CoAP URIs used in CoAP requests from SDDM-C towards the SDMM-S shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-c";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.4.3.2.

A.4.3.2 Resources

A.4.3.2.1 Overview

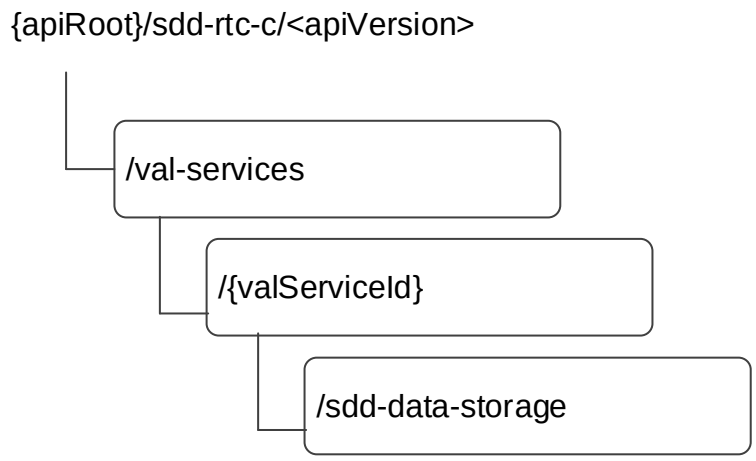

Figure A.4.3.2.1.1: Resource URI structure of the Sdd_DataStorage API provided by SDDM-C

Table A.4.3.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.4.3.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD data storage	val-services/{valServiceId}/sdd-data-storage	POST	Establish an SDDM data storage or reservation of an SDDM data storage.
		PUT	Update an SDDM data storage.
		DELETE	Releases an SDDM data storage.
		GET	Retrieve an SDDM data storage.
		FETCH	Observe an SDDM data storage.

A.4.3.2.2 Resource: SDD Data Storage

A.4.3.2.2.1 Description

The SDDM data storage resource allows an SDDM-S to manage an SDDM data storage of an SDDM-C.

A.4.3.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-c/<apiVersion>/val-services/{valServiceId}/sdd-data-storage**

This resource shall support the resource URI variables defined in the table A.4.3.2.2.2.1.

Table A.4.3.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.4.3.1.
valServiceId	string	Identifier of a VAL service.

A.4.3.2.2.3 Resource Standard Methods

A.4.3.2.2.3.1 POST

This operation request establishment or reservation of an SDDM data storage.

This method shall support the data structures, request codes and response codes specified in table A.4.3.2.2.3.1.1 and A.4.3.2.2.3.1.2.

Table A.4.3.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
DataStorageCreationRequest	O	0..1	The information of request of establishment of an SDDM data storage.
DataStorageReservationRequest	O	0..1	The information of request of reservation of an SDDM data storage.

Table A.4.3.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
DataStorageCreationResponse	O	0..1	2.01 Created	SDDM data storage created successfully.
DataStorageReservationResponse	O	0..1	2.01 Created	SDDM data storage reserved successfully.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.4.3.2.2.3.2 PUT

This operation updates an SDDM data storage.

This method shall support the data structures, request codes and response codes specified in table A.4.3.2.2.3.2.1 and A.4.3.2.2.3.2.2.

Table A.4.3.2.2.3.2.1: Data structures supported by the PUT Request payload on this resource

Data type	P	Cardinality	Description
DataStorageMgtRequest	M	1	The information of request of update an SDDM data storage.

Table A.4.3.2.2.3.2.1: Data structures supported by the PUT Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.04 Changed	SDDM data storage updated successfully.
NOTE: The mandatory CoAP error status codes for the PUT method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.4.3.2.2.3.3 DELETE

This operation releases an SDD data storage.

This method shall support the data structures, request codes and response codes specified in table A.4.3.2.2.3.3.1 and A.4.3.2.2.3.3.2.

Table A.4.3.2.2.3.3.1: Data structures supported by the DELETE Request payload on this resource

Data type	P	Cardinality	Description
DataStorageMgtRequest	M	1	The information of request of release of an SDD data storage.

Table A.4.3.2.2.3.3.2: Data structures supported by the DELETE Response payload on this resource

Data type	P	Cardinality	Response codes	Description
n/a			2.02 Deleted	SDDM data storage released successfully.
NOTE: The mandatory CoAP error status codes for the DELETE method listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.4.3.2.2.3.4 GET

This operation retrieves an SDDM data storage information.

This method shall support the URI query parameters, the data structures and response codes specified in table A.4.3.2.2.3.4.1 and A.4.3.2.2.3.4.2.

Table A.4.3.2.2.3.4.1: URI query options supported by the GET Request on this resource

Name	Data type	P	Cardinality	Description
data-identifier	string	M	1	The data identifier of an SDDM data storage.

Table A.4.3.2.2.3.4.2: Data structures supported by the GET Response payload on this resource

Data type	P	Cardinality	Response codes	Description
DataStorageQuery Response	M	1	2.05 Content	The SDDM data storage information based on the request from the SDDM-C.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

A.4.3.2.2.3.5 FETCH

This operation provides an SDDM data storage.

This method shall support the request options, the data structures, request codes and response codes, and the response options specified in table A.4.3.2.2.3.5.1, A.4.3.2.2.3.5.2, A.4.3.2.2.3.5.3 and A.4.3.2.2.3.5.4.

Table A.4.3.2.2.3.5.1: Options supported by the FETCH Request on this resource

Name	Data type	P	Cardinality	Description
observe	Uinteger	O	0..1	When set to 0 (Register) it extends the FETCH request to subscribe to the changes of this resource. When set to 1 (Deregister) it cancels the subscription.
NOTE: Other request options also apply in accordance with normal CoAP procedures.				

Table A.4.2.2.3.5.2: Data structures supported by the FETCH Request on this resource

Data type	P	Cardinality	Description
DataStorageMgtRequest	M	1	The identifier of an SDDM data storage.

Table A.4.2.2.3.5.3: Data structures supported by the FETCH Response payload on this resource

Data type	P	Cardinality	Response codes	Description
DataStorageStatusNotification	M	1	2.05 Content	The information of an SDDM data storage based on the request from the SDDM-C.
NOTE: The mandatory CoAP error status codes for the GET Request listed in table C.1.3-1 of 3GPP TS 24.546 [6] shall also apply.				

Table A.4.2.2.3.5.4: Options supported by the 2.05 Response Code on this resource

Name	Data type	P	Cardinality	Description
observe	Uinteger	O	0..1	Sequence number of the SDDM data storage notification.
NOTE: Other response options also apply in accordance with normal CoAP procedures.				

A.4.3.3 Data Model

A.4.3.3.1 General

Table A.4.3.3.1.1 specifies the data types defined specifically for the SDD_DataStorage API service provided by SDDM-C.

Table A.4.3.3.1.1: SDD_DataStorage API provided by SDDM-C specific data types

Data type	Section defined	Description	Applicability
ValTargetUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
DataStorageCreationRequest	A.4.3.3.2.1	Information identifying an SDD data storage creation request.	
DataStorageCreationResponse	A.4.3.3.2.2	Information identifying an SDD data storage creation response.	
DataStorageReservationRequest	A.4.3.3.2.3	Information identifying an SDD data storage reservation request.	
DataStorageReservationResponse	A.4.3.3.2.4	Information identifying an SDD data storage reservation response.	
DataStorageStatusNotification	A.4.3.3.2.5	Information identifying an SDD data storage notification.	
DataStorageQueryResponse	A.4.3.3.2.6	Information identifying an SDD data storage query response.	
DataStorageMgtRequest	A.4.3.3.2.7	Information identifying an SDD data storage management request.	
StatusInformationReq	A.4.3.3.2.8	Information identifying the identity of stored data.	
StatustInformationRes	A.4.3.3.2.9	Information of the stored data returned by the SDDM-S which is tracked or monitored.	

