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Protocol specification  
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# Foreword

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

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Version x.y.z

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  - 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 location 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 location management client functionality as described in 3GPP TS 23.434 [4], to the application server supporting the location management server functionality as described in 3GPP TS 23.434 [4] 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 23.003: "Numbering, addressing and identification".
- [3] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [4] 3GPP TS 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".
- [5] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".
- [6] 3GPP TS 24.547: "Identity management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".
- [7] Void.
- [8] IETF RFC 3261 (June 2002): "SIP: Session Initiation Protocol". [9] IETF RFC 4825: "The Extensible Markup Language (XML) Configuration Access Protocol (XCAP)".
- [10] IETF RFC 6050 (November 2010): "A Session Initiation Protocol (SIP) Extension for the Identification of Services"
- [11] IETF RFC 6665 (July 2012): "SIP-Specific Event Notification".
- [12] OMA OMA-TS-XDM\_Group-V1\_1\_1-20170124-A: "Group XDM Specification".
- [13] IETF RFC 6750: "The OAuth 2.0 Authorization Framework: Bearer Token Usage".
- [14] IETF RFC 3428 (December 2002): "Session Initiation Protocol (SIP) Extension for Instant Messaging".
- [15] 3GPP TS 24.379: "Mission Critical Push To Talk (MCPTT) call control Protocol specification".
- [16] IETF RFC 7231 (June 2014): "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content".

- [17] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".
- [18] 3GPP TS 29.549: "Service Enabler Architecture Layer for Verticals (SEAL); Application Programming Interface (API) 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 location management client:** An entity that provides the client side functionalities corresponding to the SEAL location management service.

**SEAL location management server:** An entity that provides the server side functionalities corresponding to the SEAL location management service.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.434 [4] 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].

SCEF	Service Capability Exposure Function
SEAL	Service Enabler Architecture Layer for verticals
SLM-C	SEAL Location Management Client
SLM-S	SEAL Location Management Server
VAL	Vertical Application Layer

---

## 4 General description

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

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## 5 Functional entities

### 5.1 SEAL location management client (SLM-C)

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

- a) shall support the role of XCAP client as specified in IETF RFC 4825 [9];
- b) shall support the role of XDMC as specified in OMA OMA-TS-XDM\_Core-V2\_1 [12];
- c) shall support the location management procedures in clause 6.2; and
- d) shall support the off-network location management procedure in clause 6.3.

## 5.2 SEAL location management server (SLM-S)

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

- a) shall support the role of XCAP server as specified in IETF RFC 4825 [9];
- b) shall support the role of XDMS as specified in OMA OMA-TS-XDM\_Core-V2\_1 [12]; and
- c) shall support the location management procedures in clause 6.2.

---

# 6 Location 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 SLM-S shall authenticate the identity of the sender of the HTTP request is authorized as specified in 3GPP TS 24.547 [6], and if authentication is successful, the SLM-S shall use the identity of the sender of the HTTP request as an authenticated identity.

#### 6.2.2 Event-triggered location reporting procedure

##### 6.2.2.1 General

The SLM-C sends a location reporting configuration request when it needs to fetch location reporting configuration from the SLM-S.

The SLM-C sends a location report when at least one of the trigger criteria is fulfilled. To send the location report the SLM-C can use an appropriate HTTP request message.

If a location reporting trigger is met, the SLM-C checks if the minimum-report-interval timer is running. If the timer is running, the SLM-C waits until the timer expires. When the minimum-report-interval timer expires, the SLM-C:

- a) shall send a location information report as specified in clause 6.2.2.2, if any of the reporting triggers are still met.

##### 6.2.2.2 Client procedure

###### 6.2.2.2.1 Fetching location reporting configuration

In order to fetch location reporting configuration, the SLM-C shall send an HTTP GET request message according to procedures specified in IETF RFC 7231 [16]. In the HTTP GET request message, the SLM-C:

- a) shall set the Request-URI to the URI identifying the XML document to be fetched. In the Request-URI;

- 1) the "aud" is set to specific VAL service identity; and
- 2) the document selector is set to a document URI pointing to the location reporting configuration document; and
- b) shall include an Authorization header field with the "Bearer" authentication scheme set to an access token of the "bearer" token type as specified in IETF RFC 6750 [13].

Upon receiving an HTTP 200 (OK) response from the SLM-S containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <configuration> element included in the <location-info> root element;

the SLM-C:

- a) shall store the content of the <configuration> elements;
- b) shall set the location reporting triggers accordingly; and
- c) shall start the minimum-report-interval timer.

#### 6.2.2.2.2 Location reporting

In order to report the location information, the SLM-C shall send an HTTP POST request message according to procedures specified in IETF RFC 7231 [16]. In the HTTP POST request message, the SLM-C:

- a) shall set the Request-URI to the URI included in the received HTTP response message for location report configuration;
- b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user for location report; and
  - 2) shall include a <report> element and, if the report was triggered by a location request, include the <report-id> attribute set to the value of the <request-id> attribute in the received request. The <report> element:
    - i) shall include a <trigger-id> child element set to the value of each <trigger-id> value of the triggers that have been met; and
    - ii) shall include the location reporting elements corresponding to the triggers that have been met;
- d) shall set the minimum-report-interval timer to the minimum-report-interval time and start this timer; and
- e) shall reset all the trigger criteria for location reporting.

#### 6.2.2.3 Server procedure

##### 6.2.2.3.1 Fetching location reporting configuration

Upon receiving of an HTTP GET request where the Request-URI of the HTTP GET request identifies a location reporting configuration document as specified in the specific vertical application, the SLM-S:

- a) shall determine the identity of the sender of the received HTTP GET request as specified in clause 6.2.1.1, and:
  - 1) if the identity of the sender of the received HTTP GET request is not authorized to fetch requested configuration document, shall respond with a HTTP 403 (Forbidden) response to the HTTP GET request and skip rest of the steps;

- b) shall support handling an HTTP GET request from a SLM-C according to procedures specified in IETF RFC 4825 [9] "GET Handling".
- c) shall generate an HTTP 200 (OK) response according to IETF RFC 7231 [16]. In the HTTP 200 (OK) response message, the SLM-S:
  - 1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
  - 2) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
    - i) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user requesting for location reporting configuration;
    - ii) shall include a <configuration> element which shall include at least one of the followings:
      - A) the location reporting elements which are requested;
      - B) a <triggering-criteria> child element which provides the triggers for the SLM-C to request a location report as described in clause 7; and
      - C) a <minimum-interval-length>child element specifying the minimum time between consecutive reports. The value is given in seconds;
  - 3) shall include the <trigger-id> attribute where defined for the sub-elements defining the trigger criterion; and
- d) shall send the HTTP 200 (OK) response towards the SLM-C.

#### 6.2.2.3.2 Location reporting

Upon reception of an HTTP POST request message containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <report> element included in the <location-info> root element;

where the Request-URI of the HTTP POST request identifies an element of a XML document as specified in application usage of the specific vertical application, the SLM-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 obtain location information of another VAL user, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and
  - 2) shall support handling an HTTP POST request from a SLM-C according to procedures specified in IETF RFC 4825 [9] where the Request-URI of the HTTP POST request identifies an element of XML document as specified in application usage of the specific vertical application. The SLM-S:
    - i) shall store the received location information of the reporting SLM-C; and
    - ii) shall use the location information as needed.

NOTE: The <report> element contains the event triggering identity in the location information report from the VAL client, and can contain location information.

### 6.2.3 On-demand location reporting procedure

#### 6.2.3.1 Client procedure

Upon receiving an HTTP POST request containing:

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

- b) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) an application/vnd.3gpp.seal-location-info+xml MIME body with a <request> element included in the <location-info> root element;

the SLM-C:

- a) may send a location report as specified in clause 6.2.2.2.2.

### 6.2.3.2 Server procedure

If the SLM-S needs to request the SLM-C to report its location, the SLM-S shall generate an HTTP POST request according to procedures specified in IETF RFC 7231 [16]. The SLM-S:

- a) shall include a Request-URI set to the URI corresponding to the identity of the SLM-C;
- b) shall include an Accept header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- d) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include a <requested-identity> element with a <VAL-user-id> child element set to the identity of the VAL user whose location is requested;
  - 2) shall include a <request> element; and
- e) shall send the HTTP POST request as specified in IETF RFC 7231 [16].

## 6.2.4 Client-triggered or VAL server-triggered location reporting procedure

### 6.2.4.1 Client procedure

Upon receiving a request from a VAL user to obtain the location information of another VAL user or to update the location reporting trigger, the SLM-C shall send an HTTP POST request according to procedures specified in IETF RFC 7231 [16]. In the HTTP POST request, the SLM-C:

- a) shall set the Request-URI to the URI included in the received HTTP response message for location report configuration;
- b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user which requests the location report;
  - 2) shall include a <requested-identity> element with a <VAL-user-id> child element set to the identity of the VAL user for which a location report is requested. The VAL user should belong to the same VAL service as the identity of the VAL user which requests the location report; and
  - 3) a <report-request> element which shall include at least one of the followings:
    - i) an <immediate-report-indicator> child element to indicate that an immediate location report is required;
    - ii) the location reporting elements which are requested;
    - iii) a <triggering-criteria> child element which indicate a specified location trigger criteria to send the location report;
    - iv) a <minimum-interval-length>child element specifying the minimum time between consecutive reports. The value is given in seconds; and

- v) if an <immediate-report-indicator> element is set to required, an <endpoint-info> child element set to the information of the endpoint of the requesting VAL server to which the location report notification has to be sent.

Upon reception of an HTTP POST request message containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <report> element included in the <location-info> root element;

where the Request-URI of the HTTP POST request identifies an element of a XML document as specified in application usage of the specific vertical application, the SLM-C shall follow the procedure as specified in clause 6.2.2.3.2.

## 6.2.4.2 Server procedure

Upon reception of an HTTP POST request where the Request-URI of the HTTP POST request identifies an element of a XML document as specified in application usage of the specific vertical application, the SLM-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 obtain location information of another VAL user, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and
  - 2) shall support handling an HTTP POST request from a SLM-C according to procedures specified in IETF RFC 4825 [9] where the Request-URI of the HTTP POST request identifies an element of XML document as specified in application usage of the specific vertical application. Depending on the information specified by the HTTP POST request, the SLM-S initiates either an event-triggered location reporting procedure as specified in clause 6.2.2.2 or an on-demand location reporting procedure as specified in clause 6.2.2.3 for providing the SLM-C with the location of the requested VAL user; and
- b) For on-demand location report request, upon receiving the location information of the SLM-C, the SLM-S sends location report to the requesting SLM-C or VAL server as specified in clause 6.2.2.2.

