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TECHNICAL SPECIFICATION

5G;
**Network Resource Management - Service Enabler Architecture
Layer for Verticals (SEAL);
Protocol specification
(3GPP TS 24.548 version 16.1.0 Release 16)**

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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 network resource management capability of SEAL to support vertical applications (e.g. V2X) over the 3GPP system.

The present document is applicable to the user equipment (UE) supporting the network resource management client functionality as described in 3GPP TS 23.434 [2], to the application server supporting the network resource management server functionality as described in 3GPP TS 23.434 [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 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".

[3] 3GPP TS 23.003: "Numbering, addressing and identification".

[4] 3GPP TS 23.203: "Policy and charging control architecture".

[5] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[6] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[7] 3GPP TS 24.486: "Vehicle-to-Everything (V2X) Application Enabler (VAE) layer; Protocol aspects; Stage 3".

[8] 3GPP TS 24.545: "Location Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[9] 3GPP TS 24.547: "Identity management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[10] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".

[11] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[12] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[13] 3GPP TS 29.468: "Group Communication System Enablers for LTE (GCSE_LTE); MB2 reference point; Stage 3".

[14] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[15]   IETF RFC 2616: "Hypertext Transfer Protocol -- HTTP/1.1".

[16]   IETF RFC 3095: "RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed".

[17]   IETF RFC 3428: "Session Initiation Protocol (SIP) Extension for Instant Messaging".

[18]   IETF RFC 3841: "Caller Preferences for the Session Initiation Protocol (SIP)".

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

[20]   IETF RFC 5795: "The Robust Header Compression (ROHC) Framework".

[21]   OMA OMA-TS-XDM_Group-V1_1_1-20170124-A: "Group XDM Specification".

3 Definitions of terms and abbreviations

3.1 Terms

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

SEAL network resource management client: An entity that provides the client side functionalities corresponding to the SEAL network resource management service.

SEAL network resource management server: An entity that provides the server side functionalities corresponding to the SEAL network resource management service.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.434 [2] apply:

SEAL client
SEAL server
SEAL service
VAL server
VAL service
VAL user
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].

BM-SC   Broadcast-Multicast Service Centre
SNRM-C   SEAL Network Resource Management Client
SNRM-S   SEAL Network Resource Management Server
PCF   Policy Control Function
SEAL   Service Enabler Architecture Layer for verticals
VAL   Vertical Application Layer

4 General description

Network resource management is a SEAL service that provides the network resource management related capabilities (e.g. unicast and multicast network resources) to one or more vertical applications. The present document enables a

SEAL network resource management client (SNRM-C) and a VAL server that communicate with a SEAL network resource management server (SNRM-S).

The SNRM-S obtains and controls multicast resources from the underlying 3GPP network system via the BM-SC and controls unicast resources from the underlying 3GPP network system via the PCRF/PCF.

5 Functional entities

5.1 SEAL network resource management client (SNRM-C)

The SNRM-C functional entity acts as the application client for network resource management related transactions. To be compliant with the procedures in the present document the SNRM-C shall:

    a) shall support the role of XCAP client as specified in IETF RFC 4825 [19];

    b) shall support the role of XDMC as specified in OMA OMA-TS-XDM_Core-V2_1 [21];

    c) shall support the unicast resource management procedures in clause 6.2.2; and

    d) shall support the multicast resource management procedures in clause 6.2.3.

5.2 SEAL network resource management SEAL server (SNRM-S)

The SNRM-S is a functional entity used to provide resource management of 3GPP system network resources (e.g. unicast, multicast) to one or more vertical applications. To be compliant with the procedures in the present document the SNRM-S shall:

    a) shall support the role of XCAP server as specified in IETF RFC 4825 [19];

    b) shall support the role of XDMS as specified in OMA OMA-TS-XDM_Core-V2_1 [21];

    c) shall support the unicast resource management procedures in clause 6.2.2; and

    d) shall support the multicast resource management procedures in clause 6.2.3.

6 Network resource management procedures

6.1 General

6.2 On-network procedures

6.2.1 General

6.2.1.1 Authenticated identity in HTTP request

Upon receiving an HTTP request, the SNRM-S shall authenticate the identity of the sender of the HTTP request is authorized as specified in 3GPP TS 24.547 [9], and if authentication is successful, the SNRM-S shall use the identity of the sender of the HTTP request as an authenticated identity.

6.2.2   Unicast resource management

6.2.2.1   General

This clause describes the procedures used for unicast resource management. The unicast resource management comprises procedures for:

a) activation and deactivation of bearers;

b) modification of the QoS characteristics of a bearer; and

c) modification of GBR due to application requirement.

The VAL client can request the VAL server to provide unicast resources (see clause 6.2.2.2), to modify or to release unicast resources (see clause 6.2.2.3) or to perform network resource adaptation (see clause 6.2.2.4).

NOTE: A VAL service communication can consist of both unicast and multicast bearers which can all need modification due to the same event.

VAL specific pre-requisites and resultant behaviour by functional entities in performing the unicast resource management procedures are specified in the respective VAL TS (e.g. for V2X application layer, see 3GPP TS 24.486 [7]).

Unicast resource management is supported with PCRF interactions with SIP core and PCC interactions with the SNRM-S. The PCRF procedures are specified in 3GPP TS 29.214 [12] and the PCF procedures are specified in 3GPP TS 29.514 [14].

6.2.2.2   Request for unicast resource at VAL service communication establishment procedure with SIP core

6.2.2.2.1   VAL server procedure

If the VAL client requests VAL service communication with the VAL server, the VAL server shall generate an HTTP POST request message according to procedures specified in IETF RFC 2616 [15]. In the HTTP POST request message, the VAL server:

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

b) shall include an Accept header field set to "application/vnd.3gpp.seal-unicast-info+xml";

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

d) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

  1) shall include a <request> element which shall include:

    i) a <requester-identity> element set to the identity of the VAL server performing the request;

    ii) an <identity> element set to the identity of the VAL user or VAL UE which requests the VAL service communication; and

    iii) an optional <requirement-info> element set to the requested unicast resource information; and

e) shall send the HTTP POST request message towards the SNRM-S according to IETF RFC 2616 [15].

NOTE: Before terminating connection due to no response from the SNRM-S, the VAL server allows sufficient time for the SNRM-S to reserve resources and respond. It is up to implementation to decide how long the VAL server waits for receiving response.

6.2.2.2.2   Server procedure

Upon receiving an HTTP POST request message containing:

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

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

c) an application/vnd.3gpp.seal-unicast-info+xml MIME body with a <request> element in the <unicast-info> root element;

the NRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

   1) if the identity of the sender of the received HTTP POST request is not authorized to request unicast resource, 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 a VAL server according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

b) shall evaluate the need for network resources and use of resource sharing, and then send a SIP MESSAGE request containing request for resources according to procedures specified in 3GPP TS 29.214 [12] for EPS and/or 3GPP TS 29.514 [14] for 5GS.

Upon receiving a SIP 200 (OK) response to the SIP MESSAGE request, the SNRM-S:

a) shall generate an HTTP 200 (OK) response message according to IETF RFC 2616 [15]. In the HTTP 200 (OK) response message, the SNRM-S:

   1) shall include a Request-URI set to the URI corresponding to the identity of the VAL server;

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

   3) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

i) shall include a <request-result> element set to "success" indicating success of the resource request operation; andb) shall send the HTTP 200 (OK) response message towards the VAL server according to IETF RFC 2616 [15].

6.2.2.3 Request for modification of unicast resources procedure with SIP core

6.2.2.3.1 VAL server procedure

To modify unicast bearers, the VAL server shall generate an HTTP POST request according to procedures specified in IETF RFC 2616 [15]. In the HTTP POST request message, the VAL server:

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

b) shall include an Accept header fideld set to "application/vnd.3gpp.seal-unicast-info+xml";

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

d) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

   1) shall include a <modification> element which shall include:

      i) a <requester-identity> element set to the identity of the VAL server performing the request;

      ii) an <identity> element set to the identity of the VAL user or VAL UE which requests the VAL service communication; and

      iii) an <requirement-info> element set to the modified unicast resource information; and

e) shall send the HTTP POST request message towards the VAL server according to IETF RFC 2616 [15].