Table A.4.3.3.1.2 specifies the simple data types defined specifically for the SDD_DataStorage API service provided by SDDM-C.

Table A.4.3.3.1.2: SDD_DataStorage API provided by SDDM-C specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.4.3.3.1.3 specifies the enumerations defined specifically for the SDD_DataStorage API service provided by SDDM-C.

Table A.4.3.3.1.3: SDD_DataStorage API provided by SDDM-C specific enumeration

Data type	Section defined	Description
ResultOp	A.2.6.2	Information identifying the result of an operation.
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.

A.4.3.3.2 Structured data types

A.4.3.3.2.1 Type: DataStorageCreationRequest

Table A.4.3.3.2.1.1: Definition of type DataStorageCreationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
applicationData	bytes	M	1	Information of the application data to be stored.	
accessControlPolicy	string	M	1	Identity of the control policy for the requested data access from other consumers which is set to "SDDM-C", "VAL server" or "SDDM-S".	
expiryTime	DateTime	O	0..1	Information of the expiration time of the data to be stored.	
statusInformationReq	StatusInformationReq	O	0..1	Identity of the information of the stored data.	

A.4.3.3.2.2 Type: DataStorageCreationResponse

Table A.4.3.3.2.2.1: Definition of type DataStorageCreationResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the data storage creation request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the data storage creation request (NOTE 1).	
dataIdentifier	string	O	0..1	Information of the identity of the stored data (NOTE 2).	
NOTE 1: This attribute shall be included if result is set to "FAILURE". NOTE 2: This attribute shall be included if result is set to "SUCCESS".					

A.4.3.3.2.3 Type: DataStorageReservationRequest

Table A.4.3.3.2.3.1: Definition of type DataStorageReservationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
valServiceId	string	M	1	Identity of the VAL service of the vertical application.	
dataLength	Uinteger	O	0..1	Identity of the data length to be stored.	

A.4.3.3.2.4 Type: DataStorageReservationResponse

Table A.4.3.3.2.4.1: Definition of type DataStorageReservationResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the data storage creation request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the data storage creation request (NOTE 1).	
address	string	O	0..1	Information of the identity of the reserved address for data storage (NOTE 2).	
NOTE 1: This attribute shall be included if result is set to "FAILURE". NOTE 2: This attribute shall be included if result is set to "SUCCESS".					

A.4.3.3.2.5 Type: DataStorageStatusNotification

Table A.4.3.3.2.5.1: Definition of type DataStorageStatusNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
dataIdentifier	string	M	1	Information of the identity of the stored data.	
statusInformationRsp	StatusInformationRsp	M	1	Information of the stored data returned by the SDDM-S which is tracked or monitored.	

A.4.3.3.2.6 Type: DataStorageQueryResponse

Table A.4.3.3.2.6.1: Definition of type DataStorageQueryResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the data storage creation request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the data storage creation request (NOTE 1).	
dataIdentifier	string	O	0..1	Information of the identity of the stored data (NOTE 2).	
applicationData	bytes	O	0..1	Information of the application data to be stored (NOTE 3).	
NOTE 1: This attribute shall be included if result is set to "FAILURE". NOTE 2: This attribute shall be included if result is set to "SUCCESS". NOTE 3: This attribute may be included if result is set to "SUCCESS".					

A.4.3.3.2.7 Type: DataStorageMgtRequest

Table A.4.3.3.2.7.1: Definition of type DataStorageMgtRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
dataIdentifier	string	M	1	Information of the identity of the stored data.	
applicationData	bytes	O	0..1	Information of the application data to be stored.	

A.4.3.3.2.8 Type: StatusInformationReq

Table A.4.3.3.2.8.1: Definition of type StatusInformationReq

Attribute name	Data type	P	Cardinality	Description	Applicability
noTimesDataAccessed	boolean	O	0..1	Identify whether information of how many times the stored data is accessed is requested. Value "true" indicates that the information about how many times the stored data is accessed is requested. Value "false" indicates that the information about how many times the stored data is accessed is not requested.	
noTimesDataManaged	boolean	O	0..1	Identify whether information of how many times the stored data is managed is requested. Value "true" indicates that the information about how many times the stored data is managed is requested. Value "false" indicates that the information about how many times the stored data is managed is not requested.	

A.4.3.3.2.9 Type: StatusInformationRes

Table A.4.3.3.2.9.1: Definition of type StatusInformationRes

Attribute name	Data type	P	Cardinality	Description	Applicability
noTimesDataAccessedValue	Uinteger	O	0..1	Information of the value of how many times the stored data is accessed.	
noTimesDataManagedValue	Uinteger	O	0..1	Information of the value of how many times the stored data is managed.	

A.4.3.3.3 Simple data types and enumerations

None.

A.4.3.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.4.3.5 CDDL Specification

A.4.3.5.1 Introduction

The data model described in clause A.4.3.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.4.3.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the SDD_DataStorage API provided by the SDDM-C data model.

A.4.3.5.2 CDDL document

```
;;; DataStorageCreationRequest
;;+ Represents a request for performing SDDM data data storage creation.
DataStorageCreationRequest = {
 applicationData: bytes
 accessControlPolicy: tstr
 ? expiryTime: DateTime
 ? statusInformationReq: StatusInformationReq
* tstr => any
}

;;; DataStorageCreationResponse
;;+ Represents the response of a request for performing SDDM data data storage creation.
DataStorageCreationResponse = {
 result: ResultOp
 ? cause: Cause
 ? dataIdentifier: tstr
* tstr => any
}

;;; DataStorageReservationRequest
;;+ Represents a request for performing SDDM data data storage reservation.
DataStorageReservationRequest = {
 valServiceId: tstr
 ? dataLength: Uinteger
* tstr => any
}

;;; DataStorageReservationResponse
;;+ Represents the response of a request for performing SDDM data data storage reservation.
DataStorageReservationResponse = {
 result: ResultOp
 ? cause: Cause
 ? address: tstr
* tstr => any
}

;;; DataStorageStatusNotification
```

```
;;+ Represents the information of SDDM data storage status notification of the SDDM-C.
MeasurementSubscriptionNotification = {
 dataIdentifier: tstr
 statusInformationRsp: StatusInformationRsp
* tstr => any
}

;;; DataStorageQueryResponse
;;+ Represents the response of a request for performing SDDM data data storage query.
DataStorageQueryResponse = {
 result: ResultOp
 ? cause: Cause
 ? dataIdentifier: tstr
 ? applicationData: bytes
* tstr => any
}

;;; DataStorageMgtRequest
;;+ Represents a request for performing SDDM data data storage management.
DataStorageMgtRequest = {
 dataIdentifier: tstr
 ? applicationData: bytes
* tstr => any
}

;;; StatusInformationReq
StatusInformationReq = {
 ? noTimesDataAccessed: bool
 ? noTimesDataManageed: bool
* tstr => any
}

;;; StatusInformationRes
StatusInformationRes = {
 noTimesDataAccessed: Uinteger
 noTimesDataManageed: bool
* tstr => any
}

;;; DateTime
DateTime = {
 date : tdate
 time : time
}

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0
```

A.4.3.6 Media Types

See clause A.5.

A.4.3.7 Void

A.4.3.8 Void

A.4.3.9 Void

A.4.3.10 Void

A.4.3.11 Void

A.4.3.12 Void

A.4.3.13 Void

A.4.4 Sdd_XRTransmissionConnnection API

A.4.4.1 API URI

The CoAP URIs used in CoAP requests from SDDM-C towards the SDMM-S shall have the Resource URI structure as defined in clause C.1.1 of 3GPP TS 24.546 [6] with the following clarifications:

a) the <apiName> shall be "sdd-rtc-c";

b) the <apiVersion> shall be "v1"; and

c) the <apiSpecificSuffixes> shall be set as described in clause A.4.4.2.