## 6.2.5 Location reporting triggers configuration cancel procedure

### 6.2.5.1 Client procedure

Upon receiving an HTTP POST request containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <configuration> element included in the <location-info> root element, which has none of child elements;

the SLM-C:

- a) shall delete the content of the <configuration> elements;
- b) shall stop the location reporting; and
- c) shall generate an HTTP 200 (OK) response to the received HTTP POST request message according to IETF RFC 7231 [16] and shall send it towards SLM-S.

### 6.2.5.2 Server procedure

Upon receiving an HTTP POST request containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <configuration> element included in the <location-info> root element, which has none of child elements;

the SLM-S:

- a) shall include a Request-URI set to the URI corresponding to the identity of the SLM-C;
- b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user for location reporting event triggers configuration cancellation;
  - 2) shall include a <configuration> element which shall not include any child element; and
- d) shall send the HTTP POST request as specified in IETF RFC 7231 [16].

Upon receiving response from the SLM-C, the SLM-S shall generate an HTTP 200 (OK) response to the received HTTP POST request message according to IETF RFC 7231 [16] and shall send it towards VAL server.

### 6.2.5.3 VAL Server procedure

The VAL Server (or authorized VAL user) may cancel the location reporting triggers configuration for the SLM-C by generating an HTTP POST request message according to procedures specified in IETF RFC 7231 [16]. The VAL server:

- a) shall include a Request-URI set to the URI corresponding to the identity of the SLM-S;
- b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include a <VAL-user-id> element set to the identity of the VAL user for location reporting event triggers configuration cancellation;
  - 2) shall include a <configuration> element which shall not include any child element; and
- d) shall send the HTTP POST request as specified in IETF RFC 7231 [16].

## 6.2.6 Location information subscription procedure

The VAL service 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.

### 6.2.6.1 VAL server procedure

#### 6.2.6.1.1 SIP based procedure

##### 6.2.6.1.1.1 Create subscription

In order to subscribe location information of one or more VAL users or VAL UEs, if VAL server supports SIP, the VAL server shall generate an initial SIP MESSAGE request according to 3GPP TS 24.229 [5] and IETF RFC 3428 [14]. In the SIP MESSAGE request, the VAL server:

- a) shall set the Request-URI to the public service identity identifying the originating SLM-S serving the VAL server;
- b) shall include the ICSI value "urn:urn-7:3gpp-service.ims.icsi.seal" (coded as specified in 3GPP TS 24.229 [5]), in a P-Preferred-Service header field according to IETF RFC 6050 [10];
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element;

- 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL server which requests the location information subscription;
- 2) shall include a <subscription> element which shall include:
  - i) an <identities-list> element with one or more <VAL-user-id> child elements set to the identities of the VAL users whose location information is requested;
  - ii) a <time-interval-length> element specifying the time between consecutive reports. The value is given in seconds; and
  - iii) an <expiry-time> element specifying the time when the VAL server wants to receive the current status and later notification; and
- d) shall send the SIP MESSAGE request towards the SLM-S according to 3GPP TS 24.229 [5].

Upon receiving a SIP MESSAGE with an application/vnd.3gpp.seal-location-info+xml MIME body, the VAL server:

- a) shall store the Subscription expiry value set in <expiry-time> element; and
- b) may start subscription refresh timer and set expiry time for the subscription refresh timer to the 2/3 of Subscription expiry value.

NOTE: It is upto implementation to refresh subscribe upon expiry of subscription refresh timer.

#### 6.2.6.1.1.2 Deleting subscription

In order to delete the subscription as identified by the subscription identifier, the VAL server:

- a) shall generate a SIP MESSAGE request according to 3GPP TS 24.229 [5] and IETF RFC 3428 [14];
- b) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element, the VAL server:
  - 1) a <subscription-identifier> element set to the subscription identifier value which uniquely identified the subscription; and
  - 2) set an <expiry-time> element to zero;
- c) shall send the SIP MESSAGE request towards the SLM-S according to 3GPP TS 24.229 [5].

Upon receiving a SIP MESSAGE with an application/vnd.3gpp.seal-location-info+xml MIME body containing <subscription-identifier> element along with <expiry-time> element set to zero, the VAL server:

- a) shall delete the subscription related data.

#### 6.2.6.1.2 HTTP based procedure

##### 6.2.6.1.2.1 Create subscription

If VAL server does not support SIP, the VAL server shall send an HTTP POST request to the SLM-S according to procedures specified in IETF RFC 7231 [16]. 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 SLM-S;
- b) shall include an Accept header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- d) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL server which requests the location information subscription; and
  - 2) shall include a <subscription> element as described in clause 6.2.6.1.1.1; and

- e) shall send the HTTP POST request towards the SLM-S as specified in IETF RFC 7231 [16].

Upon receiving an HTTP POST request with an application/vnd.3gpp.seal-location-info+xml MIME body, the VAL server:

- a) shall store the Subscription expiry value set in <expiry-time> element; and
- b) may start subscription refresh timer and set expiry time for the subscription refresh timer to the 2/3 of Subscription expiry value.

NOTE: It is upto implementation to refresh subscribe upon expiry of subscription refresh timer.

#### 6.2.6.1.2.2 Delete subscription

In order to delete the subscription as identified by the subscription identifier, the VAL server shall generate an HTTP POST request according to procedures specified in IETF RFC 7231 [16]. In the HTTP POST request message, the VAL server:

- a) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include a <subscription-identifier> element set to the subscription identifier value which uniquely identified the subscription; and
  - 2) shall include an <expiry-time> element set to zero;
- b) shall send the HTTP POST request towards the SLM-S as specified in IETF RFC 7231 [16].

Upon receiving an HTTP POST with an application/vnd.3gpp.seal-location-info+xml MIME body containing <subscription-identifier> element along with <expiry-time> element set to zero, the VAL server:

- a) shall delete the subscription related data.

### 6.2.6.2 Server procedure

#### 6.2.6.2.1 SIP based procedure

##### 6.2.6.2.1.1 Create subscription

Upon receiving a SIP MESSAGE request such that:

- a) Request-URI of the SIP MESSAGE request contains the public service identity identifying the SLM-S of the served VAL server;
- b) the ICSI value "urn:urn-7:3gpp-service.ims.icsi.seal" (coded as specified in 3GPP TS 24.229 [5]), in a P-Asserted-Service header field according to IETF RFC 6050 [10]; and
- c) the SIP MESSAGE request contains an application/vnd.3gpp.seal-location-info+xml MIME body with an <subscription> element included in the <location-info> root element;

the SLM-S:

- a) shall identify the served VAL user ID in the <identity> element of the application/vnd.3gpp.seal-location-info+xml MIME body of the SIP MESSAGE request;
- b) if the Request-URI of the SIP MESSAGE request contains the public service identity identifying the SLM-S serving the VAL server, shall identify the originating VAL user ID from public user identity in the P-Asserted-Identity header field of the SIP MESSAGE request;
- c) if the originating VAL user ID is different than the served VAL user ID, shall send a 403 (Forbidden) response and shall not continue with the rest of the steps; and
- d) shall generate a 200 (OK) response to the SIP MESSAGE request according to 3GPP TS 24.229 [5] and send it towards VAL server.

- e) shall store all users information contained in <VAL-user-id> element of <identities-list> element;
- f) shall store the expiry time for the subscription to the <expiry-time> value; if the expiry time value as present in <expiry-time> element is not acceptable to the SLM-S, the SLM-S may change the expiry time value to a lower value;
- g) shall store the time interval value to the <time-interval-length> element;
- h) shall generate and assign a unique integer as subscription identifier to the subscription request received from VAL server;
- i) shall generate a SIP MESSAGE request according to 3GPP TS 24.229 [5] and IETF RFC 3428 [14].
- j) In the SIP MESSAGE, the SLM-S shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element;
  - 1) shall include a <subscription> element which shall include:
    - i) a <subscription-identifier> element set to the unique subscription identifier which is assigned to the subscription request;
    - ii) an <expiry-time> element set to the accepted expiry time value; and
    - iii) if the VAL users whose location information is requested as present in <identities-list> element is not fully acceptable to the SLM-S, the SLM-S may change the VAL users to a subset and shall include an <identities-list> with one or more <VAL-user-id> child elements set to the identities of the new VAL users;
- k) shall send the SIP MESSAGE request towards the VAL server according to 3GPP TS 24.229 [5]; and
- l) shall start the timer TLM-1 (subscription expiry) and set the expiry time of the timer to the expiry time for the subscription.
- m) shall start the timer TLM-2 (notification interval) timer and set the internal time of the timer to the <time-interval-length> element value.

#### 6.2.6.2.1.2 Delete subscription

Upon receiving a SIP MESSAGE with an application/vnd.3gpp.seal-location-info+xml MIME body containing <subscription-identifier> element along with <expiry-time> element set to zero, the SLM-S:

- a) shall generate a SIP 200 (OK) response and send it towards VAL server;
- b) shall delete all information related to subscription;
- c) shall generate a SIP MESSAGE request according to 3GPP TS 24.229 [5] and IETF RFC 3428 [14].
- d) In the SIP MESSAGE, the SLM-S shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element;
  - 1) shall include a <subscription> element which shall include:
    - i) a <Subscription Identifier> element set to the unique subscription identifier which is assigned to the subscription request;
- d) shall send the SIP MESSAGE request towards the VAL server according to 3GPP TS 24.229 [5];
- e) shall stop TLM-1 (subscription expiry) timer if it is running; and
- f) shall stop TLM-2 (notification interval) timer if it is running.

#### 6.2.6.2.1.3 Expiry of TLM-1 (subscription expiry)

On expiry of TLM-1 (subscription expiry) timer, the SLM-S shall consider the subscription terminated and shall inform VAL server about subscription terminated. In order to notify the VAL server about the termination of the subscription, the SLM-S:

- a) shall generate a SIP MESSAGE request according to 3GPP TS 24.229 [5] and IETF RFC 6086 [r6086];
- b) shall include in the SIP MESSAGE request, an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element, the VAL server:
  - 1) a <subscription-identifier> element set to the subscription identifier value which uniquely identified the subscription; and
  - 2) set an <expiry-time> element to zero;
- c) shall send the SIP MESSAGE request towards the VAL server according to 3GPP TS 24.229 [5].