NOTE: Before terminating connection due to no response from the SNRM-S, the VAL server allows sufficient time for the SNRM-S to reserve resources and respond. It is up to implementation to decide how long the VAL server waits for receiving response.

6.2.2.3.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

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

c) an application/vnd.3gpp.seal-unicast-info+xml MIME body with a <modification> element in the <unicast-info> root element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

    1) if the identity of the sender of the received HTTP POST request is not authorized to modify unicast resource, 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 a VAL server according to procedures specified in IETF RFC 4825 [19] "POST Handling";

b) if the media bearer modification is not required, shall generate an HTTP 200 (OK) response message according to IETF RFC 2616 [15]. In the HTTP 200 (OK) response message, the SNRM-S:

    1) shall include a Request-URI set to the URI corresponding to the identity of the VAL server;

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

    3) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

        i) shall include a <modification-result> element set to "failure" indicating failure of the resource modification request operation; and

    4) shall send the HTTP 200 (OK) response message towards the VAL server according to IETF RFC 2616 [15]; and

c) if the media bearer modification is required, shall send a SIP MESSAGE request containing the modified parameters of the unicast bearer according to procedures specified in 3GPP TS 29.214 [12] for EPS and/or 3GPP TS 29.514 [14] for 5GS.

Upon receiving a SIP 200 (OK) response to the SIP MESSAGE request, the SNRM-S:

a) shall generate an HTTP 200 (OK) response message according to IETF RFC 2616 [15]. In the HTTP 200 (OK) response message, the SNRM-S:

    1) shall include a Request-URI set to the URI corresponding to the identity of the VAL server;

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

    3) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

        i) shall include a <modification-result> element set to "success" indicating success of the resource modification request operation; and

b) shall send the HTTP 200 (OK) response message towards the VAL server according to IETF RFC 2616 [15].

6.2.2.4 Network resource adaptation procedure with SIP core

6.2.2.4.1 VAL server procedure

In order to request unicast resources or modify already allocated unicast resources to VAL communications, the VAL server shall generate an HTTP POST request according to procedures specified in IETF RFC 2616 [15]. In the HTTP POST request message, the VAL server:

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

b) shall include an Accept header field set to "application/vnd.3gpp.seal-unicast-info+xml";

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

d) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

    1) shall include an <adaptation> element which shall include:

        i) a <requester-identity> element set to the identity of the VAL server performing the request;

        ii) an <identity> 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 the network resource adaptation occurs; or

            B) a <VAL-group-id> element set to the identity of the VAL group for whom the network resource adaptation occurs; and

        iii) a <requirement> element set to the VAL service QoS requirements as applied for the corresponding VAL UEs or group of UEs; and

e) shall send the HTTP POST request message towards the VAL server according to procedures specified in IETF RFC 2616 [15].

6.2.2.4.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

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

c) an application/vnd.3gpp.seal-unicast-info+xml MIME body with an <adaptation> element in the <unicast-info> root element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

    1) if the identity of the sender of the received HTTP POST request is not authorized to adapt unicast resource, 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 a VAL server according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

b) shall apply/enforce the resource adaptation per VAL UE, and then initiate the PCC procedures for each VAL UE as described in 3GPP TS 29.214 [12] for EPS and/or 3GPP TS 29.514 [14] for 5GS. After the PCC procedures, the SNRM-S shall generate an HTTP 200 (OK) response message according to IETF RFC 2616 [15]. In the HTTP 200 (OK) response message, the SNRM-S:

    1) shall include a Request-URI set to the URI corresponding to the identity of the VAL server;

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

    3) shall include an application/vnd.3gpp.seal-unicast-info+xml MIME body and in the <unicast-info> root element:

        i) shall include an <adaptation-result> element set to "success" or "failure" indicating success or failure of the network resource adaptation with the underlying network; and

    4) shall send the HTTP 200 (OK) response message towards the VAL server according to procedures specified in IETF RFC 2616 [15].

6.2.3 Multicast resource management

6.2.3.1 General

6.2.3.2 Use of pre-established MBMS bearers procedure

6.2.3.2.1 VAL server procedure

When a user originates a request for a VAL service group communication session for one of these areas, in order to use the pre-established MBMS bearers, the VAL server shall generate an HTTP POST request according to procedures specified in IETF RFC 2616 [15]. In the HTTP POST request message, the VAL server:

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

    b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

    c) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body and in the <mbms-info> root element:

        1) shall include an <request> element which shall include:

            i) a <requester-identity> element set to the identity of the VAL server performing the request;

            ii) a <VAL-group-id> element set to the identity of the VAL group that the MBMS bearer is requested for;

            iii) a <service-anouncement-mode> indicating whether the request is sent by NRM server or by the VAL server;

            iv) a <QoS> element indicating the requested QoS for the bearer;

            v) an optional <broadcast-area> element indicating the area where the MBMS bearer is requested for; and

            vi) an <endpoint-info> element set to the information of the endpoint of the VAL server to which the user plane notifications have to be sent; and

    d) shall send the HTTP POST request message towards the SNRM-S according to IETF RFC 2616 [15].

6.2.3.2.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

    b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with a <request> element in the <mbms-info> root element;

the SNRM-S:

    a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

        1) if the identity of the sender of the received HTTP POST request is not authorized to request mbms resource, 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 a VAL server according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

    b) shall determine to activate MBMS bearer, and then generate an HTTP POST request message according to IETF RFC 2616 [15]. In the HTTP POST request message, the SNRM-S:

        1) shall set the Request-URI to the URI corresponding to the identity of the SNRM-C;

        2) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info+xml";

3) shall include in a MIME body with Content-Type header field set to "application/vnd.3gpp.seal-info+xml", the <seal-request-uri> element set to the VAL user ID of the user;

4) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with the <version> element set to "1" and one or more <announcement> elements associated with the pre-activated MBMS bearers in the <mbms-info> root element. Each set of an <announcement> element:

   i) shall include a <TMGI> element set to a TMGI value;

NOTE 1: The same TMGI value can only appear in one <announcement> element. The TMGI value is also used to identify the <announcement> when updating or cancelling the <announcement> element.

NOTE 2: The security key active for the general purpose MBMS subchannel on which the mapping (i.e. the Map Group To Bearer message) of media or media control to this MBMS bearer was indicated, is used for MBMS subchannels on this MBMS bearer, unless a different key or an indication of not using encryption is in place.

   ii) may include an <alternative-TMGI> element set to a list of additional alternative TMGI used in roaming scenarios;

   iii) may include the QCI value in the <QCI> element;

   iv) shall include one or more MBMS service area IDs in <mbms-service-area-id> elements in the <mbms-service-areas> element;

NOTE 3: Initial mappings of groups to MBMS subchannels on an MBMS bearer for the purpose of carrying media or media control can occur only where the MBMS service area for this bearer and the MBMS service area for the bearer carrying the general purpose MBMS subchannel on which the Map Group To Bearer message is sent intersect. However, once media or media control were successfully mapped to this bearer, the reception by the SNRM-C can continue (until Unmap Group To Bearer is received or until timeout) throughout the entire MBMS service area of this bearer.

   v) if multiple carriers are supported, shall include the frequency to be used in the <frequency> element;

NOTE 4: In the current release if the <frequency> element is included, the frequency in the <frequency> element is the same as the frequency used for unicast.

   vi) shall include a <seal-mbms-sdp> element set to the SDP with media and application control information applicable to groups that can use this bearer;

   vii) may include a <monitoring-state> element set to "monitoring" or "not-monitoring" used to control if the client is actively monitoring the MBMS bearer quality or not;

   viii) may include an <announcement-acknowlegement> element set to "true" or "false" indicating if the NRM server requires an acknowledgement of the MBMS bearer announcement;

   ix) may include an <unicast-status> element set to "listening" or "not-listening" indicating if the listening status of the unicast bearer is requested;

   x) if the packet headers are compressed with ROHC specified in IETF RFC 5795 [20] in this MBMS bearer, shall include a <seal-mbms-rohc> element; and

5) shall send the HTTP POST request message towards the SNRM-C according to IETF RFC 2616 [15].