A.4.4.2 Resources

A.4.4.2.1 Overview

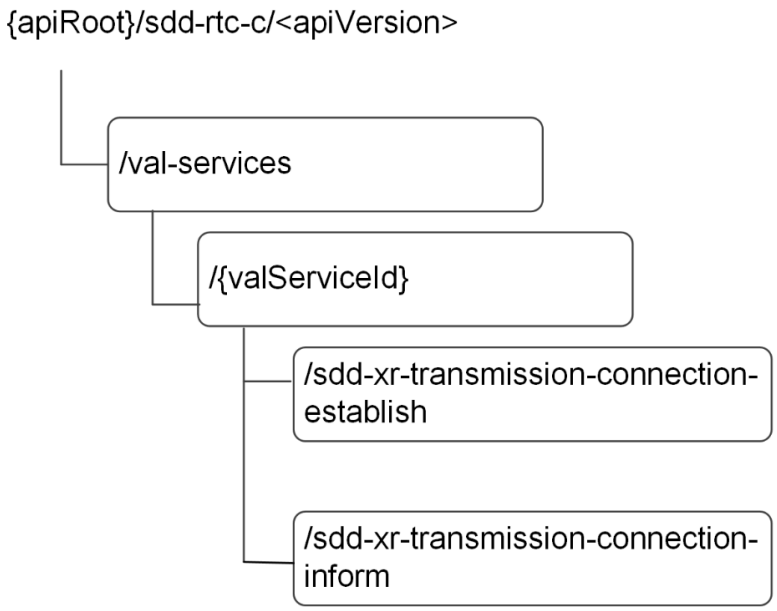

Figure A.4.4.2.1.1: Resource URI structure of the Sdd_XRTransmissionConnnection API provided by SDDM-C

Table A.4.4.2.1.1 provides an overview of the resources and applicable CoAP methods.

Table A.4.4.2.1.1: Resources and methods overview

Resource name	Resource URI	CoAP method	Description
SDD XR transmission connection	val-services/{valServiceId}/sdd-xr-transmission-connection	POST	Inform an SDDM XR transmission connection event.
SDD XR transmission connection establish	val-services/{valServiceId}/sdd-xr-transmission-connection-establish	POST	Establish an SDDM XR transmission connection event.

A.4.4.2.2 Resource: SDD XR transmission connection inform

A.4.4.2.2.1 Description

The SDD XR transmission connection inform resource represents an SDD XR transmission connection inform to be created at a given SDDM-C and SDDM-S.

A.4.4.2.2.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-c/<apiVersion>/val-services/{valServiceId}/sdd-xr-transmission-connection inform**

This resource shall support the resource URI variables defined in the table A.4.4.2.2.2.1.

Table A.4.4.2.2.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.4.4.1.
valServiceId	string	Identifier of a VAL service.

A.4.4.2.2.3 Resource Standard Methods

A.4.4.2.2.3.1 POST

This operation allows to inform XR transmission connection status between two UEs.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.4.2.2.3.1.1 and A.4.4.2.2.3.1.2.

Table A.4.4.2.2.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
XRInformRequest	M	1	The information of the request informing of an SDDM XR transmission connection status.

Table A.4.4.2.2.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
XRInformResponse	M	1	2.01 Created	SDDM XR transmission connection inform created successfully.
NOTE: The mandatory CoAP error status codes for the GET request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.4.2.3 Resource: SDD XR transmission connection establish

A.4.4.2.3.1 Description

The SDD XR transmission connection establish resource represents an SDD XR transmission connection establish to be created at a given SDDM-C and SDDM-S.

A.4.4.2.3.2 Resource Definition

Resource URI: **{apiRoot}/sdd-rtc-c/<apiVersion>/val-services/{valServiceId}/sdd-xr-transmission-connection-establish**

This resource shall support the resource URI variables defined in the table A.4.4.2.3.2.1.

Table A.4.4.2.3.2.1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	string	See clause C.1.1 of 3GPP TS 24.546 [6].
apiVersion	string	See clause A.4.4.1.
valServiceId	string	Identifier of a VAL service.

A.4.4.2.3.3 Resource Standard Methods

A.4.4.2.3.3.1 POST

This operation allows to establish XR transmission connection between two UEs.

This method shall support the request data structures the data structures, request codes and response codes specified in table A.4.4.2.3.3.1.1 and A.4.4.2.3.3.1.2.

Table A.4.4.2.3.3.1.1: Data structures supported by the POST Request payload on this resource

Data type	P	Cardinality	Description
XREstablishmentRequest	M	1	The information of request of establishment of an SDDM XR transmission connection.

Table A.4.4.2.3.3.1.2: Data structures supported by the POST Response payload on this resource

Data type	P	Cardinality	Response codes	Description
XREstablishmentResponse	M	1	2.01 Created	SDDM XR transmission connection establishment created successfully.
NOTE: The mandatory CoAP error status codes for the GET request listed in table C.1.3-1 of 3GPP TS 24.546 [31] shall also apply.				

A.4.4.3 Data Model

A.4.4.3.1 General

Table A.4.4.3.1.1 specifies the data types defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-C.

Table A.4.4.3.1.1: Sdd_XRTransmissionConnnection API provided by SDDM-C specific data types

Data type	Section defined	Description	Applicability
ProtocolDescriptorInfo	A.4.4.3.2.7	Contains information of the protocol of the VAL traffic.	
SealddFlowsInfo	A.4.4.3.2.5	Contains the information of the XR SEALDD flows.	
SealddMultiModalFlowInfo	A.4.4.3.2.6	Contains the information of the XR SEALDD multi modal flow	
valTgtUe	A.2.2	Information identifying a VAL user ID or VAL UE ID.	
XREstablishmentRequest	A.4.4.3.2.3	Information identifying an SDDM XR transmission connection establishment request.	
XREstablishmentResponse	A.4.4.3.2.4	Information identifying an SDDM XR transmission connection establishment response.	
XRInformRequest	A.4.4.3.2.1	Information identifying an SDDM XR transmission connection inform request.	
XRInformResponse	A.4.4.3.2.2	Information identifying an SDDM XR transmission connection inform response.	

Table A.4.4.3.1.2 specifies the simple data types defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-C.

Table A.4.4.3.1.2: Sdd_XRTransmissionConnnection API provided by SDDM-C specific simple data types

Data type	Section defined	Description
Uinteger	A.2.3	Unsigned integer.
ServerId	A.2.5	String representing a unique identifier of a VAL server.

Table A.4.4.3.1.3 specifies the enumerations defined specifically for the Sdd_XRTransmissionConnnection API service provided by SDDM-C.

Table A.4.4.3.1.3: Sdd_XRTransmissionConnnection API provided by SDDM-C specific enumeration

Data type	Section defined	Description
Cause	A.2.6.3	Information identifying the reason of the cause of the failure of an operation.
ResultOp	A.2.6.2	Information identifying the result of an operation.
Status	A.4.4.3.3.2	Information identifying the UE-to-UE direct communication status.

A.4.4.3.2 Structured data types

A.4.4.3.2.1 Type: XRInformRequest

Table A.4.4.3.2.1.1: Definition of type XRInformRequest

Attribute name	Data type		P	Cardinality	Description	Applicability
requestorId	string		M	1	Identity of the requestor of the establishment request. (NOTE)	
valUeIds	array(ValTargetUe)		M	1..N	Information of the identities of the VAL UEs or VAL users involved in the UE-to-UE direct communication.	
status	Status		M	1	Identifies the UE-to-UE direct communication status (i.e. established, released).	
valServiceId	string		O	0..1	Identity of the VAL service enabled by the XR transmission connection.	
NOTE: This attribute shall be set to identity of the SDDM-C.						