#### 6.2.6.2.1.4 Expiry of TLM-2 (notification interval) timer

On expiry of TLM-2 (notification interval) timer, the SLM-S shall check if any notification is pending to send or not. The SLM-S should follow procedure described in clause 6.2.7.2 to send notification if any pending notifications are present.

#### 6.2.6.2.2 HTTP based procedure

Upon receiving an HTTP POST request containing:

- a) an Accept header field set to "application/vnd.3gpp.seal-location-info+xml";
- b) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) an application/vnd.3gpp.seal-location-info+xml MIME body with a <subscription> element included in the <location-info> root element;

the SLM-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 subscribe location information of another VAL user or VAL UE, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;
  - 2) shall support handling an HTTP POST request from a SLM-C according to procedures specified in IETF RFC 4825 [9] "POST Handling";
  - 3) may initiate location reporting configuration with the location management client of the UE for immediate reporting as specified in clause 6.2.3.2; and
  - 4) may subscribe for the location of the UE as specified in clause 4.4.2.2.2 of 3GPP TS 29.122 [17];
- b) shall store the expiry time for the subscription to the <expiry-time> value. If the expiry time value as present in <expiry-time> element is not acceptable to the SLM-S, the SLM-S may change the expiry time value to a lower value;
- c) shall store the time interval value to the <time-interval-length> element. If the time interval value as present in <time-interval-length> element is not acceptable to the SLM-S, the SLM-S may change the time interval value to a lower value;
- d) shall generate and assign a unique integer as subscription identifier to the subscription request received from VAL server;
- e) shall store the users information contained in the <VAL-user-id> elements of <identities-list> element. If the VAL users whose location information is requested as present in <identities-list> element is not fully acceptable to the SLM-S, the SLM-S may change the VAL users to a subset and store the identities of the new VAL users;
- f) shall generate an HTTP 200 (OK) response according to IETF RFC 7231 [16]. In the HTTP 200 (OK) message, the SLM-S:
  - 1) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:

- i) a <subscription-identifier> element set to the unique subscription identifier which is assigned to the subscription request;
  - ii) an <expiry-time> element set to the accepted expiry time value; and
  - iii) if the VAL users whose location information is requested as present in <identities-list> element is not fully acceptable to the SLM-S, the SLM-S may change the VAL users to a subset and shall include an <identities-list> with one or more <VAL-user-id> child elements set to the identities of the new VAL users;
- g) shall send the HTTP 200 (OK) message towards the VAL server according to IETF RFC 7231 [16];
  - h) shall start the timer TLM-1 (subscription expiry) and set the expiry time of the timer to the expiry time for the subscription; and
  - i) shall start the timer TLM-2 (notification interval) timer and set the internal time of the timer to the <time-interval-length> element value.

Upon receiving an HTTP POST request with an application/vnd.3gpp.seal-location-info+xml MIME body containing <subscription-identifier> element along with <expiry-time> element set to zero, the SLM-S:

- a) shall delete all information related to subscription;
- b) shall generate an HTTP 200 (OK) message according to IETF RFC 7231 [16]. In the HTTP 200 (OK) message, the SLM-S shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include a <subscription> element which shall include:
    - i) a <Subscription Identifier> element set to the unique subscription identifier which is assigned to the subscription request;
- d) shall send the HTTP 200 (OK) message towards the VAL server according to IETF RFC 7231 [16];
- e) shall stop TLM-1 (subscription expiry) timer if it is running; and
- f) shall stop TLM-2 (notification interval) timer if it is running.

## 6.2.7 Event-triggered location information notification procedure

NOTE: The SLM-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.

### 6.2.7.1 Client procedure

Upon receiving a SIP NOTIFY request containing an application/vnd.3gpp.seal-location-info+xml MIME body with a <notification> element included in the <location-info> root element, or an HTTP POST request message containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <notification> element included in the <location-info> root element;

the SLM-C:

- a) shall store the received location information; and
- b) may share the information to a group or to another VAL user or VAL UE.

### 6.2.7.2 Server procedure

In order to notify the subscriber about the location information report, the SLM-S:

- a) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body containing:

- 1) an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user which subscribed to location of another VAL user or VAL UE; and
- 2) a <notification> element which shall include:
  - i) an <identities-list> element with one or more <VAL-user-id> child elements set to the identities of the VAL users whose location information needs to be notified;
  - ii) a <trigger-id> element set to the value of each <trigger-id> value of the triggers that have been met; and
  - iii) a <reports> element containing one or more <loc-info-report> elements. The <loc-info-report> shall include:
    - A) a <VAL-user-id> element set to the identity of the VAL user whose location information needs to be notified; and
    - B) the latest location information corresponding to the VAL user; and
- b) if SLM-C supports SIP, shall send a SIP NOTIFY request according to 3GPP TS 24.229 [5] and IETF RFC 6665 [11] with the constructed application/vnd.3gpp.seal-location-info+xml MIME body;
- c) if SLM-C does not support SIP, shall send an HTTP POST request message to the SLM-C according to procedures specified in IETF RFC 7231 [16] with the constructed application/vnd.3gpp.seal-location-info+xml MIME body and an Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml".

## 6.2.8 On-demand usage of location information procedure

### 6.2.8.1 VAL server procedure

If the VAL server needs to request UE location information, the VAL server shall send an HTTP POST request to the SLM-S according to procedures specified in IETF RFC 7231 [16]. 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 SLM-S;
- b) shall include an Accept header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- d) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL server which requests the location information; and
  - 2) shall include an <identities-list> element with one or more <VAL-user-id> child elements set to the identities of the VAL users whose location information is requested;

Upon receiving an HTTP 200 (OK) response from the SLM-S containing:

- a) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- b) an application/vnd.3gpp.seal-location-info+xml MIME body with a <reports> element included in the <location-info> root element;

the VAL server:

- a) shall store the received location information; and
- b) may share the information to a group or to another VAL user or VAL UE.

### 6.2.8.2 Server procedure

Upon receiving an HTTP POST request containing:

- a) an Accept header field set to "application/vnd.3gpp.seal-location-info+xml";
- b) a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
- c) an application/vnd.3gpp.seal-location-info+xml MIME body with an < identities-list > element included in the <location-info> root element;

the SLM-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 obtain location information of another VAL user, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps; and
- b) shall support handling an HTTP POST request from a SLM-C according to procedures specified in IETF RFC 4825 [9] "POST Handling";
- c) shall generate an HTTP 200 (OK) response according to IETF RFC 7231 [16]. In the HTTP 200 (OK) response message, the SLM-S:
  - 1) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml";
  - 2) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
    - i) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the VAL user for location reporting configuration;
    - ii) an <identities-list> element with one or more <VAL-user-id> child elements set to the identities of the VAL users whose location information is requested;
    - iii) a <reports> element containing one or more <loc-info-report> elements. The <loc-info-report> contains a <VAL-user-id> element set to the identity of the VAL user in the requested-identity-list and the latest location information corresponding to the VAL user; and
- d) shall send an HTTP 200 (OK) response towards the VAL server.

## 6.2.9 Query list of users based on location

### 6.2.9.1 Client procedure

The procedure defined in this clause can be used by SEAL server to query list of users based on given geolocation area.

In order to query the list of users based on given geolocation area, the client shall send an HTTP POST request message according to procedures specified in IETF RFC 7231 [16]. In the HTTP POST request message, the SLM-C:

- a) shall set the Request-URI to the URI corresponding to the identity of the SEAL server;
- b) shall include a Content-Type header field set to "application/vnd.3gpp.seal-location-info+xml"; and
- c) shall include an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
  - 1) shall include an <identity> element with a <VAL-user-id> child element set to the identity of the SEAL server querying list of users; and
  - 2) shall include an <location-based-query> element with a <polygon-area> child element or an <ellipsoid-arc-area> child element.

### 6.2.9.2 Server procedure

Upon reception of an HTTP POST request containing:

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

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

the SLM-S:

- a) shall authorize the identity of the sender of the received HTTP POST request; and
  - 1) if the identity of the sender of the received HTTP POST request is not authorized to obtain list of users based on given geolocation area, shall respond with a HTTP 403 (Forbidden) response to the HTTP POST request and shall skip rest of the steps;
- b) shall generate the list of users who are currently available in requested geographical area; and
- c) shall send an HTTP 200 (OK) response message to SLM-C. In the HTTP 200 (OK) response message, the SLM-S:
  - 1) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body containing:
    - i) an <identity> element with a <VAL-user-id> child element set to the identity of the SEAL server querying list of users; and
    - ii) a <location-based-response> element which shall include:
      - A) an <identities-list> element with one or more <VAL-user-id> child elements set to the identities of the VAL users to be queried;

## 6.2.10 Location area monitoring information procedure

In order to subscribe for monitoring location area, the SLM-C sends subscription request as specified in clause 5.2.6 and clause 6 of 3GPP TS 29.549 [18].

## 6.3 Off-network procedures

### 6.3.1 General

#### 6.3.1.1 SEAL Off-network Location Management message transport

In order to send the request, response or acknowledgement, the SEAL location management client:

- 1) shall send the message as a UDP message to the local IP address of the VAL user, to UDP port XXX, with an IP time-to-live set to 255; and
- 2) shall treat UDP messages received on the port TBD as received messages.

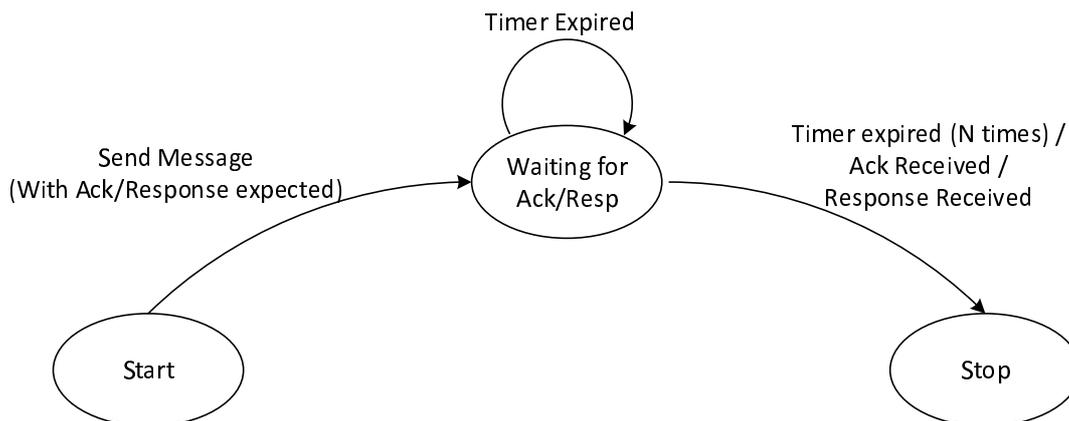
The SEAL Off-network Location Management message is the entire payload of the UDP message.