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

1) if the identity of the sender of the received HTTP POST request is not authorized to report mbms listening status, 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 a SNRM-C according to procedures specified in IETF RFC 4825 [19] "POST Handling";

b) shall generate an HTTP 200 (OK) response message according to IETF RFC 2616 [15]. In the HTTP 200 (OK) response message, the SNRM-S:

1) shall set the Request-URI to the URI corresponding to the identity of the VAL server;

2) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info+xml";

3) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-bearers> element in the <mbms-info> root element which:

   i) shall include a <result> element set to "success" or "failure" indicating success or failure of the MBMS bearers request operation;

   ii) may include a <TMGI> element set to a TMGI value;

   iii) shall include a <user-plane-address> element set to the BM-SC user plane IP address and port; and

   iv) may include a <service-description> element indicating MBMS bearer related configuration information as defined in 3GPP TS 26.346 [10]; and

c) shall send the HTTP 200 (OK) response message towards the VAL server according to IETF RFC 2616 [15].

6.2.3.2.3 Client procedure

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with one or more <announcement> element(s);

the NRM-C:

a) shall store the content of the <announcement> elements and generate an HTTP POST request message according to IETF RFC 2616 [15]. In the HTTP POST request message, the SNRM-C:

1) shall set the Request-URI to the URI corresponding to the identity of the SNRM-S;

2) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

3) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> subelement which:

   i) shall include an <identity> element set to the identity of the VAL user or VAL UE who wants to report the MBMS listening status;

   ii) shall include one or more <TGMI> elements for which the listening status applies;

   iii) shall include an <mbms-listening-status> element set to "listening" if the SNRM-C is listening to the MBMS bearer or "not-listening" if the SNRM-C is not listening;

   iv) may include an <mbms-reception-quality-level> element set to the reception quality level per TMGI; and

b) shall send the HTTP POST request towards the SNRM-S according to IETF RFC 2616 [15].

6.2.3.3   MBMS bearer announcement over MBMS bearer procedure

6.2.3.3.1   General

The availability of a MBMS bearer is announced to SNRM-Cs by means of an MBMS bearer announcement message. One or more MBMS bearer announcement elements are included in an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body.

An MBMS bearer announcement message can contain new MBMS bearer announcements, updated MBMS bearer announcements or cancelled MBMS bearer announcements or a mix of all of them at the same time in an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body. Each initial MBMS bearer announcement message announces one MBMS bearer intended to carry a general purpose MBMS subchannel used for application level multicast signalling in a specified MBMS service area and additionally, the message could also announce zero or more extra MBMS bearers intended to carry media and media control.

NOTE 1:   A new MBMS bearer announcement does not implicitly remove previously sent MBMS bearer announcements if the previously sent MBMS bearer announcement is not included in an MBMS bearer announcement message.

NOTE 2:   The SNRM-C will use the same identity which has been authenticated by VAL service with SIP core using SIP based REGISTER message. If VAL service do not support SIP protocol, then HTTP based method needs to be used.

NOTE 3:   The VAL service can select appropriate procedure(s) based on service specific requirements. If the VAL service supports both HTTP and SIP, HTTP is prior.

When and to whom the SNRM-S sends the MBMS bearer announcement is based on local policy in the SNRM-S.

6.2.3.3.2   Server procedure

6.2.3.3.2.1   Generate MBMS bearer announcement message

For each SNRM-C that the SNRM-S is sending an MBMS bearer announcement to, the SNRM-S:

a)   shall generate an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with the <version> element set to "1" and one or more <announcement> elements associated with the pre-activated MBMS bearers. Each set of an <announcement> element:

    1)   shall include a <TMGI> element set to a TMGI value;

NOTE 1:   The same TMGI value can only appear in one <announcement> element. The TMGI value is also used to identify the <announcement> when updating or cancelling the <announcement> element.

NOTE 2:   The security key active for the general purpose MBMS subchannel on which the mapping (i.e. the Map Group To Bearer message) of media or media control to this MBMS bearer was indicated, is used for MBMS subchannels on this MBMS bearer, unless a different key or an indication of not using encryption is in place.

    2)   may include an <alternative-TMGI> element set to a list of additional alternative TMGI used in roaming scenarios;

    3)   may include the QCI value in the <QCI> element;

    4)   shall include one or more MBMS service area IDs in <mbms-service-area-id> elements in the <mbms-service-areas> element;

NOTE 3:   Initial mappings of groups to MBMS subchannels on an MBMS bearer for the purpose of carrying media or media control can occur only where the MBMS service area for this bearer and the MBMS service area for the bearer carrying the general purpose MBMS subchannel on which the Map Group To Bearer message is sent intersect. However, once media or media control were successfully mapped to this bearer, the reception by the SNRM-C can continue (until Unmap Group To Bearer is received or until timeout) throughout the entire MBMS service area of this bearer.

    5)   if multiple carriers are supported, shall include the frequency to be used in the <frequency> element;

NOTE 4: In the current release if the <frequency> element is included, the frequency in the <frequency> element is the same as the frequency used for unicast.

6) shall include a <seal-mbms-sdp> element set to the SDP with media and application control information applicable to groups that can use this bearer;

7) may include a <monitoring-state> element set to "monitoring" or "not-monitoring" used to control if the client is actively monitoring the MBMS bearer quality or not;

8) may include an <announcement-acknowlegement> element set to "true" or "false" indicating if the NRM server requires an acknowledgement of the MBMS bearer announcement;

9) may include an <unicast-status> element used to indicate the listening status of the unicast bearer which is requested;

10) if the packet headers are compressed with ROHC specified in IETF RFC 5795 [20] in this MBMS bearer, shall include a <seal-mbms-rohc> element.

6.2.3.3.2.1.1 SIP based procedure

If the VAL service supports SIP, the SNRM-S shall generate an SIP MESSAGE request in accordance with 3GPP TS 24.229 [6] and IETF RFC 3428 [17] with the constructed application/vnd.3gpp.seal-mbms-usage-info +xml MIME body as specified in clause 6.2.3.3.2.1. In the SIP MESSAGE request, the SNRM-S:

a) shall set the Request-URI to the URI received in the To header field in a third-party SIP REGISTER request;

b) shall include an Accept-Contact header field with the g.3gpp.icsi-ref media-feature tag with the value of "urn:urn-7:3gpp-service.ims.icsi.seal" along with parameters "require" and "explicit" according to IETF RFC 3841 [18];

c) shall include a P-Asserted-Service header field with the value "urn:urn-7:3gpp-service.ims.icsi.seal";

d) shall include the MBMS public service identity of the SNRM-S in the P-Asserted-Identity header field;

e) shall include in a MIME body with Content-Type header field set to "application/vnd.3gpp.seal-info+xml", the <seal-request-uri> element set to the VAL user ID of the user; and

f) shall send the SIP MESSAGE request towards the SNRM-C according to 3GPP TS 24.229 [6].

6.2.3.3.2.1.2 HTTP based procedure

If the VAL service does not support SIP, the SNRM-S shall generate an HTTP POST request message in accordance with IETF RFC 2616 [15] with the constructed application/vnd.3gpp.seal-mbms-usage-info +xml MIME body as specified in clause 6.2.3.3.2.1. In the HTTP POST request message, the SNRM-S:

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

b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

c) shall include in a MIME body with Content-Type header field set to "application/vnd.3gpp.seal-info+xml", the <seal-request-uri> element set to the VAL user ID of the user; and

d) shall send the HTTP POST request towards the SNRM-C according to IETF RFC 2616 [15].