A.4.4.3.2.2 Type: XRInformResponse

Table A.4.4.3.2.2.1: Definition of type XRInformResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the XR transmission connection request.	
cause	Cause	O	0..1	Reason of the cause of the failure of the XR transmission connection inform request (NOTE).	
NOTE: This attribute shall be included if result is set to "FAILURE".					

A.4.4.3.2.3 Type: XREstablishmentRequest

Table A.4.4.3.2.3.1: Definition of type XREstablishmentRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
sealClientId	string	M	1	Identity of the SDDM-C of the XR transmission connection establishment request.	
sealddFlowsInfos	array(SealddFlowsInfo)	M	1..N	Information of the SDDM flows used by the SDDM-C and SDDM-S.	
valTgtUe	ValTargetUe	O	0..1	VAL user to whom the establishment request is applied.	
serverId	ServerId	O	0..1	Identity of the VAL server.	
valServiceId	String	O	0..1	Identity of the VAL service enabled by the URLLC transmission connection.	

A.4.4.3.2.4 Type: XREstablishmentResponse

Table A.4.4.3.2.4.1: Definition of type XREstablishmentResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
result	ResultOp	M	1	Result of the establishment request.	
sealddMultimodalFlow	SealddMultiModalFlowInfo	M	1	Information of the multi-modal SDDM flow used by the SDDM-C and SDDM-S (NOTE 2).	
cause	Cause	O	0..1	Reason of the cause of the failure of the establishment request (NOTE 1).	
protocolDescriptorInfo	ProtocolDescriptorInfo	O	0..1	Specifying the information of the protocol of the VAL traffic (NOTE 2).	
NOTE 1: This attribute shall be included if result is set to "failure". NOTE 2: This attribute may be included if result is set to "success".					

A.4.4.3.2.5 Type: SealddFlowsInfo

Table A.4.4.3.2.5.1: Definition of type SealddFlowsInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddFlowId	Uinteger	M	1	Identity of SDDM flow used by the SDDM-C and the SDDM-S to identify the application traffic.	
userPlaneAddress	string	O	0..1	Identity of the IP address of the traffic.	
portNumber	Uinteger	O	0..1	Identity of the port number of the traffic.	
url	string	O	0..1	Identity of the address of a given unique resource on the Web for the traffic.	
transportLayer	string	O	0..1	Identity of the transport layer protocol for the traffic.	

A.4.4.3.2.6 Type: SealddMultiModalFlowInfo

Table A.4.4.3.2.6.1: Definition of type SealddMultiModalFlowInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
sealddMultimodalFlowId	Uinteger	M	1	Identity of the multi-modal SDDM flow used by the SDDM-C and SDDM-S to identify application traffic.	
sealddFlowsInfos	array(SealddFlowsInfo)	M	1..N	Information of the SDDM flows used by the SDDM-C and the SDDM-S associated with the multi-modal flow.	

A.4.4.3.2.7 Type: ProtocolDescriptorInfo

Table A.4.4.3.2.7.1: Definition of type ProtocolDescriptorInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
headerExtType	string	O	0..1	Specifying the header extension type (NOTE).	
headerExtId	Uinteger	O	0..1	Specifying the header extension identity. Minimum: 1 Maximum: 255 (NOTE)	
packetizationIndication	boolean	O	0..1	Indicating packetization for multi-modal SDDM flow traffic. "true": payload type information included "false": payload type information not included default value is "false".	
payloadType	string	O	0..1	Specifying the type of the payload (e.g. RTP, SRTP).	
payloadFormat	string	O	0..1	Specifying the format of the payload (e.g. H.264, H.265).	
NOTE: This attribute shall be included if payloadType indicates RTP.					

A.4.4.3.3 Simple data types and enumerations

A.4.4.3.3.1 Simple data types

Table A.4.4.3.3.1.1: Simple data types

Type Name	Type Definition	Description

A.4.4.3.3.2 Enumeration: Status

Table A.4.4.3.3.2: Status

Enumeration value	Description	Applicability
ESTABLISHED	The UE-to-UE direct communication status is established.	
RELEASED	The UE-to-UE direct communication status is released.	

A.4.4.4 Error Handling

General error responses are defined in clause C.1.3 of 3GPP TS 24.546 [6].

A.4.4.5 CDDL Specification

A.4.4.5.1 Introduction

The data model described in clause A.4.4.3 shall be binary encoded in the CBOR format as described in IETF RFC 8949 [20].

Clause A.4.4.5.2 uses the concise data definition language described in IETF RFC 8610 [19] and provides corresponding representation of the Sdd_XRTransmissionConnnection API provided by the SDDM-C data model.

A.4.4.5.2 CDDL document

```
;;; XRInformRequest
;;+ Represents a request for performing SDDM XR transmission connection inform.
XRInformRequest = {
 requestorId: tstr  ; identity of the SDDM-C, e.g. unique client identifier.
 valUeIds: [* ValTargetUe]
 status: Status
 ? valServiceId: tstr
 * tstr => any
}

;;; XRInformResponse
;;+ Represents the response of a request for performing SDDM XR transmission connection inform.
XRInformResponse = {
 result: ResultOp
 ? cause: Cause
* tstr => any
}

;;; XREstablishmentRequest
;;+ Represents a request for establishing an XR transmission connection.
XREstablishmentRequest = {
sealClientId: tstr
 sealClientId: string
 sealddFlowsInfos: SealddFlowsInfo
 valTgtUe: ValTargetUe
 serverId: ServerId
 valServiceId: tstr
 * tstr => any
}

;;; XREstablishmentResponse
;;+ Represents a response for establishing an XR transmission connection.
XREstablishmentResponse = {
 result: ResultOp
 sealddmultimodalFlow: SealddMultiModalFlowInfo
 ? cause: Cause
 ? protocolDescriptorInfo: ProtocolDescriptorInfo
* tstr => any
}

;;; SealddFlowsInfo
;;+ Represents the information of the SDDM flows.
SealddFlowsInfo = {
 sealddFlowId: Uinteger
 ? userPlaneAddress: tstr
 ? portNumber: Uinteger
 ? url: tstr
 ? transportLayer: tstr
 * tstr => any
}

;;; SealddMultiModalFlowInfo
;;+ Represents the information of the multi-modal SDDM flow.
SealddMultiModalFlowInfo = {
sealddMultimodalFlowId: Uinteger
 sealddFlowsInfos: SealddFlowsInfo
* tstr => any
}

;;; ProtocolDescriptorInfo
;;+ Represents the information of the protocol of the VAL traffic.
ProtocolDescriptorInfo = {
 ? headerExtType: tstr                        ; URI identifying the extension semantics, e.g.
urn:ietf:params:rtp-hdrext:abs-send-time.
 ? headerExtId: Uinteger                      ; numeric extmap id (validate range per "format")
 ? packetizationIndication: bool              ; "true" if packetization affects parsing (e.g.
fragmented frames)
 ? payloadType: PayloadTransportType
 ? payloadFormat: tstr                        ; MIME or codec descriptor, e.g.
"H264;profile=42e01f", "video/H264;profile=42e01f"
 * tstr => any
}

;;; PayloadTransportType
;;+ Indicates supported payload transport types.
```

```
PayloadTransportType = "RTP" / "SRTP" / "DTLS-SRTP" / "RTP/UDP" / "RTP/UDP/IPv6" / "RTP/SCTP" /
tstr ; tstr value provides forward-compatibility with future extensions to the enumeration but is
not used to encode content defined in the present version of this API.

;;; ValTargetUe
;;+ Represents information identifying a VAL user ID or a VAL UE ID.
valUserId = {
 valUserId: tstr                ; Unique identifier of a VAL user.
}

valUeId = {
 valUeId: tstr                  ; Unique identifier of a VAL UE.
}

ValTargetUe = valUserId / valUeId

;;; Status
;;+ Identifies the UE-to-UE direct communication status.
Status = "ESTABLISHED" / "RELEASED"

;;; Uinteger
;;+ Unsigned Integer, i.e. only value 0 and integers above 0 are permissible.
Uinteger = int .ge 0

;;; Cause
;;+ Represents the cause of failure of an operation.
Cause = "VAL CLIENT ERROR" / "SEALDD POLICY MISMATCH" / "OTHER"

;;; ResultOp
;;+ Represents the result of an operation.
ResultOp = "SUCCESS" / "FAILURE"
```

A.4.4.6 Media Types

See clause A.5.