**Editor's note: The exact UDP port number on which the message is sent, is FFS.**

#### 6.3.1.2 Basic Message Control

##### 6.3.1.2.1 General

The figure 6.3.1.2.1-1 gives an overview of the main states and transitions on the UE for sending a SEAL Off-network Location Management message.



**Figure 6.3.1.2.1-1: Basic state machine to send SEAL Off-network Location Management message**

### 6.3.1.2.2 State: Start

This state exists for the SLM-C, when the SLM-C decides the SEAL Off-network Location Management message.

#### 6.3.1.2.2.1 Send Message (With Ack/Response expected)

When SLM-C sends a SEAL Off-network Location Management message for which response or acknowledgement from the target UE is expected, the SLM-C:

- a) shall set counter C101 to the value 1;
- b) shall start the timer T101 (waiting for ack/resp);
- c) shall send the message to the target UE; and
- d) shall enter the state "Waiting for Ack/Resp".

**Editor's note: The definition of the timer T101 (waiting for ack/resp) and the counter C101 is FFS.**

### 6.3.1.2.3 State: Waiting for Ack/Resp

This state exists for the SLM-C, when the SLM-C has already sent the SEAL Off-network Location Management message, and waiting to receive which response or acknowledgement.

#### 6.3.1.2.3.1 Timer T101 Expired

Upon expiry of the timer T101 where current value of the counter C101 is less than N, the SLM-C:

- a) shall increment the value of the counter C101 by 1;
- b) shall restart the timer T101 (waiting for ack/resp);
- c) shall send the message to the target UE; and
- d) shall remain in the state "Waiting for Ack/Resp".

#### 6.3.1.2.3.2 Timer T101 Expired (N times)

Upon expiry of the timer T101 where current value of the counter C101 is greater than or equal to N, the SLM-C:

- a) shall consider the message sending as failure;
- b) shall stop the timer T101 (waiting for ack/resp);
- c) shall inform the VAL user about the failure of the message; and

- d) shall enter the state "Stop".

#### 6.3.1.2.3.2 Acknowledgement Received or Response Received

Upon receiving response of the message or acknowledgement of the message, the SLM-C:

- a) shall stop the timer T101 (waiting for ack/resp);
- b) shall enter the state "Stop"; and
- c) shall inform the VAL user about the success of the message.

#### 6.3.1.2.4 State: Stop

This state exists for the SLM-C, when the procedure to send the SEAL Off-network Location Management message is completed, and no further response or acknowledgement is expected.

### 6.3.1.3 Sending acknowledgement

The SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2 by setting:
  - i) the Message type IE to "LOCATION MANAGEMENT ACK";
  - ii) the Originating VAL user ID IE to its own VAL user ID;
  - iii) the Terminating VAL user ID IE to the VAL user ID of the target VAL user;
  - iv) the Message I D IE to the value of the Message ID of the received message; and
- b) shall send the message as specified in clause 6.3.1.2.

## 6.3.2 Event-triggered location reporting procedure

### 6.3.2.1 Location reporting trigger configuration

#### 6.3.2.1.1 Client originating procedure

Upon receiving a request from a VAL user to configure the location information trigger to another VAL user, the SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2. In the Off-network location management message:
  - i) shall set the Message type IE to "LOCATION REPORTING TRIGGER CONFIGURATION REQUEST";
  - ii) shall set the Originating VAL user ID IE to its own VAL user ID;
  - iii) shall set the Terminating VAL user ID IE to the VAL user ID of the target VAL user;
  - iv) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element including a <configuration> element with at least one of the followings:
    - 1) the location reporting elements which are requested;
    - 2) a <triggering-criteria> child element which indicate a specified location trigger criteria to send the location report; or
    - 3) a <minimum-interval-length>child element specifying the minimum time between consecutive reports. The value is given in seconds; and
  - v) shall set the Location Management Data IE to the application/vnd.3gpp.seal-location-info+xml MIME body; and

- vi) shall set the Message ID IE to the unique identity of this message; and
- b) shall send the message as specified in clause 6.3.1.2.

Upon reception of Off-network location management message containing a Message type IE set to "LOCATION REPORTING TRIGGER CONFIGURATION RESPONSE", the SLM-C shall send the acknowledgement message as specified in clause 6.3.1.3.

#### 6.3.2.1.2 Client terminating procedure

Upon reception of Off-network location management message containing a Message type IE set to "LOCATION REPORTING TRIGGER CONFIGURATION REQUEST", the SLM-C:

- a) shall store the content of the <configuration> elements;
- b) shall set the location reporting triggers accordingly;
- c) shall start the minimum-report-interval timer;
- d) shall generate the Off-network location management message according to clause 8.1.2 by setting:
  - i) the Message type IE to "LOCATION REPORTING TRIGGER CONFIGURATION RESPONSE";
  - ii) the Originating VAL user ID IE to its own VAL user ID; and
  - iii) the Terminating VAL user ID IE to the VAL user ID of the originating VAL user;
  - iv) the Message ID IE to the unique identity of this message; and
  - v) the Reply-to message ID IE to the value of the Message ID of the received message; and
- e) shall send the message as specified in clause 6.3.1.2.

#### 6.3.2.2 Location reporting

##### 6.3.2.2.1 Client originating procedure

In order to report the location information, the SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2. In the Off-network location management message:
  - i) shall set the Message type IE to "LOCATION REPORT";
  - ii) shall set the Originating VAL user ID IE to its own VAL user ID;
  - iii) shall set the Terminating VAL user ID IE to the VAL user ID of the target VAL user;
  - iv) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
    - 1) shall include a <report> element and, in the <report> element:
      - A) shall include a <trigger-id> child element set to the value of each <trigger-id> value of the triggers that have been met; and
      - B) shall include the location reporting elements corresponding to the triggers that have been met; and
    - 2) if the report was triggered by a location request, include the <report-id> attribute set to the value of the <request-id> attribute in the received request; and
  - v) shall set the Location Management Data IE to the application/vnd.3gpp.seal-location-info+xml MIME body; and
  - vi) shall set the Message ID IE to the unique identity of this message;

- b) shall send the message as specified in clause 6.3.1.2;
- c) shall set the minimum-report-interval timer to the minimum-report-interval time and start this timer; and
- d) shall reset all the trigger criteria for location reporting.

#### 6.3.2.2.2 Client terminating procedure

Upon reception of Off-network location management message containing a Message type IE set to "LOCATION REPORT", the SLM-C:

- a) shall be acknowledged by the acknowledgement message as specified in clause 6.3.1.3.
- b) shall store the received location information of the reporting SLM-C; and
- c) shall use the location information as needed.

#### 6.3.2.3 Location reporting trigger cancel

##### 6.3.2.3.1 Client originating procedure

Upon receiving a request from a VAL user to cancel the location information trigger to another VAL user, the SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2. In the Off-network location management message:
  - i) shall set the Message type IE to "LOCATION REPORTING TRIGGER CANCEL REQUEST";
  - ii) shall set the Originating VAL user ID IE to its own VAL user ID;
  - iii) shall set the Terminating VAL user ID IE to the VAL user ID of the target VAL user;
  - iv) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element including a <configuration> element which shall not include any child element;:
  - v) shall set the Location Management Data IE to the application/vnd.3gpp.seal-location-info+xml MIME body; and
  - vi) shall set the Message ID IE to the unique identity of this message; and
- b) shall send the message as specified in clause 6.3.1.2.

Upon reception of Off-network location management message containing a Message type IE set to "LOCATION REPORTING TRIGGER CANCEL RESPONSE", the SLM-C shall acknowledge the acknowledgement message as specified in clause 6.3.1.3.

##### 6.3.2.3.2 Client terminating procedure

Upon reception of Off-network location management message containing a Message type IE set to "LOCATION REPORTING TRIGGER CANCEL REQUEST", the SLM-C:

- a) shall delete the content of the <configuration> elements;
- b) shall stop the location reporting;
- d) shall generate the Off-network location management message according to clause 8.1.2 by setting:
  - i) the Message type IE to "LOCATION REPORTING TRIGGER CANCEL RESPONSE";
  - ii) the Originating VAL user ID IE to its own VAL user ID;
  - iii) the Terminating VAL user ID IE to the VAL user ID of the originating VAL user;
  - iv) the Message ID IE to the unique identity of this message; and

- v) the Reply-to message ID IE to the value of the Message ID of the received message; and
- e) shall send the message as specified in clause 6.3.1.2.

### 6.3.3 On-demand location reporting

#### 6.3.3.1 Client originating procedure

Upon receiving a request from a VAL user to request the location information from another VAL user, the SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2. In the Off-network location management message:
  - i) shall set the Message type IE to "LOCATION REQUEST (ON-DEMAND)";
  - ii) shall set the Originating VAL user ID IE to its own VAL user ID;
  - iii) shall set the Terminating VAL user ID IE to the VAL user ID of the target VAL user;
  - iv) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element shall include a <report-request> element which shall include at least one of the followings:
    - 1) an <immediate-report-indicator> child element to indicate that an immediate location report is required; and
    - 2) the location reporting elements which are requested;
  - v) shall set the Location Management Data IE to the application/vnd.3gpp.seal-location-info+xml MIME body;
  - vi) shall set the Message ID IE to the unique identity of this message; and
- b) shall send the message as specified in clause 6.3.1.2.

Upon reception of Off-network location management message containing a Message type IE set to "ON-DEMAND LOCATION RESPONSE", the SLM-C shall send the acknowledgement message as specified in clause 6.3.1.3.

#### 6.3.3.2 Client terminating procedure

Upon reception of Off-network location management message containing a Message type IE set to "ON-DEMAND LOCATION REQUEST", the SLM-C:

- a) shall generate the Off-network location management message according to clause 8.1.2. In the Off-network location management message:
  - i) shall set the Message type IE to "LOCATION RESPONSE (ON-DEMAND)";
  - ii) shall set the Originating VAL user ID IE to its own VAL user ID;
  - iii) shall set the Terminating VAL user ID IE to the VAL user ID of the originating VAL user;
  - iv) shall generate an application/vnd.3gpp.seal-location-info+xml MIME body and in the <location-info> root element:
    - 1) shall include a <report> element and, if the report was triggered by a location request, include the <report-id> attribute set to the value of the <request-id> attribute in the received request. The <report> element:
      - A) shall include a <trigger-id> child element set to the value of each <trigger-id> value of the triggers that have been met; and
      - B) shall include the location reporting elements corresponding to the triggers that have been met; and
  - v) shall set the Location Management Data IE to the application/vnd.3gpp.seal-location-info+xml MIME body;
  - vi) shall set the Message ID IE to the unique identity of this message; and

- vii) shall set the Reply-to message ID IE to the value of the Message ID of the received message; and
- b) shall send the message as specified in clause 6.3.1.2.