6.2.3.3.2.2 MBMS bearer de-announcement procedure

When the SNRM-S wants to cancel an MBMS bearer announcement associated with an <announcement> element, the SNRM-S sends an MBMS bearer announcement as specified in clause 6.2.3.3.2.1 where the SNRM-S in the <announcement> element to be cancelled. The SNRM-S:

a) shall include the same TMGI value as in the <announcement> element to be cancelled in the <TMGI> element; and

b) shall not include an <mbms-service-areas> element.

6.2.3.3.3 Client procedure

Upon receiving a SIP MESSAGE request containing:

    a) a P-Asserted-Service header field containing the "urn:urn-7:3gpp-service.ims.icsi.seal"; and

    b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body containing one or more <announcement> element(s);

or an HTTP POST request message containing:

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

    b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body containing one or more <announcement> element(s);

the SNRM-C for each <announcement> element in the application/vnd.3gpp.seal-mbms-usage-info+xml MIME body:

    a) if the <mbms-service-areas> element is present:

        1) if an <announcement> element with the same value of the <TMGI> element is already stored:

            i) shall replace the old <announcement> element with the <announcement> element received in the application/vnd.3gpp.seal-mbms-usage-info+xml MIME body;

        2) if there is no <announcement> element with the same value of the <TMGI> element stored:

            i) shall store the received <announcement> element;

        3) shall store the MBMS public service identity of the SNRM-S received in the P-Asserted-Identity header field and associate the MBMS public service identity with the new <announcement> element;

        4) if there is an <announcement-acknowlegement> element set to "true", shall send an acknowledgement of the MBMS bearer to the SNRM-S;

        5) shall check the condition for sending a listening status report;

    b) if no <mbms-service-areas> element is present:

        1) shall discard a previously stored <announcement> element identified by the value of the <TMGI>; and

        2) check the condition for sending a listening status report;

    c) if the <monitoring-state> element is present:

        1) if the <monitoring-state> is set to "monitor", shall start to monitor the MBMS bearer quality; and

        2) if the <monitoring-state> is set to "not-monitor", shall stop monitoring the MBMS bearer quality; and

    d) if the <unicast-status> element is present, shall include the <unicast-listening-status> element in the MBMS listening status report message.

6.2.3.4 MBMS bearer quality detection procedure

    NOTE 1: The SNRM-C will use the same identity which has been authenticated by VAL service with SIP core using SIP based REGISTER message. If VAL service do not support SIP protocol, then HTTP based method needs to be used.

    NOTE 2: The VAL service can select appropriate procedure(s) based on service specific requirements. If the VAL service supports both HTTP and SIP, HTTP is prior.

6.2.3.4.1 Client procedure

Upon determining the MBMS bearer quality, if the MBMS bearer quality reaches a certain threshold, the SNRM-C shall report the MBMS listening status. The SNRM-C:

NOTE 1: The SNRM-C may determine the MBMS bearer quality by using the BLER of the received data. When no data is received, the quality estimation can consider the reference signals and the modulation and coding scheme (MCS). The UE may also use predictive methods to estimate the expected MBMS bearer quality (e.g. speed and direction) to proactively inform the NRM server of an expected loss of the MBMS bearer quality.

NOTE 2: The threshold used to indicate MBMS bearer quality depends on VAL service type and the metrics used. The metrics used and the associated thresholds are out of scope of this specification.

NOTE 3: The application/vnd.3gpp.seal-mbms-usage-info+xml can contain both the listening status "listening" and "not listening" at the same time.

a) shall generate an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> element in the <mbms-info> root element which;

    1) shall include an <identity> element set to the identity of the VAL user or VAL UE who wants to report the MBMS listening status;

    2) shall include an <mbms-listening-status> element set to "listening" if the SNRM-C is listening to the MBMS bearer or "not-listening" if the SNRM-C is not listening;

    3) shall include one or more <TGMI> elements for which the listening status applies;

    4) may include an <mbms-reception-quality-level> element set to the reception quality level per TMGI; and

    5) if the <unicast-status> element is present in the MBMS announcement message, shall include an <unicast-listening-status> element set to "listening" or "not-listening" indicating the unicast listening status.

6.2.3.4.1.1 SIP based procedure

If the VAL service supports SIP, the SNRM-S shall generate a SIP MESSAGE request according to 3GPP TS 24.229 [6] and IETF RFC 3428 [17] with the constructed application/vnd.3gpp.seal-mbms-usage-info +xml MIME body as specified in clause 6.2.3.4.1 and the application/vnd.3gpp.seal-info+xml MIME body. In the SIP MESSAGE request, the SNRM-C:

a) shall include a Request-URI set to the MBMS public service identity of the SNRM-S received in the P-Asserted-Identity header field of the announcement message;

b) shall include an Accept-Contact header field with the g.3gpp.icsi-ref media-feature tag with the value of "urn:urn-7:3gpp-service.ims.icsi.seal" along with parameters "require" and "explicit" according to IETF RFC 3841 [18];

c) should include a public user identity in the P-Preferred-Identity header field as specified in 3GPP TS 24.229 [6];

d) shall include a P-Preferred-Service header field with the value "urn:urn-7:3gpp-service.ims.icsi.seal";

e) shall send the SIP MESSAGE request according to 3GPP TS 24.229 [6].

6.2.3.4.1.2 HTTP based procedure

If the VAL service does not support SIP, the SNRM-S shall generate an HTTP POST request message in accordance with IETF RFC 2616 [15] with the constructed application/vnd.3gpp.seal-mbms-usage-info +xml MIME body as specified in clause 6.2.3.4.1 and the application/vnd.3gpp.seal-info+xml MIME body. In the HTTP POST request message, the SNRM-C:

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

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

c) shall send the HTTP POST request towards the SNRM-S according to IETF RFC 2616 [15].

6.2.3.4.2 Server procedure

6.2.3.4.2.1 SIP based procedure

Upon receiving a SIP MESSAGE request containing:

    a) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status> element and an <mbms-reception-quality-level> element;

the SNRM-S:

    a) shall verify that the public user identity in the P-Asserted-Identity header field is bound to theVAL user ID in the <seal-request-uri> element in the application/vnd.3gpp.seal-info+xml MIME body;

    b) may send an MBMS bearer announcement message as specified in clause 6.2.3.3 with additional proposal for measurements, e.g. information about neighbouring MBMS bearers; and

    c) may send user plane delivery mode to VAL server based on the MBMS listening status to preserve the service continuity as described in clause 6.2.3.5.

6.2.3.4.2.2 HTTP based procedure

Upon receiving an HTTP POST request message containing:

    a) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status> element and an <mbms-reception-quality-level> element;

the SNRM-S:

    a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.3.4.1.2, and:

        1) if the identity of the sender of the received HTTP POST request is not authorized to detect MBMS bearer quality, shall respond with an HTTP 403 (Forbidden) response to the HTTP POST request and skip rest of the steps;

    b) may send an MBMS bearer announcement message as specified in clause 6.2.3.3 with additional proposal for measurements, e.g. information about neighbouring MBMS bearers; and

    c) may send user plane delivery mode to VAL server based on the MBMS listening status to preserve the service continuity as described in clause 6.2.3.5.

6.2.3.5 Service continuity in MBMS scenarios

6.2.3.5.1 Client procedure

If the VAL UE is located in MBSFN 1 and can listen to TMGI 1, where no additional MBMS bearers that the SNRM-C is interested in are active in the current cell, the SNRM-C shall send an MBMS listening status report with information related to TMGI 1 as specified in clause 6.2.3.4.1 towards the SNRM-S.

If the VAL UE moves into a new cell in which both TMGI 1 and TMGI 2 are active, the SNRM-C shall send a location information report as specified in 3GPP TS 24.545 clause 6.2.2.2.2 [8] towards the SNRM-S.