A.5 Media types

A.5.1 General

This clause defines media types and its model that are applicable to APIs defined for CoAP resource representations in the present specification.

NOTE: Media types (formerly known as a multipurpose internet mail extensions (MIME) types) indicate the nature and format of a document, file, or assortment of bytes and are defined in IETF RFC 6838 [13A].

A.5.2 Media type structure and definition

The media type for the APIs defined for CoAP resource representations shall be "application/vnd.3gpp.seal-data-delivery-info+cbor". This media type may be appended with a media type parameter to identify a particular data type, e.g. "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-req", "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-res", "application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification".

Table A.5.2.1 lists the single media type for the APIs defined for CoAP resource representations with a required parameter to identify the defined data types.

Table A.5.2.1: Media type and parameter

Media type and parameter	Section used	Description

vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req	7.2.2.3, 7.2.2.4	The media type and parameter for a request to establish an SDDM regular transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-res	7.2.3.3, 7.2.3.4	The media type and parameter for a response of establishing an SDDM regular transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=release-req	7.2.3.3, 7.2.3.4	The media type and parameter for a request to release an SDDM regular transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-req	7.2.14.3, 7.2.14.4, 7.2.15.3, 7.2.15.4	The media type and parameter for a request to establish an SDDM data transmission quality measurement.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-subscription-res	7.2.14.3, 7.2.14.4	The media type and parameter for a response of establishing an SDDM data transmission quality measurement.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=measurement-notification	7.2.15.3, 7.2.15.4	The media type and parameter for notification of an SDDM data transmission quality measurement.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=tx-quality-mgt-req	7.2.16.3, 7.2.16.4	The media type and parameter for a request to establish an SDDM data transmission quality guarantee.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=tx-quality-mgt-res	7.2.16.3, 7.2.16.4	The media type and parameter for a response of establishing a SDDM data transmission quality guarantee.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-req	7.2.4.3, 7.2.4.4, 7.2.18.3, 7.2.18.4	The media type and parameter for a request to establish a URLLC transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-establishment-res	7.2.4.3, 7.2.4.4, 7.2.18.3, 7.2.18.4	The media type and parameter for a response of establishing a URLLC transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-update-req	7.2.6.3, 7.2.6.4	The media type and parameter for updating an established URLLC transmission connection shall.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-update-res	7.2.6.3, 7.2.6.4	The media type and parameter for updating an established URLLC transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=urllc-release-req	7.2.5.3, 7.2.5.4	The media type and parameter for a request to release a URLLC transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-req	7.2.8.3, 7.2.8.4	The media type and parameter for a request to create data storage to the SDDM-S.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-creation-res	7.2.8.3, 7.2.8.4	The media type and parameter for a response of creating data storage.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-reservation-req	7.2.9.3, 7.2.9.4	The media type and parameter for a request to reserve data storage.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-reservation-res	7.2.9.3, 7.2.9.4	The media type and parameter for a response of reserving data storage.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-status-notification	7.2.10.3, 7.2.10.4	The media type and parameter for a data storage notification.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-data-storage-query-res	7.2.11.3, 7.2.11.4	The media type and parameter for a response of querying data storage.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=data-storage-mgt-req	7.2.12.3, 7.2.12.4, 7.2.10.3, 7.2.10.4	The media type and parameter for a request to manage data storage
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-configuration-req	7.2.19.3, 7.2.19.4	The media type and parameter for a request to establish an SDDM connection status reporting configuration.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-configuration-res	7.2.19.3, 7.2.19.4	The media type and parameter for a response of establishing an SDDM connection status reporting configuration.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-notification	7.2.21.3, 7.2.21.4	The media type and parameter for notification of an SDDM connection status reporting.

vnd.3gpp.seal-data-delivery-info+cbor;modeltype=connection-status-config-subsc	7.2.21.3, 7.2.21.4	The media type and parameter for request to obtain an SDDM connection status reporting.
application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-trigger-req	7.2.22.3, 7.2.22.4	The media type and parameter for a request to trigger an SDDM XR transmission connection operation.
application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-trigger-res	7.2.22.3, 7.2.22.4	The media type and parameter for a response of triggering an SDDM XR transmission connection operation.
application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-inform-req	7.2.233, 7.2.23.4	The media type and parameter for a request to inform an SDDM XR transmission connection status.
application/vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-inform-rsp	7.2.23.3, 7.2.23.4	The media type and parameter for a response of informing an SDDM XR transmission connection status.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-establishment-req	7.2.24.3, 7.2.24.4	The media type and parameter for request to establish XR transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=xr-establishment-res	7.2.24.3, 7.2.24.4	The media type and parameter for a response of establishing XR transmission connection.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=policy-configuration-req	7.2.25.3, 7.2.25.4	The media type and parameter for request to establish policy configuration.
vnd.3gpp.seal-data-delivery-info+cbor;modeltype=policy-configuration-res	7.2.25.3, 7.2.25.4	The media type and parameter for a response of establishing policy configuration.

A.5.3 Media type registration template for application/vnd.3gpp.seal-data-delivery-info+cbor

Type name: application

Subtype name: vnd.3gpp.seal-data-delivery-info+cbor

Required parameters: none

Optional parameters: modeltype.

The "modetype" parameter identifies a specific data type, e.g, "vnd.3gpp.seal-data-delivery-info+cbor;modeltype=establishment-req" where "establishment-req" indicates the "EstablishmentRequest" data type in 3GPP TS 24.543 clause A.2.4.2.

Encoding considerations: Must be encoded as using IETF RFC 8949 [20]. See data types defined in 3GPP TS 24.543 clause A.2, A.3, and A.4 for details. Clause A.5 provides the media type structure and definition.

Security considerations: See Section 10 of IETF RFC 8949 [20] and Section 11 of IETF RFC 7252 [14].

Interoperability considerations: Applications must ignore any key-value pairs that they do not understand. This allows backwards-compatible extensions to this specification.

Published specification: 3GPP TS 24.543 "Data Delivery Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification", available via http://www.3gpp.org/specs/numbering.htm.

Applications that use this media type: Applications supporting the SEAL data delivery management procedures as described in the published specification.

Fragment identifier considerations: Fragment identification is the same as specified for "application/cbor" media type in IETF RFC 8949 [20]. Note that currently that RFC does not define fragmentation identification syntax for "application/cbor".