---

## 7 Coding

### 7.1 General

This clause specifies the coding to enable an SLM-C and an SLM-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 location management document shall conform to the XML schema described in clause 7.4.

The <location-info> element shall be the root element of the SEALLocationManagement document.

The <location-info> element shall include at least one of the following:

- a) an <identity> element;
- b) a <subscription> element;
- c) a <notification> element;
- d) a <report> element;
- e) a <configuration> element;
- f) a <request> element;
- g) a <requested-identity> element;
- h) a <report-request> element;
- i) a <location-based-query> element; or
- j) a <location-based- response> element.

The <identity> element shall include one of the following:

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

The <subscription> element shall include:

- a) an <identities-list> element which shall include:
  - 1) one or more <VAL-user-id> elements; and
- b) a <time-interval-length> element;
- c) a <subscription-identifier> element;
- d) an <expiry-time> element;

The <notification> element shall include:

- a) an <identities-list> element which shall include:
  - 1) one or more <VAL-user-id> elements;
- b) a <trigger-id> element; and
- c) a <reports> element containing one or more <loc-info-report> elements. The <loc-info-report> element shall include:
  - 1) a <VAL-user-id> element;
  - 2) a <latest-location> element, which shall include at least one of the following sub-elements:
    - i) a <latest-serving-NCGI> element;
    - ii) a <neighbouring-NCGI> element;
    - iii) an <mbms-service-area-id> element;
    - iv) an <mbsfn-area> element; or
    - v) a <latest-coordinate> element;

The <report> element shall contain a <report-id> attribute. The <report> shall include:

- a) a <trigger-id> element; and
- b) a <current-location> element which shall include at least one of the following:
  - 1) a <current-serving-NCGI> element;
  - 2) a <neighbouring-NCGI> element;
  - 3) a <mbms-service-area-id> element; or
  - 4) a <current-coordinate> element.

The <configuration> element includes:

- a) a <location-information> element including:
  - 1) a <current-serving-NCGI> element;
  - 2) a <neighbouring-NCGI> element;
  - 3) an <mbms-service-area-id> element;
  - 4) an <mbsfn-area-id> element; or
  - 5) a <current-geographical-coordinate> element;
- b) a <triggering-criteria> element shall include at least one of the following sub-elements:
  - 1) a <cell-change> element shall include one of the following sub-elements:
    - i) an <any-cell-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-cell> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-cell> element include a <trigger-id> element;
  - 2) a <tracking-area-change> element shall include one of the following sub-elements:
    - i) an <any-tracking-area-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-tracking-area> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-tracking-area> element shall include a <trigger-id> element;

- 3) a <plmn-change> element shall include one of the following sub-elements:
  - i) an <any-plmn-change> element shall include a <trigger-id> element;
  - ii) an <enter-specific-plmn> element shall include a <trigger-id> element; and
  - iii) an <exit-specific-plmn> element shall include a <trigger-id> element;
- 4) an <mbms-sa-change> element shall include one of the following sub-elements:
  - i) an <any-mbms-sa-change> element shall include a <trigger-id> element;
  - ii) an <enter-specific-mbms-sa> element shall include a <trigger-id> element; and
  - iii) an <exit-specific-mbms-sa> element shall include a <trigger-id> element;
- 5) an <mbsfn-area-change> element shall include one of the following sub-elements:
  - i) an <any-mbsfn-area-change> element shall include a <trigger-id> element;
  - ii) an <enter-specific-mbsfn-area> element shall include a <trigger-id> element; and
  - iii) an <exit-specific-mbsfn-area> element shall include a <trigger-id> element;
- 6) a <periodic-report> element shall include a <trigger-id> element;
- 7) a <travelled-distance> element shall include a <trigger-id> element;
- 8) a <vertical-application-event> element shall include one of the following sub-elements:
  - i) an <initial-log-on> element shall include a <trigger-id> element;
  - ii) a <location-configuration-received> element shall include a <trigger-id> element; and
  - iii) an <any-other-event>, an optional element specifying that any other application signalling event than initial-log-on and location-configuration-received triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 9) a <geographical-area-change> element shall include one of the following sub-elements:
  - i) an <any-area-change> element shall include a <trigger-id> element;
  - ii) an <enter-specific-area> element shall include the following sub-element:
    - A) a <geographical-area> element shall include the following two sub-elements:
      - I) a <polygon-area> element shall include a <trigger-id> element; and
      - II) an <ellipsoid-arc-area> element shall include a <trigger-id> element;
    - iii) an <exit-specific-area-type> element shall include a <trigger-id> element;
  - c) a <minimum-interval-length> element;

The <request> shall contain a <request-id> attribute.

The <requested-identity> element shall include one of the following sub-elements:

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

The <report-request> element shall include at least one of the following sub-elements:

- a) an <immediate-report-indicator> element;
- b) a <current-location> element which shall include at least one of the following sub-elements:
  - 1) a <current-serving-NCGI> element;

- 2) a <neighbouring-NCGI> element;
  - 3) an <mbms-service-area-id> element; or
  - 4) a <current-coordinate> element;
- c) a <triggering-criteria> element shall include at least one of the following sub-elements:
- 1) a <cell-change> element shall include one of the following sub-elements:
    - i) an <any-cell-change> element shall include a <trigger-id> element;
    - ii) a <enter-specific-cell> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-cell> element include a <trigger-id> element;
  - 2) a <tracking-area-change> element shall include one of the following sub-elements:
    - i) an <any-tracking-area-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-tracking-area> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-trackin-area> element shall include a <trigger-id> element;
  - 3) a <plmn-change> element shall include one of the following sub-elements:
    - i) an <any-plmn-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-plmn>element shall include a <trigger-id> element; and
    - iii) an <exit-specific-plmn> element shall include a <trigger-id> element;
  - 4) an <mbms-sa-change> element shall include one of the following sub-elements:
    - i) an <any-mbms-sa-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-mbms-sa> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-mbms-sa> element shall include a <trigger-id> element;
  - 5) an <mbsfn-area-change> element shall include one of the following sub-elements:
    - i) an <any-mbsfn-areaChange> element shall include a <trigger-id> element;
    - ii) an <enter-specific-mbsfn-area> element shall include a <trigger-id> element; and
    - iii) an <exit-specific-mbsfn-area> element shall include a <trigger-id> element;
  - 6) a <periodic-report> element shall include a <trigger-id> element;
  - 7) a <travelled-distance> element shall include a <trigger-id> element;
  - 8) a <vertical-application-event> element shall include one of the following sub-elements:
    - i) an <initial-log-on> element shall include a <trigger-id> element;
    - ii) a <location-configuration-received> element shall include a <trigger-id> element; and
    - iii) an <any-other-event>, an optional element specifying that any other application signalling event than initial-log-on and location-configuration-received triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - 9) a <geographical-area-change> element shall include one of the following sub-elements:
    - i) an <any-area-change> element shall include a <trigger-id> element;
    - ii) an <enter-specific-area> element shall include the following sub-element:
      - A) a <geographical-area> element shall include the following two sub-elements:

- I) a <polygon-area> element shall include a <trigger-id> element; and
- II) an <ellipsoid-arc-area> element shall include a <trigger-id> element;
- iii) an <exit-specific-area-type> element shall include a <trigger-id> element;
- d) a <minimum-interval-length> element; and
- e) an <endpoint-info> element.

The <location-based-query> element shall include at least one of the following:

- a) a <polygon-area> element; or
- b) an <ellipsoid-arc-area> element.

The <location-based-response> element may include:

- a) an <identities-list> element which shall include:
  - 1) one or more <VAL-user-id> elements;

## 7.4 XML schema

### 7.4.1 General

This clause defines the XML schema for location information.

### 7.4.2 XML schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:sealLocationInfo:1.0"
xmlns:sealloc="urn:3gpp:ns:sealLocationInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
  <xs:element name="location-info" id="loc">
    <xs:annotation>
      <xs:documentation>Root element, contains all information related to location configuration,
location request and location reporting for the SEAL service</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:choice>
        <xs:element name="Identity" type="sealloc:tIdentityType"/>
        <xs:element name="Configuration" type="sealloc:tConfigurationType"/>
        <xs:element name="Report" type="sealloc:tReportType"/>
        <xs:element name="LocationBasedQuery" type="sealloc:tLocationBasedQueryType"/>
        <xs:element name="LocationBasedReponse" type="sealloc:tLocationBasedResponseType"/>
        <xs:element name="Notification" type="sealloc:tNotificationType"/>
        <xs:element name="Request" type="sealloc:tRequestType"/>
        <xs:element name="RequestedID" type="sealloc:tRequestedIDType"/>
        <xs:element name="Subscription" type="sealloc:tSubscriptionType"/>
        <xs:element name="ReportRequest" type="sealloc:tReportRequestType"/>
        <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="tIdentityType">
    <xs:choice>
      <xs:element name="VAL-user-id" type="sealloc:contentType" minOccurs="0"/>
      <xs:element name="VAL-group-id" type="xs:string" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tConfigurationType">
    <xs:sequence>
```