If the SNRM-C receives TMGI 1 and TMGI 2, the SNRM-C shall send an MBMS listening status report with information related to TMGI 1 and TMGI 2 as specified in clause 6.2.3.4.1 towards the SNRM-S.

If the VAL UE moves into a new cell in MBSFN area 2, where only TMGI 2 is active, the SNRM-C shall send an MBMS listening status report with information related to TMGI 2 as specified in clause 6.2.3.4.1 towards the SNRM-S.

6.2.3.5.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

1) if the identity of the sender of the received HTTP POST request is not authorized to report mbms listening status, 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 a SNRM-C according to procedures specified in IETF RFC 4825 [19] "POST Handling";

b) shall generate an HTTP POST request message according to IETF RFC 2616 [15]. In the HTTP POST request message, the SNRM-S:

1) shall include a Request-URI set to the URI corresponding to the identity of the VAL server;

2) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

3) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with a <user-plane-delivery-mode> element in the <mbms-info> root element which shall include:

i) a <delivery-mode> element indicating whether to deliver the user data to the UE(s) via unicast mode or multicast mode;

ii) an <MBMS-media-stream-id> element indicating the MBMS media stream to be used to deliver the media currently over unicast, or the MBMS media stream currently being used.; and

iii) one or more <unicast-media-stream-id> element(s), each element indicating the unicast media stream to be used to deliver the media currently over multicast, or the unicast to be stopped and switched to multicast; and

c) shall send the HTTP POST request towards the VAL server according to IETF RFC 2616 [15].

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <report> element in the <location-info> root element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

1) if the identity of the sender of the received HTTP POST request is not authorized to report location information, 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 a SNRM-C according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

b) shall send an MBMS bearer announcement message with information related to TMGI 2 as specified in clause 6.2.3.3 towards the SNRM-C.

6.2.3.6 MBMS suspension notification procedure

6.2.3.6.1 Client procedure

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-suspension-reporting-instruction> element in the <mbms-info> root element;

the SNRM-C shall send an HTTP 204 (No Content) response according to IETF RFC 2616 [15] towards the SNRM-S.

If the SNRM-C detects the MBMS suspension and has not received a <suspension-reporting> element set to "disable", the SNRM-C shall generate an HTTP POST request message according to IETF RFC 2616 [15]. In the HTTP POST request message, the SNRM-C:

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

b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

c) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-suspension-report> element in the <mbms-info> root element which:

   1) shall include an <identity> element set to the identity of the VAL user or VAL UE that reports MBMS suspension;

   2) if at least one MBMS bearer is about to be suspended:

      i) shall include an <mbms-suspension-status> element set to "suspending";

      ii) shall set the <number-of-reported-bearers> element to the total number of the included <suspended-TMGI> elements and <other-TMGI> elements;

      iii) shall include <suspended-TMGI> element(s) set to the TMGI value for each of the MTCHs on the same MCH corresponding to the MBMS bearers about to be suspended; and

      iv) may include <other-TMGI> elements, if available, corresponding to the TMGI values for other MTCHs on the same MCH as the MBMS bearers to be suspended; and

   3) if the MBMS bearer is no longer about to be suspended, shall include:

      i) an <mbms-suspension-status> element set to "not-suspending";

      ii) a <number-of-reported-bearers> element set to the number of included <suspended-TMGI> elements; and

      iii) a <suspended-TMGI> element set to the corresponding TMGI value for each of the MTCHs of the MBMS bearers that are no longer about to be suspended.

d) shall send the HTTP POST request message towards the SNRM-S according to IETF RFC 2616 [15].

6.2.3.6.2 Server procedure

If the SNRM-S decide on a subset of all VAL UEs in the MBMS broadcast area that shall report on MBMS bearer suspension, the SNRM-S shall generate an HTTP POST request message according to IETF RFC 2616 [15]. In the HTTP POST request message, the SNRM-S:

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

b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-mbms-usage-info +xml";

c) shall include an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-suspension-reporting-instruction> element in the <mbms-info> root element which:

   1) if a unicast bearer is used for MBMS suspension reporting, shall include:

      i) an <identity> element set to the identity of the VAL user or VAL UE that shall report MBMS suspension; and

      ii) a <suspension-reporting> element indicating to enable or disable the suspension reporting for the SNRM-C;

   2) if a multicast bearer is used for MBMS suspension reporting, shall include:

    i) a <suspension-reporting-client-subset> element containing a uniquely defined subset of NRM clients that shall report MBMS suspension; and

  d) shall send the HTTP POST request message towards the SNRM-C according to IETF RFC 2616 [15].

6.2.3.7 MBMS bearer event notification procedure

6.2.3.7.1 Server procedure

    NOTE   The details between the SNRM-S and EPS (BM-SC) are defined in 3GPP TS 29.468 [13].

Upon receiving an MBMS bearer event notification as described in the clause 6.4.5 of 3GPP TS 29.468 [13], the SNRM-S shall send a user plane delivery mode as described in clause 6.2.2.4.2 towards the VAL server.

6.2.3.8 Switching between MBMS bearer bearer and unicast bearer procedure

6.2.3.8.1 Client procedure

If the VAL UE detects changing MBMS bearer condition (good or bad MBMS coverage) for the corresponding MBMS service, the NRM-C shall send an MBMS listening status report as specified in clause 6.2.3.4.1 towards the SNRM-S.

6.2.3.8.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

  b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> element;

the SNRM-S:

  a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

    1) if the identity of the sender of the received HTTP POST request is not authorized to report mbms listening status, 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 a SNRM-C according to procedures specified in IETF RFC 4825 [19] "POST Handling";

  b) shall send a user plane delivery mode as described in clause 6.2.2.4.2 towards the VAL server.

6.2.3.9 Use of dynamic MBMS bearers procedure

6.2.3.9.1 VAL server procedure

If the VAL server uses a unicast bearer for communication with the UE on the DL at the start of the group communication session, in order to trigger to use an MBMS bearer in EPS for the DL VAL service communication, the VAL server shall send an MBMS bearer request message as described in clause 6.2.3.2.1 towards the SNRM-S.

6.2.3.9.2 Server procedure

Upon receiving an HTTP POST request message containing:

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

  b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with a <request> element in the <mbms-info> root element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

    1) if the identity of the sender of the received HTTP POST request is not authorized to request mbms resource, 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 a VAL server according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

b) shall determine to activate MBMS bearer, and then send an MBMS bearer announcement message as described in clause 6.2.3.2.2 towards the SNRM-C.

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with an <mbms-listening-status-report> element;

the SNRM-S:

a) shall determine the identity of the sender of the received HTTP POST request as specified in clause 6.2.1.1, and:

    1) if the identity of the sender of the received HTTP POST request is not authorized to report mbms listening status, 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 a SNRM-C according to procedures specified in IETF RFC 4825 [19] "POST Handling"; and

b) shall send an MBMS bearers response message as decribed in clause 6.2.3.2.2 towards the VAL server.

6.2.3.9.3 Client procedure

Upon receiving an HTTP POST request message containing:

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

b) an application/vnd.3gpp.seal-mbms-usage-info+xml MIME body with one or more <announcement> element(s);

the NRM-C:

a) shall store the content of the <anouncement> elements and starts monitoring data over MBMS associated with the TMGI, while in the service area associated with the TMGI; and

b) if the VAL UE detects that it is able to receive data over MBMS associated with the TMGI, shall send an MBMS bearer listening status report as described in clause 6.2.3.2.3 towards the SNRM-S.

6.3 Off-network procedures

The off-network procedures are out of scope of the present document in this release of the specification.

7 Coding

7.1 General

This clause specifies the coding to enable an SNRM-C and an SNRM-S to communicate.

7.2   Application unique ID

The AUID shall be set to the VAL service ID as specified in specific VAL service specification.

7.3   Structure

The network resource management document shall conform to the XML schema described in clause 7.4.