Additional information:

Deprecated alias names for this type: N/A

Magic number(s): N/A

File extension(s): none

Macintosh file type code(s): none

Person & email address to contact for further information: <MCC name>, <MCC email address>

Intended usage: COMMON

Restrictions on usage: None

Author: 3GPP CT1 Working Group/3GPP_TSG_CT_WG1@LIST.ETSI.ORG

Change controller: <MCC name>/<MCC email address>

Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2023-03	CT1#140	C1-230388				Draft skeleton provided by the rapporteur.	0.0.0
2023-03	CT1#140	C1-230389 C1-230394 C1-230395 C1-230868 C1-230869 C1-230870 C1-230871 C1-230872				Implementing the following p-CRs agreed by CT1: C1-230389, C1-230394, C1-230395, C1-230868, C1-230869, C1-230870, C1-230871, C1-230872; and editorial changes from the rapporteur.	0.1.0
2023-10	CT1#144	C1-237196 C1-237283 C1-237546 C1-237607 C1-237654 C1-237692 C1-238061 C1-238062 C1-238063 C1-238064 C1-238065 C1-238066 C1-238067 C1-238068 C1-238070 C1-238071 C1-238072 C1-238073 C1-238075 C1-238198				Implementing the following p-CRs agreed by CT1: C1-237196, C1-237283, C1-237546, C1-237607, C1-237654, C1-237692, C1-238061, C1-238062, C1-238063, C1-238064, C1-238065, C1-238066, C1-238067, C1-238068, C1-238069, C1-238070, C1-238071, C1-238072, C1-238073, C1-238075, C1-238198; and editorial changes from the rapporteur.	0.2.0
2023-11	CT1#145	C1-238643 C1-238644 C1-238649 C1-238650 C1-238656 C1-238657 C1-238658 C1-238659 C1-238660 C1-238661 C1-238663 C1-238664 C1-238665 C1-238666 C1-238667 C1-238674 C1-238675 C1-238676 C1-238677 C1-238678 C1-238679 C1-238680 C1-239159 C1-239400 C1-239401 C1-239402 C1-239403 C1-239494 C1-239405 C1-239408 C1-239409 C1-239410 C1-239411 C1-239412 C1-239414 C1-239571 C1-239577 C1-239578				Implementing the following p-CRs agreed by CT1: C1-238643, C1-238644, C1-238649, C1-238650, C1-238656, C1-238657, C1-238658, C1-238659, C1-238660, C1-238661, C1-238663, C1-238664, C1-238665, C1-238666, C1-238667, C1-238674, C1-238675, C1-238676, C1-238677, C1-238678, C1-238679, C1-238680, C1-239159, C1-239400, C1-239401, C1-239402, C1-239403, C1-239404, C1-239405, C1-239408, C1-239409, C1-239410, C1-239411, C1-239412, C1-239414, C1-239571, C1-239577, C1-239578; and editorial changes from the rapporteur.	0.3.0
2023-11	CT#102	CP-233156				Version 1.0.0 created for presentation to TSG CT#102 for information.	1.0.0

2024-01	CT1#146	C1-240234 C1-240252 C1-240280 C1-240309 C1-240310 C1-240311 C1-240312 C1-240313 C1-240314 C1-240317 C1-240318 C1-240401				Implementing the following p-CRs agreed by CT1: C1-240234, C1-240252, C1-240280, C1-240309, C1-240310, C1-240311, C1-240312, C1-240313, C1-240314, C1-240317, C1-240318, C1-240401; and editorial changes from the rapporteur.	1.1.0
2024-03	CT1#147	C1-240808 C1-240809 C1-240817 C1-240818 C1-240824 C1-240825 C1-240826 C1-241537 C1-241538 C1-241539 C1-241540 C1-241541 C1-241543 C1-241544 C1-241545 C1-241546 C1-241547 C1-241617 C1-241631 C1-241632				Implementing the following p-CRs agreed by CT1: C1-240808, C1-240809, C1-240817, C1-240818, C1-240824, C1-240825, C1-240826, C1-241537, C1-241538, C1-241539, C1-241540, C1-241541, C1-241543, C1-241544, C1-241545, C1-241546, C1-241547, C1-241617, C1-241631, C1-241632; and editorial changes from the rapporteur.	1.2.0
2024-04	CT1#148	C1-242099 C1-242101 C1-242102 C1-242105 C1-242107 C1-242373 C1-242374 C1-242381 C1-242382 C1-242385 C1-242386 C1-242397 C1-242471 C1-242492 C1-242763 C1-242764 C1-242765 C1-242766 C1-242767 C1-242768 C1-242769 C1-242770				Implementing the following p-CRs agreed by CT1: C1-242099, C1-242101, C1-242102, C1-242105, C1-242107, C1-242373, C1-242374, C1-242381, C1-242382, C1-242385, C1-242386, C1-242397, C1-242471, C1-242492, C1-242763, C1-242764, C1-242765, C1-242766, C1-242767, C1-242768, C1-242769, C1-242770; and editorial changes from the rapporteur.	1.3.0

2024-06	CT1#149	C1-243257 C1-243271 C1-243274 C1-243285 C1-243287 C1-243292 C1-243309 C1-243735 C1-243736 C1-243737 C1-243738 C1-243739 C1-243740 C1-243741 C1-243741 C1-243742 C1-243743 C1-243744 C1-243745 C1-243746 C1-243747 C1-243748 C1-243749 C1-243750 C1-243751 C1-243775				Implementing the following p-CRs agreed by CT1: C1-243257, C1-243271, C1-243274, C1-243285, C1-243287, C1-243292, C1-243309, C1-243735, C1-243736, C1-243737, C1-243738, C1-243739, C1-243740, C1-243741, C1-243742, C1-243743, C1-243744, C1-243745, C1-243746, C1-243747, C1-243748, C1-243749, C1-243750, C1-243751, C1-243776; and editorial changes from the rapporteur.	1.4.0
2024-06	CT#104	CP-241145				Version 2.0.0 created for presentation to TSG CT#104 for approval.	2.0.0
2024-06	CT#104	CP-241145				Approved in CT#104	18.0.0
2024-09	CT#105	CP-242196	0001	1	F	Correction to numbering of clauses	18.1.0
2024-09	CT#105	CP-242196	0002	1	F	Correction to empty clauses	18.1.0
2024-09	CT#105	CP-242196	0006	1	F	Correction to the CDDL specification for the Sdd_TransmissionQualityMeasurement AP	18.1.0
2024-09	CT#105	CP-242196	0003	2	F	CDDL specification for the Sdd_RegularTransmissionConnection API provided by the SDDM-S	18.1.0
2024-09	CT#105	CP-242196	0004	2	F	CDDL specification for the Sdd_RegularTransmissionConnection API provided by the SDDM-C	18.1.0
2024-09	CT#105	CP-242196	0005	2	F	CDDL specification for the Sdd_URLCCTransmissionConnection API provided by the SDDM-C	18.1.0
2024-12	CT#106	CP-243228	0007	-	F	Correction to the <endpoint-id> element	18.2.0
2024-12	CT#106	CP-243228	0009	-	F	Correction to the SEALDD enabled E2E redundant transmission path connection update procedure based on CoAP	18.2.0
2024-12	CT#106	CP-243228	0018	-	F	HTTP related corrections	18.2.0
2024-12	CT#106	CP-243228	0008	1	F	Correction to the EstablishmentRequest type when provided by the SDDM-C	18.2.0
2024-12	CT#106	CP-243228	0010	1	F	Correction to the <sealdd-communication-lifetime> element	18.2.0
2024-12	CT#106	CP-243228	0019	1	F	COAP related corrections	18.2.0
2024-12	CT#106	CP-243228	0011	1	F	Correction to the SEALDD enabled signalling transmission connection establishment procedure based on HTTP	18.2.0
2024-12	CT#106	CP-243228	0020	1	F	XML schema: adding new messages	18.2.0
2024-12	CT#106	CP-243228	0026	-	F	Correction to misleading clause references	18.2.0
2024-12	CT#106	CP-243228	0035	1	F	Transmission quality measurement notification data type in COAP	18.2.0
2024-12	CT#106	CP-243228	0042	4	F	Correction to SEALDD data transmission quality measurement procedure for CoAP	18.2.0
2024-12	CT#106	CP-243228	0034	4	F	Correction to SEALDD enabled data storage notification procedure for CoAP	18.2.0
2024-12	CT#106	CP-243229	0013	-	C	Data semantics for SEALDD enabled URLLC transmission connection establishment based on policy procedure	19.0.0
2024-12	CT#106	CP-243229	0015	-	B	SEALDD enabled URLLC transmission connection deletion based on policy procedure based on HTTP	19.0.0
2024-12	CT#106	CP-243229	0025	1	C	Update to the SEALDD server relocation procedure	19.0.0
2024-12	CT#106	CP-243229	0021	1	B	BAT and periodicity adaptation in transmission quality guarantee support in HTTP	19.0.0
2024-12	CT#106	CP-243229	0022	1	B	BAT and periodicity adaptation in transmission quality guarantee support in COAP	19.0.0
2024-12	CT#106	CP-243229	0012	1	B	SEALDD enabled URLLC transmission connection establishment based on policy procedure based on HTTP	19.0.0
2024-12	CT#106	CP-243229	0023	1	B	SEALDD connection status reporting configuration support in HTTP	19.0.0
2024-12	CT#106	CP-243229	0024	1	B	SEALDD connection status reporting configuration support in COAP	19.0.0
2024-12	CT#106	CP-243229	0017	2	B	Introduction of Sdd_URLCCTransmissionConnection API provided by the SDDM-S	19.0.0