```

<xs:element name="LocationInformation" type="sealloc:tRequestedLocationType" minOccurs="0"/>
<xs:element name="TriggeringCriteria" type="sealloc:TriggeringCriteriaType"/>
<xs:element name="MinimumIntervalLength" type="xs:positiveInteger"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:attribute name="ConfigScope">
<xs:simpleType>
<xs:restriction base="xs:string">
  <xs:enumeration value="Full"/>
  <xs:enumeration value="Update"/>
</xs:restriction>
</xs:simpleType>
</xs:attribute>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tReportType">
<xs:sequence>
<xs:element name="TriggerId" type="xs:string" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="CurrentLocation" type="sealloc:tCurrentLocationType"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:attribute name="ReportId" type="xs:string" use="optional"/>
</xs:attribute>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tLocationBasedQueryType">
<xs:sequence>
<xs:element name="PolygonArea" type="sealloc:tPolygonAreaType" minOccurs="0"/>
<xs:element name="EllipsoidArcArea" type="sealloc:tEllipsoidArcType" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tLocationBasedResponseType">
<xs:sequence>
<xs:element name="IDList" type="sealloc:tIDListType"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tNotificationType">
<xs:sequence>
<xs:element name="IDsList" type="sealloc:tIDsListType"/>
<xs:element name="Reports" type="sealloc:tReportsType"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tRequestType">
<xs:complexContent>
<xs:extension base="sealloc:tEmptyType">
<xs:attribute name="RequestId" type="xs:string" use="required"/> </xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="tRequestedIDType">
<xs:choice>
<xs:element name="VAL-user-id" type="sealloc:contentType" minOccurs="0"/>
<xs:element name="VAL-group-id" type="xs:string" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:choice>
</xs:complexType>
<xs:complexType name="tSubscriptionType">
<xs:sequence>
<xs:element name="IDsList" type="sealloc:tIDsListType"/>
<xs:element name="TimeIntervalLength" type="xs:positiveInteger"/>
<xs:element name="SubscriptionID" type="xs:string" minOccurs="0" maxOccurs="1"/>
<xs:element name="ExpiryTime" type="xs:nonPositiveInteger"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tReportRequestType">
<xs:sequence>

```

```

<xs:element name="ImmediateReportIndicator" type="xs:boolean"/>
<xs:element name="CurrentLocation" type="sealloc:tCurrentLocationType"/>
<xs:element name="TriggeringCriteria" type="sealloc:TriggeringCriteriaType"/>
<xs:element name="MinimumIntervalLength" type="xs:positiveInteger" minOccurs="0" maxOccurs="1"/>
<xs:element name="endpoint-info" type="sealloc:contentType" minOccurs="0" maxOccurs="1">
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:attribute>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tRequestedLocationType">
<xs:sequence>
<xs:element name="CurrentServingNcgi" type="sealloc:tEmptyType" minOccurs="0"/>
<xs:element name="NeighbouringNcgi" type="sealloc:tEmptyType" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="MbmsSaId" type="sealloc:tEmptyType" minOccurs="0"/>
<xs:element name="MbsfnArea" type="sealloc:tEmptyType" minOccurs="0"/>
<xs:element name="CurrentGeographicalCoordinate" type="sealloc:tEmptyType" 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="TriggeringCriteriaType">
<xs:sequence>
<xs:element name="CellChange" type="sealloc:tCellChange" minOccurs="0"/>
<xs:element name="TrackingAreaChange" type="sealloc:tTrackingAreaChangeType" minOccurs="0"/>
<xs:element name="PlmnChange" type="sealloc:tPlmnChangeType" minOccurs="0"/>
<xs:element name="MbmsSaChange" type="sealloc:tMbmsSaChangeType" minOccurs="0"/>
<xs:element name="MbsfnAreaChange" type="sealloc:tMbsfnAreaChangeType" minOccurs="0"/>
<xs:element name="PeriodicReport" type="sealloc:tIntegerAttributeType" minOccurs="0"/>
<xs:element name="TravellerDistance" type="sealloc:tIntegerAttributeType" minOccurs="0"/>
<xs:element name="VerticalAppEvent" type="sealloc:tVerticalAppEventType" minOccurs="0"/>
<xs:element name="GeographicalAreaChange" type="sealloc:tGeographicalAreaChange"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tEmptyType"/>
<xs:complexType name="tCellChange">
<xs:sequence>
<xs:element name="AnyCellChange" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="EnterSpecificCell" type="sealloc:tSpecificCellType" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="ExitSpecificCell" type="sealloc:tSpecificCellType" minOccurs="0"
maxOccurs="unbounded"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tNcgi">
<xs:restriction base="xs:string">
<xs:pattern value="\d{3}\d{3}[0-1]{28}"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tSpecificCellType">
<xs:simpleContent>
<xs:extension base="sealloc:tNcgi">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name="tEmptyTypeAttribute">
<xs:complexContent>
<xs:extension base="sealloc:tEmptyType">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="tTrackingAreaChangeType">
<xs:sequence>
<xs:element name="AnyTrackingAreaChange" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="EnterSpecificTrackingArea" type="sealloc:tTrackingAreaIdentity" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="ExitSpecificTrackingArea" type="sealloc:tTrackingAreaIdentity" minOccurs="0"
maxOccurs="unbounded"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>

```

```

<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tTrackingAreaIdentityFormat">
<xs:restriction base="xs:string">
<xs:pattern value="\d{3}\d{3}[0-1]{16}"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tTrackingAreaIdentity">
<xs:simpleContent>
<xs:extension base="sealloc:tTrackingAreaIdentityFormat">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name="tPlmnChangeType">
<xs:sequence>
<xs:element name="AnyPlmnChange" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="EnterSpecificPlmn" type="sealloc:tPlmnIdentity" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="ExitSpecificPlmn" type="sealloc:tPlmnIdentity" minOccurs="0"
maxOccurs="unbounded"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tPlmnIdentityFormat">
<xs:restriction base="xs:string">
<xs:pattern value="\d{3}\d{3}"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tPlmnIdentity">
<xs:simpleContent>
<xs:extension base="sealloc:tPlmnIdentityFormat">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name="tMbmsSaChangeType">
<xs:sequence>
<xs:element name="AnyMbmsSaChange" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="EnterSpecificMbmsSa" type="sealloc:tMbmsSaIdentity" minOccurs="0"/>
<xs:element name="ExitSpecificMbmsSa" type="sealloc:tMbmsSaIdentity" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tMbmsSaIdentityFormat">
<xs:restriction base="xs:integer">
<xs:minInclusive value="0"/>
<xs:maxInclusive value="65535"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tMbmsSaIdentity">
<xs:simpleContent>
<xs:extension base="sealloc:tMbmsSaIdentityFormat">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name="tMbsfnAreaChangeType">
<xs:sequence>
<xs:element name="AnyMbsfnAreaChange" type="sealloc:tMbsfnAreaIdentity" minOccurs="0"/>
<xs:element name="EnterSpecificMbsfnArea" type="sealloc:tMbsfnAreaIdentity" minOccurs="0"/>
<xs:element name="ExitSpecificMbsfnArea" type="sealloc:tMbsfnAreaIdentity" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tMbsfnAreaIdentityFormat">
<xs:restriction base="xs:integer">
<xs:minInclusive value="0"/>
<xs:maxInclusive value="255"/>
</xs:restriction>

```

```

</xs:simpleType>
<xs:complexType name="tMbsfnAreaIdentity">
<xs:simpleContent>
<xs:extension base="sealloc:tMbsfnAreaIdentityFormat">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name="tIntegerAttributeType">
<xs:simpleContent>
<xs:extension base="xs:integer">
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
</xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name=" tVerticalAppEventType">
<xs:sequence>
<xs:element name="InitialLogOn" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="LocConfigReceived" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="AnyOtherEvent" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
minOccurs="0"/>
<xs:element name="LocationConfigurationReceived" type="sealloc:tEmptyTypeAttribute"
minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

<xs:complexType name="tCurrentLocationType">
<xs:sequence>
<xs:element name=" CurrentServingNcgi" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name=" NeighbouringNcgi" type="sealloc:tLocationType" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="MbmsSaId" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name="MbsfnArea" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name="CurrentCoordinate" type="sealloc:tPointCoordinate" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="protectionType">
<xs:restriction base="xs:string">
<xs:enumeration value="Normal"/>
<xs:enumeration value="Encrypted"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tLocationType">
<xs:choice minOccurs="1" maxOccurs="1">
<xs:element name="Ncgi" type="sealloc: tNcgi" minOccurs="0"/>
<xs:element name="SaId" type="sealloc:tMbmsSaIdentity" minOccurs="0"/>
<xs:element name="MbsfnAreaId" type="sealloc:tMbsfnAreaIdentity" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:choice>
<xs:attribute name="type" type="sealloc:protectionType"/>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tGeographicalAreaChange">
<xs:sequence>
<xs:element name="AnyAreaChange" type="sealloc:tEmptyTypeAttribute" minOccurs="0"/>
<xs:element name="EnterSpecificAreaType" type="sealloc:tSpecificAreaType" minOccurs="0"/>
<xs:element name="ExitSpecificAreaType" type="sealloc:tSpecificAreaType" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tSpecificAreaType">
<xs:sequence>
<xs:element name="GeographicalArea" type="sealloc:tGeographicalAreaDef"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:attribute name="TriggerId" type="xs:string" use="required"/>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>

```

```

<xs:complexType name="tPointCoordinate">
<xs:sequence>
<xs:element name="longitude" type="sealloc:tCoordinateType"/>
<xs:element name="latitude" type="sealloc:tCoordinateType"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tCoordinateType">
<xs:choice minOccurs="1" maxOccurs="1">
<xs:element name="threebytes" type="sealloc:tThreeByteType" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:choice>
<xs:attribute name="type" type="sealloc:protectionType"/>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:simpleType name="tThreeByteType">
<xs:restriction base="xs:integer">
<xs:minInclusive value="0"/>
<xs:maxInclusive value="16777215"/>
</xs:restriction>
</xs:simpleType>
<xs:complexType name="tGeographicalAreaDef">
<xs:sequence>
<xs:element name="PolygonArea" type="sealloc:tPolygonAreaType" minOccurs="0"/>
<xs:element name="EllipsoidArcArea" type="sealloc:tEllipsoidArcType" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tPolygonAreaType">
<xs:sequence>
<xs:element name="Corner" type="sealloc:tPointCoordinate" minOccurs="3" maxOccurs="15"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tEllipsoidArcType">
<xs:sequence>
<xs:element name="Center" type="sealloc:tPointCoordinate"/>
<xs:element name="Radius" type="xs:nonNegativeInteger"/>
<xs:element name="OffsetAngle" type="xs:unsignedByte"/>
<xs:element name="IncludedAngle" type="xs:unsignedByte"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tReportsType">
<xs:sequence >
<xs:element name="VAL-user-id" type="sealloc:contentType" minOccurs="0" maxOccurs="1"/>
<xs:element name="LatestLocation" type="sealloc:tLatestLocationType"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence >
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tLatestLocationType">
<xs:sequence>
<xs:element name="LatestServingNcgi" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name="NeighbouringNcgi" type="sealloc:tLocationType" minOccurs="0"
maxOccurs="unbounded"/>
<xs:element name="MbmsSaId" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name="MbsfnArea" type="sealloc:tLocationType" minOccurs="0"/>
<xs:element name="LatestCoordinate" type="sealloc:tPointCoordinate" minOccurs="0"/>
<xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
<xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
</xs:sequence>
<xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="contentType">
<xs:choice>
<xs:element name="sealURI" type="xs:anyURI"/>
<xs:element name="sealString" type="xs:string"/>

```