7.3.1   VALInfo document

The <seal-request-uri> element shall be the root element of the VALInfo document.

The <seal-request-uri> element shall include one of the followings:

   a) a <VAL-user-id> element may include a <VAL-client-id> element; or

   b) a <VAL-group-id> element.

7.3.2   UnicastInfo document

The <unicast-info> element shall be the root element of the UnicastInfo document.

The <unicast-info> element shall include one of the followings:

   a) a <request> element;r

   b) a <request-result> element;

   c) a <modification> element;

   d) a <modification-result> element;

   e) an <adaptation> element; or

   f) an <adaptation-result> element.

The <request> element shall include the followings:

   a) a <requester-identity> element;

   b) an <identity> element; and

   c) an optional < requirement-info> element.

The <modification> element shall include the followings:

   a) a <requester-identity> element;

   b) an <identity> element; and

   c) a <requirement-info> element.

The <adaptation> element shall include the followings:

   a) a <requester-identity> element;

   b) an <identity> element which shall include one of the following elements:

      1) a <VAL-ue-id-list> element which shall include:

         i)   one or more <VAL-ue-id> elements; and

      2) a <VAL-group-id> element; and

   c) a <requirement> element.

7.3.3 MBMSInfo document

The <mbms-info> element shall be the root element of the MBMSInfo document.

The <mbms-info> element shall include one of the followings:

   a) one or more <announcement> elements;

   b) an <mbms-listening-status-report> element;

   c) a <request> element;

   d) an <mbms-bearers> element;

   e) a <user-plane-delivery-mode> element;

   f) an <mbms-suspension-reporting-instruction> element; or

   g) an <mbms-suspension-report> element.

The <announcement> element shall include:

   a) a <TMGI> element;

   b) an optional <alternative-TMGI> element;

   c) an optional <QCI> element;

   d) an <mbms-service-areas> element which shall include:

      1) one or more <mbms-sa-id> elements;

   e) a <frequency> element;

   f) an <seal-mbms-sdp> element;

   g) an optional <monitoring-state> element;

   h) an optional <announcement-acknowlegement> element;

   i) an optional <unicast-status> element; and

   j) an optional <seal-mbms-rohc> element.

The <mbms-listening-status-report> element shall include:

   a) an <identity> element;

   b) a <TMGI> element;

   c) an <mbms-listening-status> element;

   d) an optional <mbms-reception-quality-level> elment; and

   e) an optional <unicast-listening-status> element.

The <request> element shall include:

   a) a <requester-indentity> element;

   b) a <VAL-group-id> element;

   c) a <service-anouncement-mode> element;

   d) a <QoS> element;

   e) an optional <broadcast area> element; and

   f) an <endpoint-info> element.

The <mbms-bearers> element shall include:

    a) a <result> element;

    b) an optional <TMGI> element;

    c) a <user-plane-address> element; and

    d) an optional <service-description> element.

The <user-plane-delivery-mode> element shall include:

    a) a <delivery-mode> element;

    b) an <MBMS-media-stream-id> element; and

    c) a <unicast-media-stream-id> element;

The <mbms-suspension-reporting-instruction> element shall include either the first two followings or the third following:

    a) an <identity> element;

    b) a <suspension-reporting> element; or

    c) a <suspension-reporting-client-subset> element which shall include:

       1) one or more <NRM-client-id> elements.

    The <mbms-suspension-report> element shall include:

    a) an <mbms-suspension-status> element;

    b) an <number-of-reported-bearers> element;

    c) one or more <suspended-TMGI> element; and

    d) an optional <other-TMGI> element.

7.4 XML schema

7.4.1 General

This clause defines the XML schemas for application/vnd.3gpp.seal-info+xml, application/vnd.3gpp.seal-unicast-info+xml and application/vnd.3gpp.seal-mbms-usage-info+xml.

7.4.2 XML schema for application/vnd.3gpp.seal-info+xml

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:sealInfo:1.0"
xmlns:sealinfo="urn:3gpp:ns:sealInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
  <!-- root XML element -->
  <xs:element name="seal-request-uri" type="sealinfo:sealinfo-Type" id="info"/>
  <xs:complexType name="sealinfo-Type">
    <xs:sequence>
      <xs:element name="VAL-user-id" type="sealinfo:contentType" minOccurs="0"/>
      <xs:element name="VAL-group-id" type="xs:string" 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:attribute name="type" type="sealinfo:protectionType"/>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
```

7.4.3 XML schema for application/vnd.3gpp.seal-unicast-info+xml

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:sealUnicastInfo:1.0"
xmlns:sealunicast="urn:3gpp:ns:sealUnicastInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
    <!-- the root element -->
    <xs:element name="seal-unicast-info" id="unicast">
    <xs:complexType>
    <xs:choice>
    <xs:element name="request" type="sealunicast:requestType"/>
    <xs:element name="request-result" type="xs:string"/>
    <xs:element name="modification" type="sealunicast:modificationType"/>
    <xs:element name="modification-result" type="xs:string"/>
    <xs:element name="adaptation" type="sealunicast:adaptationType"/>
    <xs:element name="adaptation-result" type="xs:string"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
    </xs:element>
    <xs:complexType name="requestType">
    <xs:sequence>
    <xs:element name="requesterID" type="xs:string" use="required"/>
    <xs:element name="ID" type="xs:string" use="required"/>
    <xs:element name="requirement-info" type="xs:string" use="optional"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>

</xs:schema>
    </xs:complexType>
    <xs:complexType name="modificationType">
    <xs:sequence>
    <xs:element name="requesterID" type="xs:string" use="required"/>
    <xs:element name="ID" type="xs:string" use="required"/>
    <xs:element name="requirement-info" type="xs:string" use="required"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    </xs:complexType>
    <xs:complexType name="adaptationType">
    <xs:sequence>
    <xs:element name="requesterID" type="xs:string" use="required"/>
    <xs:element name="ID" type="xs:string" use="required"/>
    <xs:element name="requirement-info" type="xs:string" use="required"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    </xs:complexType>
</xs:schema>
```

7.4.4 XML schema for application/vnd.3gpp.seal-mbms-usage-info+xml

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:sealMbmsInfo:1.0"
xmlns:sealmbms="urn:3gpp:ns:sealMbmsInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
    <!-- the root element -->
    <xs:element name="seal-mbms-usage-info" type="sealmbms:seal-mbms-usage-info-Type" id="mbms"/>
    <xs:complexType name="seal-mbms-usage-info-Type">
    <xs:sequence>
    <xs:element name="mbms-listening-status-report" type="sealmbms:mbms-listening-status-reportType"
    minOccurs="0"/>
    <xs:element name="mbms-suspension-report" type="sealmbms:mbms-suspension-reportType"
    minOccurs="0"/>
    <xs:element name="announcement" type="sealmbms:announcementTypeParams" minOccurs="0"/>
```