2024-12	CT#106	CP-243229	0014	2	B	SEALDD enabled URLLC transmission connection establishment based on policy procedure based on CoAP	19.0.0
2024-12	CT#106	CP-243229	0016	2	B	SEALDD enabled URLLC transmission connection deletion based on policy procedure based on CoAP	19.0.0
2024-12	CT#106	CP-243229	0038	-	B	SEALDD connection status reporting configuration notification - HTTP	19.0.0
2024-12	CT#106	CP-243229	0036	1	B	BAT and periodicity adaptation support in SEALDD regular transmission connection establishment HTTP procedure	19.0.0
2024-12	CT#106	CP-243229	0039	1	B	SEALDD connection status reporting configuration notification - CoAP	19.0.0
2024-12	CT#106	CP-243229	0040	1	B	Transmission quality measurement with Non-3GPP RAT - HTTP	19.0.0
2024-12	CT#106	CP-243229	0041	1	B	Transmission quality measurement with Non-3GPP RAT - CoAP	19.0.0
2024-12	CT#106	CP-243229	0027	2	B	Updates for SEALDD enabled congestion control for VAL application by supporting L4S mechanism for HTTP	19.0.0
2024-12	CT#106	CP-243229	0029	2	B	SEALDD enabled regular data transmission connection establishment based on policy procedure based on HTTP	19.0.0
2024-12	CT#106	CP-243229	0030	2	B	Coding for SEALDD enabled regular data transmission connection establishment based on policy procedure	19.0.1
2024-12	CT#106	CP-243229	0028	4	B	Updates for SEALDD enabled congestion control for VAL application by supporting L4S mechanism for CoAP	19.0.1
2024-12	CT#106	CP-243229	0032	4	B	CDDL specification and Media types for the Sdd_URLCCTransmissionConnection API provided by the SDDM-S	19.0.1
2024-12	CT#106	CP-243229	0033	4	B	Updates to the Sdd_RegularTransmissionConnection API provided by the SDDM-S	19.0.1
2024-12	CT#106	CP-243229	0037	2	B	BAT and periodicity adaptation support in SEALDD regular transmission connection establishment COAP procedure	19.0.1
2024-12	CT#106	CP-243229	0031	2	B	SEALDD enabled regular data transmission connection establishment based on policy procedure for CoAP	19.0.1
2025-03	CT#107	CP-250166	0044	1	A	Update of MIME types for CBOR payload	19.1.0
2025-03	CT#107	CP-250166	0046	1	A	Correction to HTTP procedures	19.1.0
2025-03	CT#107	CP-250152	0047	1	B	Resolution of the editor's note related to CR#0033	19.1.0
2025-03	CT#107	CP-250152	0048	1	F	Resolution to the editor's notes on CR#0012 and 0014	19.1.0
2025-03	CT#107	CP-250152	0049	1	F	Resolution to the editor's notes on CR#0015 and 0016	19.1.0
2025-03	CT#107	CP-250152	0050	1	B	Removal of EN on Sdd_ConnectionStatusEvent API update	19.1.0
2025-03	CT#107	CP-250152	0051		B	Removal of EN on batPeriodAdaptCap and transmisAssistInfo attributes	19.1.0
2025-03	CT#107	CP-250152	0052	1	B	Support of XR Application device capability information in HTTP	19.1.0
2025-03	CT#107	CP-250152	0053	1	B	Support of XR Application device capability information in CoAP	19.1.0
2025-03	CT#107	CP-250152	0054	1	B	SEALDD data transmission quality measurement with Non-3GPP RAT - HTTP	19.1.0
2025-03	CT#107	CP-250152	0055	1	B	SEALDD data transmission quality measurement with Non-3GPP RAT - CoAP	19.1.0
2025-03	CT#107	CP-250152	0056	1	B	SEALDD non-3GPP access for connection status reporting configuration procedure - HTTP	19.1.0
2025-03	CT#107	CP-250152	0057	1	B	SEALDD non-3GPP access for connection status reporting configuration procedure - CoAP	19.1.0
2025-06	CT#108	CP-251166	0058	1	B	Removal of EN on update of ConnectionStatusNotification	19.2.0
2025-06	CT#108	CP-251166	0060	1	B	Resolution of EN on reporting mode, interval and priority	19.2.0
2025-06	CT#108	CP-251176	0061	1	B	SEALDD XR transmission connection trigger procedure - HTTP	19.2.0
2025-06	CT#108	CP-251176	0062	1	B	SEALDD XR transmission connection trigger procedure - CoAP	19.2.0
2025-06	CT#108	CP-251176	0063	1	B	SEALDD XR transmission connection inform procedure - HTTP	19.2.0
2025-06	CT#108	CP-251176	0064	1	B	SEALDD XR transmission connection inform procedure - CoAP	19.2.0
2025-06	CT#108	CP-251166	0069	-	F	Resolution of editor's note under clause A.3.1.5.2 introduced by CR#0037	19.2.0
2025-06	CT#108	CP-251166	0059	2	F	Implementation of CRs 0014 and 0031	19.2.0
2025-06	CT#108	CP-251176	0073	1	B	SEALDD enabled XR data transmission establishment service for XR application-HTTP	19.2.0
2025-06	CT#108	CP-251176	0074	1	B	SEALDD enabled XR data transmission establishment for XR application-CoAP	19.2.0
2025-06	CT#108	CP-251166	0071	2	F	Resolution of editor's note under clause 8.4.2 introduced by CR#0023	19.2.0
2025-06	CT#108	CP-251166	0066	1	F	Correction to the <transmission-assist-info> element	19.2.0
2025-06	CT#108	CP-251166	0068	1	F	Correction to the use of and/or term	19.2.0
2025-06	CT#108	CP-251166	0070	1	F	Resolution of editor's note under clause 8.4.2 introduced by CR#0030	19.2.0
2025-06	CT#108	CP-251166	0072	1	B	Corrections on SEALDD enabled URLLC transmission connection establishment	19.2.0
2025-06	CT#108	CP-251166	0065	2	F	Correction to the <bat-period-adapt-cap> element	19.2.0
2025-06	CT#108	CP-251166	0075	3	F	Correction to the Sdd_RegularTransmissionConnection API provided by the SDDM-S	19.2.0
2025-09	CT#109	CP-252162	0099	-	F	Removal of EN related to XR data transmission inform and trigger	19.3.0