```

    <xs:element name="sealBoolean" type="xs:boolean"/>
    <xs:any namespace="##other" processContents="lax"/>
  </xs:choice>
  <xs:attribute name="type" type="sealloc:protectionType"/>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tIDsListType">
  <xs:choice>
    <xs:element name="VAL-user-id" type="sealloc:contentType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="sealloc:anyExtType" minOccurs="0"/>
  </xs:choice>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
</xs:schema>

```

## 7.5 Data semantics

The <location-info> element is the root element of the XML document. The <location-info> element contains the <identity>, <subscription>, <request>, <configuration> and <report> sub-elements.

<identity> is a mandatory element used to include the identity of a VAL user, a VAL client or a VAL group. The <identity> element 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.

<subscription> contains the following sub-elements:

- a) <identities-list>, an element contains one or more <VAL-user-id> elements. Each <VAL-user-id> element contains the identity of the VAL user whose location information is requested.
- b) <time-interval-length>, an element specifying the interval time the SLM-S needs to wait before sending location reports. The value is given in seconds.
- c) <subscription-identifier>, an element specifying the value to uniquely identify the subscription.
- d) <expiry-time>, an element specifying expiry time for subscription in seconds.

<notification> contains the following sub-elements:

- a) <identities-list>, an element contains one or more <VAL-user-id> elements. Each <VAL-user-id> element contains the identity of the VAL user whose location information needs to be notified.
- b) <trigger-id>, an element which can occur multiple times that contains the value of the <trigger-id> attribute associated with a trigger that has fired; and
- c) <reports>, an element contains one or more <loc-info-report> elements. Each <loc-info-report> element contains the following sub-elements:
  - 1) <VAL-user-id>, an element contains the identity of a VAL user in the identities list;
  - 2) <latest-location >, an element contains at least one of the following sub-elements:
    - i) <latest-serving-NCGI>, an optional element containing the NR cell global identity (NCGI) of the serving cell coded as specified in clause 19.6A in 3GPP TS 23.003 [2];
    - ii) <neighbouring-NCGI>, an optional element that can occur multiple times. It contains the NCGI of any neighbouring cell the SLM-C can detect;
    - iii) <mbms-service-area-id>, an optional element containing the MBMS service area id the SLM-C is using coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI);
    - iv) <mbsfn-area> element, an optional element specifying that the MBSFN area Id needs to be reported; and

- v) <latest-coordinate>, an optional element containing the longitude and latitude coded as specified in clause 6.1 in 3GPP TS 23.032 [3];

<report> is a mandatory element used to include the location report. It contains a <report-id> attribute. The <report-id> attribute is used to return the value in the <request-id> attribute in the <request> element. The <report> element contains the following sub-elements:

- a) <trigger-id>, a mandatory element which can occur multiple times that contain the value of the <trigger-id> attribute associated with a trigger that has fired; and
- b) <current-location>, a mandatory element that contains the location information. The <current-location> element contains the following sub-elements:
  - 1) <current-serving-NCGI>, an optional element containing the NR cell global identity (NCGI) of the serving cell coded as specified in clause 19.6A in 3GPP TS 23.003 [2];
  - 2) <neighbouring-NCGI>, an optional element that can occur multiple times. It contains the NCGI of any neighbouring cell the SLM-C can detect;
  - 3) <mbms-service-area-id>, an optional element containing the MBMS service area id the SLM-C is using coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI); and
  - 4) <current-coordinate>, an optional element containing the longitude and latitude coded as specified in clause 6.1 in 3GPP TS 23.032 [3].

<request> is an element with a <request-id> attribute. The <request> element is used to request a location report. The value of the <request-id> attribute is returned in the corresponding <report-id> attribute in order to correlate the request and the report.

<requested-identity> is a mandatory element used to include the identity of a VAL user, a VAL client or a VAL group for which a location report is requested. The <requested-identity> element 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.

<configuration> is an element with a <configuration-scope> attribute that can have the value "Full" or "Update" . The value "Full" means that the <configuration> element contains the full location configuration which replaces any previous location configuration. The value "Update" means that the location configuration is an addition to any previous location configuration. To remove configuration elements a "Full" configuration is needed. The <configuration> element contains the following sub-elements:

- a) <location-information>, an optional element that specifies the location information. The <location-information> has the sub-elements:
  - 1) <serving-NCGI>, an optional element containing the NR cell global identity (NCGI) of the serving cell coded as specified in clause 19.6A in 3GPP TS 23.003 [2];
  - 2) <neighbouring-NCGI>, an optional element that can occur multiple times. It contains the NCGI of any neighbouring cell the SLM-C can detect;
  - 3) <mbms-service-area-id>, an optional element containing the MBMS service area id that the SLM-C is using. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI);
  - 4) <mbsfn-area-id>, an optional element specifying that the MBSFN area id that needs to be reported;
  - 5) <current-geographical-coordinate>, an optional element containing the longitude and latitude coded as specified in clause 6.1 in 3GPP TS 23.032 [3]; and
- b) <triggering-criteria>, an optional element specifying the triggers for the SLM-C to request a location report of a VAL user, a VAL client or a VAL group. The <triggering-criteria> element contains at least one of the following sub-elements:

- 1) <cell-change>, an optional element specifying what cell changes trigger the request for a location report. This element consists of the following sub-elements:
  - i) <any-cell-change>, an optional element. The presence of this element specifies that any cell change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-cell>, an optional element specifying an NCGI which when entered triggers a request for a location report coded as specified in clause 19.6A in 3GPP TS 23.003 [2]. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-cell>, an optional element specifying an NCGI which when exited triggers a request for a location report coded as specified in clause 19.6A in 3GPP TS 23.003 [2]. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 2) <tracking-area-change>, an optional element specifying what tracking area changes trigger a request for a location report. This element consists of the following sub-elements:
  - i) <any-tracking-area-change>, an optional element. The presence of this element specifies that any tracking area change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-tracking-area>, an optional element specifying a tracking area identity coded as specified in clause 19.4.2.3 in 3GPP TS 23.003 [2] which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-tracking-area>, an optional element specifying a tracking area identity coded as specified in clause 19.4.2.3 in 3GPP TS 23.003 [2] which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 3) <plmn-change>, an optional element specifying what PLMN changes trigger a request for a location report. This element consists of the following sub-elements:
  - i) <any-plmn-change>, an optional element. The presence of this element specifies that any PLMN change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-plmn>, an optional element specifying a PLMN id (MCC+MNC) coded as specified in 3GPP TS 23.003 [2] which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-plmn>, an optional element specifying a PLMN id (MCC+MNC) coded as specified in 3GPP TS 23.003 [2] which when exited triggers a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 4) <mbms-sa-change>, an optional element specifying what MBMS changes trigger location reporting. This element consists of the following sub-elements:
  - i) <any-mbms-sa-change>, an optional element. The presence of this element specifies that any MBMS SA change is a trigger for a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-mbms-sa>, an optional element specifying an MBMS service area id which when entered triggers a request for a location report. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI). This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-mbms-sa>, an optional element specifying an MBMS service area id which when exited triggers a request a location report. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI). This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 5) <mbsfn-area-change>, an optional element specifying what MBSFN changes trigger a request for a location report. This element consists of the following sub-elements:

- i) <any-mbsfn-area-change>, an optional element. The presence of this element specifies that any MBSFN area change is a trigger for a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-mbsfn-area>, an optional element specifying an MBSFN area which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-mbsfn-area>, an optional element specifying an MBSFN area which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 6) <periodic-report>, an optional element specifying that periodic request for a location report shall be sent. The value in seconds specifies the reporting interval. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 7) <travelled-distance>, an optional element specifying that the travelled distance shall trigger a request for a location report. The value in metres specified the travelled distance. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 8) <vertical-application-event>, an optional element specifying what application signalling events triggers a request for a location report. The <vertical-application-event> element has the following sub-elements:
- i) <initial-log-on>, an optional element specifying that an initial log on triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <location-configuration-received>, an optional element specifying that a received location configuration triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <any-other-event>, an optional element specifying that any other application signalling event than initial-log-on and location-configuration-received triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 9) <geographical-area-change>, an optional element specifying what geographical area changes trigger a request for a location reporting. This element consists of the following sub-elements:
- i) <any-area-change>, an optional element. The presence of this element specifies that any geographical area change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-area>, an optional element specifying a geographical area which when entered triggers a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string. The <enter-specific-area> element has the following sub-elements:
    - A) <geographical-area>, an optional element containing a <trigger-id> attribute and the following two subelements:
      - I) <polygon-area>, an optional element specifying the area as a polygon specified in clause 5.2 in 3GPP TS 23.032 [2]; and
      - II) <ellipsoid-arc-area>, an optional element specifying the area as an ellipsoid arc specified in clause 5.7 in 3GPP TS 23.032 [2]; and
    - iii) <exit-specific-area-type>, an optional element specifying a geographical area which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string.
  - c) <minimum-interval-length>, a mandatory element specifying the minimum time the SLM-C needs to wait between sending location reports. The value is given in seconds;

<report-request> is a mandatory element used to include the requested location report. The <report-request> element contains at least one of the following sub-elements:

- a) <immediate-report-indicator>, presence of the element indicates that an immediate location report is required;