```
    <xs:element name="user-plane-delivery-mode" type="sealmbms:user-plane-delivery-modeType"
minOccurs="0"/>
    <xs:element name="mbms-suspension-reporting-instruction" type="sealmbms:mbms-suspension-
reporting-instructionType" minOccurs="0"/>
    <xs:element name="request" type="sealmbms:requestType" minOccurs="0"/>
    <xs:element name="version" type="xs:integer"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
    <xs:complexType name="mbms-listening-status-reportType">
    <xs:sequence>
    <xs:element name="ID" type="xs:string"/>
    <xs:element name="TMGI" type="xs:hexBinary" maxOccurs="unbounded"/>
    <xs:element name="mbms-listening-status" type="xs:string"/>
    <xs:element name="mbms-reception-quality-level" type="xs:integer"/>
    <xs:element name="unicast-listening-status" type="xs:string"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
    <xs:complexType name="mbms-suspension-reportType">
    <xs:sequence>
    <xs:element name="mbms-suspension-status" type="xs:string" minOccurs="0" maxOccurs="1"/>
    <xs:element name="number-of-reported-bearers" type="xs:integer" minOccurs="0" maxOccurs="1"/>
    <xs:element name="suspended-TMGI" type="xs:hexBinary" minOccurs="0"/>
    <xs:element name="other-TMGI" type="xs:hexBinary" minOccurs="0" maxOccurs="unbounded"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
    <xs:complexType name="announcementTypeParams">
    <xs:sequence>
    <xs:element name="TMGI" type="xs:hexBinary" minOccurs="1"/>
    <xs:element name="alternative-TMGI" type="xs:hexBinary" minOccurs="0"/>
    <xs:element name="QCI" type="xs:integer" minOccurs="0"/>
    <xs:element name="frequency" type="xs:unsignedLong" minOccurs="0"/>
    <xs:element name="mbms-service-areas" type="sealmbms:mbms-service-areasType" minOccurs="0"/>
    <xs:element name="seal-mbms-sdp" type="xs:string"/>
    <xs:element name="monitoring-state" type="xs:string" minOccurs="0"/>
    <xs:element name="announcement-acknowlegement" minOccurs="0"/>
    <xs:element name="unicast-status" type="xs:string" minOccurs="0"/>
    <xs:element name="seal-mbms-rohc" 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="mbms-service-areasType">
    <xs:sequence>
        <xs:element name="mbms-service-area-id" type="xs:hexBinary"
        minOccurs="1" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute/>
    </xs:complexType>
<xs:complexType name="user-plane-delivery-modeType">
    <xs:sequence>
    <xs:element name="delivery-mode" type="xs:string" minOccurs="1"/>
    <xs:element name="MBMS-media-stream-id" type="xs:string" minOccurs="1"/>
    <xs:element name="unicast-media-stream-id" type="xs:string" 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="mbms-suspension-reporting-instructionType">
    <xs:sequence>
    <xs:element name="suspension-reporting" type="xs:string" minOccurs="1"/>
    <xs:element name="suspension-reporting-client-subset" type="sealmbms:suspension-reporting-
client-subsetType" minOccurs="1"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
    </xs:complexType>
<xs:complexType name="suspension-reporting-client-subsetType">
    <xs:sequence>
    <xs:element name="NRM-client-id" type="xs:string" minOccurs="1" maxOccurs="unbounded"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
```