2025-09	CT#109	CP-252133	0080	1	A	Resolution of editor's note under clause A.5.2	19.3.0
2025-09	CT#109	CP-252133	0083	1	A	Resolution of editor's note under clause 8.6	19.3.0
2025-09	CT#109	CP-252151	0076	1	B	Identification of added messages	19.3.0
2025-09	CT#109	CP-252151	0077	1	B	BAT and periodicity adaptation for HTTP	19.3.0
2025-09	CT#109	CP-252151	0078	1	B	BAT and periodicity adaptation for CoAP	19.3.0
2025-09	CT#109	CP-252151	0084	1	F	Resolution of editor's note under clause A.2.4	19.3.0
2025-09	CT#109	CP-252151	0085	1	F	Resolution of editor's note under clause A.3.1.3.2.3	19.3.0
2025-09	CT#109	CP-252151	0090	1	F	Resolution of editor's note on support of L4S mechanism under the XML schema clause	19.3.0
2025-09	CT#109	CP-252151	0091	1	F	Correction to the <L4S-feedback-capability> element	19.3.0
2025-09	CT#109	CP-252151	0092	1	F	Correction to the <XR-establishment-req> and <XR-establishment-rsp> elements	19.3.0
2025-09	CT#109	CP-252151	0093	1	F	Correction because of approved CR in S6-251365	19.3.0
2025-09	CT#109	CP-252151	0098	1	F	Removal of EN related to Connection status reporting configuration notification	19.3.0
2025-09	CT#109	CP-252162	0094	2	B	SEALDD enabled XR data transmission establishment service for XR application-HTTP-XML Schema and Data Semantics	19.3.0
2025-09	CT#109	CP-252162	0095	2	B	SEALDD enabled XR data transmission establishment for XR application-CoAP Coding	19.3.0
2025-09	CT#109	CP-252151	0086	2	F	Resolution of editor's note under clause A.3.1.5.2	19.3.0
2025-12	CT#110	CP-253112	0102	-	B	Resolving editor's note for the clarifcation in SEALDD enabled bandwidth control - CoAP	19.4.0
2025-12	CT#110	CP-253112	0103	-	B	Resolving editor's note for the clarifcation in SEALDD enabled bandwidth control - HTTP	19.4.0
2025-12	CT#110	CP-253119	0107	-	F	Resolution of Editor's note to align with stage 2 on changing XR to multi-modal.	19.4.0
2025-12	CT#110	CP-253112	0110	-	F	Resolution of editor's note under clause A.2.4.12	19.4.0
2025-12	CT#110	CP-253119	0111	-	F	Resolution of editor's notes under clause 7.2.24.2	19.4.0
2025-12	CT#110	CP-253119	0108	1	F	Corrections to SEALDD enabled multi-modal data transmission establishment procedure and related parameters	19.4.0
2025-12	CT#110	CP-253119	0113	1	F	Resolution of editor's note under clause A.4.4.3.2.6	19.4.0
2025-12	CT#110	CP-253119	0112	1	F	Resolution of editor's note under clause 8.5	19.4.0
2025-12	CT#110	CP-253119	0115	1	F	Corrections to SDDM XR transmission connection	19.4.0
2025-12	CT#110	CP-253111	0104	1	A	Fixing the CDDL extensibility issue for Sdd_TransmissionQualityManagement API	19.4.0
2025-12	CT#110	CP-253112	0105	1	B	Adding sleeping duration attribute to Connection Status Notification - CoAP	19.4.0
2025-12	CT#110	CP-253112	0106	1	B	Adding sleeping duration element to Connection Status Notification - HTTP	19.4.0
2025-12	CT#110	CP-253112	0109	1	F	Resolution of editor's note under clause 8.3	19.4.0
2025-12	CT#110	CP-253119	0114	2	F	Resolution of editor's note under clause A.4.4.5.2	19.4.0
2025-12	CT#110	CP-253112	0122	-	F	Resolution of editor's note under clause 8.4.2	19.4.0
2025-12	CT#110	CP-253127	0127	-	F	Correction to data semantics of the <sealdd-flow-id> element	19.4.0
2025-12	CT#110	CP-253119	0132	-	F	Fixing the SDDMC Sdd_XRTransmissionConnnection API - CDDL	19.4.0
2025-12	CT#110	CP-253119	0133	-	F	Fixing the SDDMS Sdd_XRTransmissionConnnection API - CDDL	19.4.0
2025-12	CT#110	CP-253111	0135	-	A	Fixing the SDDMC Sdd_RegularTransmissionConnection API Sdd_URLLCTransmissionConnection API and Sdd_DataStorage API - CDDL	19.4.0
2025-12	CT#110	CP-253111	0137	-	A	Fixing the SDDM-S Sdd_RegularTransmissionConnection API Sdd_TransmissionQualityMeasurement API and Sdd_TransmissionQualityManagement API - CDDL	19.4.0
2025-12	CT#110	CP-253112	0138	-	F	Fixing the SDDMS Sdd_URLLCTransmissionConnection API - CDDL	19.4.0
2025-12	CT#110	CP-253112	0139	-	F	Fixing the SDDMS Sdd_ConnectionStatusEvent API - CDDL	19.4.0
2025-12	CT#110	CP-253119	0118	1	B	SEALDD enabled policy configuration procedure - HTTP	19.4.0
2025-12	CT#110	CP-253119	0119	1	B	SEALDD enabled policy configuration procedure - CoAP	19.4.0
2025-12	CT#110	CP-253119	0120	1	B	SEALDD enabled policy configuration procedure coding in HTTP	19.4.0
2025-12	CT#110	CP-253119	0081	6	B	Support for Multi-modal flows synchronization monitoring	19.4.0
2025-12	CT#110	CP-253111	0126	1	A	Correction to data semantics of the <measurements-notification> element	19.4.0
2025-12	CT#110	CP-253112	0130	1	F	Correction to the <VAL-ue-id-list> element	19.4.0
2025-12	CT#110	CP-253114	0117	1	F	Correction to IEEE standards reference	19.4.0
2025-12	CT#110	CP-253119	0121	2	B	SEALDD enabled policy configuration procedure coding in CoAP	19.4.0
2025-12	CT#110	CP-253111	0129	2	A	Correction to the type MeasurementNotification	19.4.0
2026-03	CT#111	CP-260100	0142		A	Correction to the <requestor-id> element - HTTP	19.5.0
2026-03	CT#111	CP-260100	0144		A	Correction to the "requestorId" attribute - CoAP	19.5.0
2026-03	CT#111	CP-260119	0145		F	Resolution of editor's notes under clauses 7.2.24.4, and A.4.4	19.5.0
2026-03	CT#111	CP-260119	0146	2	F	Resolution of editor's note under clause 8.4.2	19.5.0
2026-03	CT#111	CP-260119	0147	2	F	Resolution of editor's note under clause A.3.7.5.2	19.5.0
2026-03	CT#111	CP-260111	0148		F	Correction to packetization indication for HTTP	19.5.0
2026-03	CT#111	CP-260111	0149	1	F	Correction to packetization indication for CoAP	19.5.0

2026-03	CT#111	CP-260111	0150	1	F	Correction to fix issue with agreed CR0137	19.5.0
2026-03	CT#111	CP-260119	0151	1	F	Correction to fix extensibility issue for CoAP	19.5.0
2026-06	CT#112	CP-261107	0156		F	Correction to the <requestor-id> element in procedures defined by clauses 7.2.22, 7.2.23, and 7.2.25 - HTTP	19.6.0
2026-06	CT#112	CP-261107	0157	1	F	Correction to the "requestorId" attribute in procedures defined by clauses 7.2.22, 7.2.23, and 7.2.25 - CoAP	19.6.0
2026-06	CT#112	CP-261115	0158	2	F	Update to Payload format in multi-modal data transmission establishment.	19.6.0

History

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