```
        </xs:complexType>
</xs:schema>
```

7.5   Data semantics

7.5.1   VALInfo document

The <seal-request-uri> element is the root element of the XML document. The < seal-request-uri> element contains contains one of following sub-elements:

a) <VAL-user-id>, an element contains the identity of the VAL user. This element contains an optional <VAL-client-id> attribute that contains the identity of the VAL client; or

b) <VAL-group-id>, an element contains the group identity of a set of VAL users or VAL clients according to the VAL service.

The recipient of the XML ignores any unknown element and any unknown attribute.

7.5.2   UnicastInfo document

The recipient of the XML ignores any unknown element and any unknown attribute.

The <unicast-info> element is the root element of the XML document. The <unicast-info> element contains a <request> or <request-result> element.

<request> is an optional element used to include the unicast resource management requested information. The <request> element contains the following sub-elements:

a) <requester-identity>, an element contains the identity of the VAL server performing the request;

b) <identity>, an element contains the identity of the VAL user or VAL UE; and

c) <requirement-info>, an optional element contains the requested unicast resource information.

<request-result> contains a string set to either "success" or "failure" used to indicate success or failure of the resource request operation ".

<modification> contains the following sub-elements:

a) <requester-identity>, an element contains the identity of the VAL server performing the request;

b) <identity>, an element contains the identity of the VAL user or VAL UE; and

c) <requirement-info>, an element contains the modified unicast resource information.

<modification-result> contains a string set to either "success" or "failure" used to indicate success or failure of the resource modification request operation.

<adaptation> contains the following sub-elements:

a) <requester-identity>, an element contains the identity of the VAL server performing the request;

b) <identity>, an element contains one of the following elements:

1) <VAL-ue-id-list>, an element contains one or more <VAL-ue-id> elements. Each <VAL-ue-id> element contains the identity of the VAL UE for whom the network resource adaptation occurs; and

2) <VAL-group-id>, an element contains the identity of the VAL group for whom the network resource adaptation occurs; and

c) <requirement>, an element contains VAL service QoS requirements as applied for the corresponding VAL UEs or group of UEs.

<adaptation-result> contains a string set to either "success" or "failure" used to indicate success or failure of the network resource adaptation with the underlying network.

7.5.3   MBMSInfo document

The recipient of the XML ignores any unknown element and any unknown attribute.

The <mbms-info> element is the root element of the XML document. The <mbms-info> element contains one or more <announcement> subelements, the <mbms-listening-status-report> subelement, the <request> subelement, the <mbms-bearers> subelement, the <user-plane-delivery-mode> subelement, the <mbms-suspension-reporting-instruction> subelement and the <mbms-suspension-report> subelement.

<announcement> element contains the following sub-elements:

a) <TMGI>, an element contains the TMGI. The <TMGI> element is coded as described in 3GPP TS 24.008 [5] clause 10.5.6.13 excluding the Temporary mobile group identity IEI and the Length of temporary mobile group identity contents (octet 1 and octet 2 in 3GPP TS 24.008 [5] clause 10.5.6.13);

b) <alternative-TMGI>, an optional element contains a list of additional alternative TMGI used in roaming scenarios;

c) <QCI>, an optional element contains the QCI information used by the ProSe UE-Network Relay to determine the ProSe Per-Packet Priority value to be applied for the multicast packets relayed to Remote UE over PC5. QCI values are defined in 3GPP TS 23.203 [4];

d) <mbms-service-areas>, an element contains a list of MBMS service area IDs for the applicable MBMS broadcast area as specified in 3GPP TS 23.003 [3] for service area identifier (SAI), and with the encoding as specified in 3GPP TS 29.061 [11] for the MBMS-Service-Area AVP;

e) <frequency>, an optional element contains identification of frequency in case of multi carrier support. The <frequency> element is coded as specified in 3GPP TS 29.468 [13];

f) <seal-mbms-sdp>, an element contains SDP with media and application control information applicable to groups that can use this bearer;

g) <monitoring-state>, an optional element contains a string used to control if the client is actively monitoring the MBMS bearer quality or not:

  - The value "monitor" indicates that the SNRM-C shall monitor the MBMS bearer quality; and

  - The value "not-monitor" indicates that the SNRM-C shall not monitor the MBMS bearer quality;

h) <announcement-acknowlegement>, presence of the <announcement-acknowlegement> element indicates the NRM server requires an acknowledgement of the MBMS bearer announcement;

i) <unicast-status>, presence of the <unicast-status> element indicates the listening status of the unicast bearer is requested; and

j) <seal-mbms-rohc>, presence of the <seal-mbms-rohc> element indicates that the flows delivered by the announced MBMS bearer are header compressed with ROHC as specified in IETF RFC 5795 [20] and IETF RFC 3095 [16].

<mbms-listening-status-report> element contains the following sub-elements:

a) <identity>, an element contains the identity of the VAL user or VAL UE who wants to report the MBMS listening status;

b) <TMGI>, an element contains the TMGI. The <TMGI> element is coded as described in 3GPP TS 24.008 [5] clause 10.5.6.13 excluding the Temporary mobile group identity IEI and the Length of temporary mobile group identity contents (octet 1 and octet 2 in 3GPP TS 24.008 [5] clause 10.5.6.13);

c) <mbms-listening-status>, an element contains a string "listening" or "not-listening" used to indicate the MBMS listening status per TMGI;

d) <mbms-reception-quality-level>, an optional element contains an integer used to indicate the reception quality level per TMGI; and

e) <unicast-listening-status>, an optional element contains a string "listening" or "not-listening" used to indicate the unicast listening status.

<request> is an element used to include the multicast resource management requested information. The <request> element contains the following sub-elements:

    a) <requester-indentity>, an element contains the identity of the VAL server performing the request;

    b) <VAL-group-id>, an element contains the identity of the VAL group that the MBMS bearer is requested for;

    c) <service-anouncement-mode>, an element contains a string used to indicate whether the request is sent by NRM server or by the VAL server:

      -   The value "NRM-S" indicates the request is sent by NRM server;

      -   The value "VAL-server" indicates the request is sent by the VAL server;

    d) <QoS>, an element contains the requested QoS information for the bearer;

    e) <broadcast-area>, an optional element specifying the serving MBMS service area id where the MBMS bearer is requested for; and

    f) <endpoint-info>, an element contains the information of the endpoint of the VAL server to which the user plane notifications have to be sent.

<mbms-bearers> element contains the following sub-elements:

    a) <result>, an element contains a string either "success" or "failure" indicating success or failure of the MBMS bearers request operation;

    b) <TMGI>, an optional element contains the TMGI. The <TMGI> element is coded as described in 3GPP TS 24.008 [5] clause 10.5.6.13 excluding the Temporary Mobile Group Identity IEI and Length of Temporary Mobile Group Identity contents (octet 1 and octet 2 in 3GPP TS 24.008 [5] clause 10.5.6.13);

    c) <user-plane-address>, an element contains the BM-SC user plane IP address and port; and

    d) <service-description>, an optional element contains the MBMS bearer related configuration information as defined in 3GPP TS 26.346 [10];

<user-plane-delivery-mode> element contains the following sub-elements:

    a) <delivery-mode>, an element contains a string used to indicate whether to deliver the user data to the UE(s) via unicast mode or multicast mode:

      -   The value "unicast" indicates to deliver the user data to the UE(s) via unicast mode;

      -   The value "multicast" indicates to deliver the user data to the UE(s) via mulicast mode;

    b) <MBMS-media-stream-id>, an element set to the MBMS media stream ID indicating the MBMS media stream to be used to deliver the media currently over unicast, or the MBMS media stream currently being used; and

    c) one or more <unicast-media-stream-id> element(s), each element set to the unicast media stream ID indicating the unicast media stream to be used to deliver the media currently over multicast, or the unicast to be stopped and switched to multicast.

<mbms-suspension-reporting-instruction> contains the following sub-elements:

    a) <identity>, an element contains the identity of the VAL user or VAL UE that reports MBMS suspension in case of a unicast bearer is used for MBMS suspension reporting;

    b) <suspension-reporting>, an element contains a string used to enable or disable the suspension reporting for the SNRM-C in case of a unicast bearer is used for MBMS suspension reporting:

      -   The value "enable" indicates to enable the suspension reporting;

      -   The value "disable" indicates to disable the suspension reporting; and

    c) <suspension-reporting-client-subset>, an element contains one or more <NRM-client-id> child elements set to the identities of the NRM clients that shall report MBMS suspension in case of a multicast bearer is used for MBMS suspension reporting;

<mbms-suspension-report> element contains the following sub-elements:

a) <mbms-suspension-status>, an element contains a string used to indicate the MBMS bearers intended suspension status:

- The value "suspending" indicates that the RAN has decided to suspend the referenced MBMS bearer(s) at the beginning of the next MCCH modification period;

- The value "not-suspending" indicates that the RAN has decided to revoke its decision to suspend the referenced MBMS bearer(s) before the beginning of the next MCCH modification period;

b) <number-of-reported-bearers>, an element contains a hex binary number denoting the total number of occurrences of the <suspended-TMGI> and <other-TMGI> elements reported as part of the MBMS bearer suspension status;

c) <suspended-TMGI>, an element contains a TMGI that is being reported as about to be suspended or as no longer about to be suspended; and

d) <other-TMGI>, an element contains a TMGI that is not being reported as about to be suspended or as no longer about to be suspended, but which shares the same MCH with MBMS bearers reported in the <suspended-TMGI> elements;

7.6   MIME types

The MIME type for the VALInfo document shall be "application/vnd.3gpp.seal-info+xml MIME body".

The MIME type for the UnicastInfo document shall be "application/vnd.3gpp.seal-unicast-info+xml MIME body".

The MIME type for the MBMSInfo document shall be "application/vnd.3gpp.seal-mbms-usage-info+xml MIME body".

7.7   IANA registration template

Editor's note: The registration should be made after approval of the specification.

7.7.1 IANA registration template for VALInfo

Your Name:

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

application/vnd.3gpp.seal-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 SIP or in HTTP, so the security considerations from IETF RFC 3261 apply while exchanging information in SIP and 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.

Mechanisms for privacy and integrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229.

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 24.548 "Network Resource Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification" version 16.0.0, available via http://www.3gpp.org/specs/numbering.htm.

Applications which use this media type:

Applications supporting the SEAL network resource 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>

7.7.2   IANA registration template for UnicastInfo

Your Name:

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

application/vnd.3gpp.seal-unicast-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 SIP or in HTTP, so the security considerations from IETF RFC 3261 apply while exchanging information in SIP and 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.

Mechanisms for privacy and integrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229.

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 24.548 "Network Resource Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification" version 16.0.0, available via http://www.3gpp.org/specs/numbering.htm.

Applications which use this media type:

Applications supporting the SEAL network resource 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>

7.7.3 IANA registration template for MBMSInfo

Your Name:

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

application/vnd.3gpp.seal-mbms-usage-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 SIP or in HTTP, so the security considerations from IETF RFC 3261 apply while exchanging information in SIP and 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.

Mechanisms for privacy and integrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229.

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 24.548 "Network Resource Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification" version 16.0.0, available via http://www.3gpp.org/specs/numbering.htm.

Applications which use this media type:

Applications supporting the SEAL network resource 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 (informative):
Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2019-10	CT1#120	C1-196358				Draft skeleton provided by the rapporteur.	0.0.0
2019-10	CT1#120					Implementing the following p-CRs agreed by CT1: C1-196361, C1-196615, C1-196616, C1-196858	0.1.0
2019-11	CT1#121					Implementing the following p-CRs agreed by CT1: C1-198610, C1-198611, C1-198612, C1-198819 Corrections done by the rapporteur.	0.2.0
2020-03	CT1#122-e					Implementing the following p-CRs agreed by CT1: C1-200527, C1-200615, C1-200616, C1-200881, C1-200882, C1-200904 Corrections done by the rapporteur.	0.3.0
2020-03	CT-87e	CP-200172				Presentation to TSG CT for information	
2020-04	CT1#123-e					Implementing the following p-CRs agreed by CT1: C1-202297, C1-202299, C1-202301, C1-202305, C1-202312, C1-202313, C1-202314, C1-202715, C1-202716, C1-202718, C1-202719, C1-202720, C1-202721, C1-202722, C1-202723, C1-202724, C1-202725, C1-202726, C1-202727, C1-202770, C1-202772 Corrections done by the rapporteur.	1.1.0
2020-06	CT1#124-e					Implementing the following p-CRs agreed by CT1: C1-203565, C1-203566, C1-203567, C1-204065, C1-204066, C1-204067, C1-204068, C1-204069, C1-204070, C1-204071 Corrections done by the rapporteur.	1.2.0
2020-06	CT-88e					Presentation to TSG CT for approval	2.0.0
2020-06	CT-88e					Version 16.0.0 created after approval	16.0.0
2020-09	CT-89e	CP-202163	0001		F	Miscellaneous editorial corrections	16.1.0
2020-09	CT-89e	CP-202163	0002		F	Correction to identity element of MBMS bearers request	16.1.0
2020-09	CT-89e	CP-202163	0003	1	F	Updates to MBMS bear quality detection procedure	16.1.0
2020-09	CT-89e	CP-202163	0004	1	F	Updates to user plane delivery mode	16.1.0

History

Document history		
V16.0.0	November 2020	Publication
V16.1.0	November 2020	Publication