- b) <current-location>, an optional element that contains the location information. The <current-location> element contains the following sub-elements:
- 1) <current-serving-NCGI>, an optional element containing the NR cell global identity (NCGI) of the serving cell coded as specified in clause 19.6A in 3GPP TS 23.003 [2];
  - 2) <neighbouring-NCGI>, an optional element that can occur multiple times. It contains the NCGI of any neighbouring cell the SLM-C can detect;
  - 3) <mbms-service-area-id>, an optional element containing the MBMS service area id that the SLM-C is using. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI); and
  - 4) <current-coordinate>, an optional element containing the longitude and latitude coded as specified in clause 6.1 in 3GPP TS 23.032 [3].
- c) <triggering-criteria>, a mandatory element specifying the triggers for the SLM-C to request a location report of a VAL user, a VAL client or a VAL group. The <triggering-criteria> element contains at least one of the following sub-elements:
- 1) <cell-change>, an optional element specifying what cell changes trigger the request for a location report. This element consists of the following sub-elements:
    - i) <any-cell-change>, an optional element. The presence of this element specifies that any cell change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
    - ii) <enter-specific-cell>, an optional element specifying an NCGI which when entered triggers a request for a location report coded as specified in clause 19.6A in 3GPP TS 23.003 [2]. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
    - iii) <exit-specific-cell>, an optional element specifying an NCGI which when exited triggers a request for a location report coded as specified in clause 19.6A in 3GPP TS 23.003 [2]. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - 2) <tracking-area-change>, an optional element specifying what tracking area changes trigger a request for a location report. This element consists of the following sub-elements:
    - i) <any-tracking-area-change>, an optional element. The presence of this element specifies that any tracking area change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
    - ii) <enter-specific-tracking-area>, an optional element specifying a tracking area identity coded as specified in clause 19.4.2.3 in 3GPP TS 23.003 [2] which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
    - iii) <exit-specific-tracking-area>, an optional element specifying a tracking area identity coded as specified in clause 19.4.2.3 in 3GPP TS 23.003 [2] which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - 3) <plmn-change>, an optional element specifying what PLMN changes trigger a request for a location report. This element consists of the following sub-elements:
    - i) <any-plmn-change>, an optional element. The presence of this element specifies that any PLMN change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
    - ii) <enter-specific-plmn>, an optional element specifying a PLMN id (MCC+MNC) coded as specified in 3GPP TS 23.003 [2] which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
    - iii) <exit-specific-plmn>, an optional element specifying a PLMN id (MCC+MNC) coded as specified in 3GPP TS 23.003 [2] which when exited triggers a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - 4) <mbms-sa-change>, an optional element specifying what MBMS changes trigger location reporting. This element consists of the following sub-elements:

- i) <any-mbms-sa-change>, an optional element. The presence of this element specifies that any MBMS SA change is a trigger for a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-mbms-sa>, an optional element specifying an MBMS service area id which when entered triggers a request for a location report. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI). This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-mbms-sa>, an optional element specifying an MBMS service area id which when exited triggers a request a location report. The MBMS service area id is coded as specified in clause 15.3 in 3GPP TS 23.003 [2] for service area identifier (SAI). This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 5) <mbsfn-area-change>, an optional element specifying what MBSFN changes trigger a request for a location report. This element consists of the following sub-elements:
- i) <any-mbsfn-area-change>, an optional element. The presence of this element specifies that any MBSFN area change is a trigger for a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-mbsfn-area>, an optional element specifying an MBSFN area which when entered triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <exit-specific-mbsfn-area>, an optional element specifying an MBSFN area which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 6) <periodic-report>, an optional element specifying that periodic request for a location report shall be sent. The value in seconds specifies the reporting interval. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 7) <travelled-distance>, an optional element specifying that the travelled distance shall trigger a request for a location report. The value in metres specified the travelled distance. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 8) <vertical-application-event>, an optional element specifying what application signalling events triggers a request for a location report. The <vertical-application-event> element has the following sub-elements:
- i) <initial-log-on>, an optional element specifying that an initial log on triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <location-configuration-received>, an optional element specifying that a received location configuration triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string; and
  - iii) <any-other- event>, an optional element specifying that any other application signalling event than initial-log-on and location-configuration-received triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- 9) <geographical-area-change>, an optional element specifying what geographical are changes trigger a request for a location reporting. This element consists of the following sub-elements:
- i) <any-area-change>, an optional element. The presence of this element specifies that any geographical area change is a trigger. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
  - ii) <enter-specific-area>, an optional element specifying a geographical area which when entered triggers a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string. The <enter-specific-area> element has the following sub-elements:
    - A) <geographical-area>, an optional element containing a <trigger-id> attribute and the following two subelements:

- D) <polygon-area>, an optional element specifying the area as a polygon specified in clause 5.2 in 3GPP TS 23.032 [3]; and
- II) <ellipsoid-arc-area>, an optional element specifying the area as an ellipsoid arc specified in clause 5.7 in 3GPP TS 23.032 [3]; and
- iii) <exit-specific-area-type>, an optional element specifying a geographical area which when exited triggers a request for a location report. This element contains a mandatory <trigger-id> attribute that shall be set to a unique string;
- d) <minimum-interval-length>, an optional element that defaults to 0 if absent otherwise indicates the interval time between consecutive reports. The value is given in seconds.
- e) <endpoint-info>, an optional element specifying information of the endpoint of the requesting VAL server to which the location report notification has to be sent. It is provided if Immediate Report Indicator is set to required.

<location-based-query> contains at least one of the following sub-elements:

- a) <polygon-area>, an optional element specifying the area as a polygon specified in clause 5.2 in 3GPP TS 23.032 [3]; and
- b) <ellipsoid-arc-area>, an optional element specifying the area as an Ellipsoid Arc specified in clause 5.7 in 3GPP TS 23.032 [3].

<location-based-response> contains the following sub-elements:

- a) <identities-list>, an optional element contains one or more <VAL-user-id> elements. Each <VAL-user-id> element contains the identity of the VAL user to be queried.

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

## 7.6 MIME type

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

## 7.7 IANA registration template

Your Name:

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

vnd.3gpp.seal-location-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, so the security considerations from IETF RFC 3261 apply.

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 24.545 "Location Management - Service Enabler Architecture Layer for Verticals (SEAL)" version 16.0.0, available via <http://www.3gpp.org/specs/numbering.htm>.

Applications which use this media type:

Applications supporting the SEAL location 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>

## 8 SEAL Off-network Location Management protocol message formats

### 8.1 Functional definitions and contents

#### 8.1.1 General

The following clauses describe the SEAL Off-network Location Management message functional definition and contents. The standard format of a MONP message and the encoding rules for each type of information element as documented in Annex I of 3GPP TS 24.379 [15] is used to describe Off-network location management message and information elements.

#### 8.1.2 Off-network location management message

##### 8.1.2.1 Message definition

This message is used between SEAL location management clients (of UE-1 and UE-2) to send request, response or acknowledgement. The Message Type IE identifies the request, response, or acknowledgement. For contents of the message see Table 8.1.2.1-1.

Message type: Off-network location management message

Direction: UE to other UE

**Table 8.1.2.1-1: Off-network location reporting trigger configuration message content**

IEI	Information Element	Type/Reference	Presence	Format	Length
	Message Type	Message Type 8.2.2	M	V	1
	Originating VAL user ID	VAL user ID 8.2.3	M	LV-E	3-x
	Terminating VAL user ID	VAL User ID 8.2.3	M	LV-E	3-x
	Message ID	Message ID 8.2.6	M	V	16
X	Reply-to message ID	Reply-to message ID 8.2.7	O	TV	17
Z	Location Management Data	Message Data 8.2.4	O	TLV-E	4-x
A	Cause	Cause 8.2.5	O	TLV-E	3-x

## 8.2 General message format and information elements coding

### 8.2.1 General

### 8.2.2 Message type

The purpose of the Message type information element is to identify the type of the message.

The value part of the Message type information element is coded as shown in Table 8.2.2-1.

The Message type information element is a type 3 information element with a length of 1 octet.

**Table 8.2.2-1: Message types**

Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	LOCATION REPORTING TRIGGER CONFIGURATION REQUEST
0	0	0	0	0	0	0	1	LOCATION REPORTING TRIGGER CONFIGURATION RESPONSE
0	0	0	0	0	0	1	1	LOCATION MANAGEMENT ACK
0	0	0	0	0	1	0	0	LOCATION REPORT
0	0	0	0	0	1	0	1	LOCATION REPORTING TRIGGER CANCEL REQUEST
0	0	0	0	0	1	1	0	LOCATION REPORTING TRIGGER CANCEL RESPONSE
0	0	0	0	0	1	1	1	LOCATION REQUEST (ON-DEMAND)
0	0	0	0	1	0	0	0	LOCATION RESPONSE (ON-DEMAND)

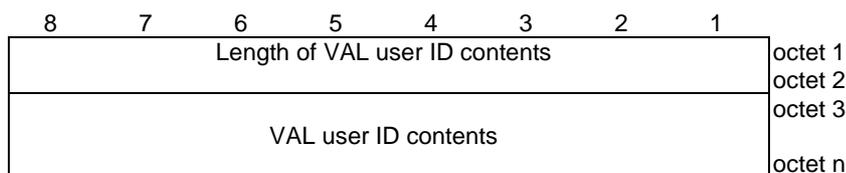
All other values are reserved.

### 8.2.3 VAL user ID

The VAL user ID information element is used to indicate a VAL user ID.

The VAL user ID information element is coded as shown in Figure 8.2.3-1 and Table 8.2.3-1.

The VAL user ID information element is a type 6 information element.



**Figure 8.2.3-1: VAL user ID information element**

**Table 8.2.3-1: VAL user ID information element**

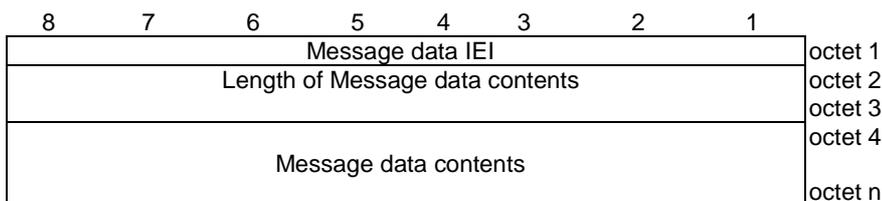
VAL user ID is contained in octet 3 to octet n; Max value of 65535 octets.
--

### 8.2.4 Message Data

The Message data information element is used to send message specific data based on Message Type IE;

The Message data information element is coded as shown in Figure 8.2.4-1 and Table 8.2.4-1.

The Message data information element is a type 6 information element.



**Figure 8.2.4-1: Message data information element**

**Table 8.2.4-1: Message data information element**

Message data is contained in octet 4 to octet n; Max value of 65535 octets.

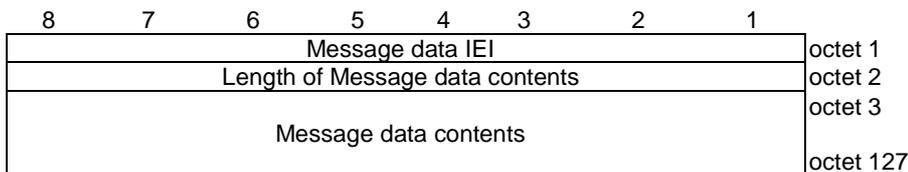
The Message data information element contains the seal-location-info+xml defined in clause 7.4.

### 8.2.5 Cause

The Cause information element is used to provide short cause of the failure;

The Cause information element is coded as shown in Figure 8.2.5-1 and Table 8.2.5-1.

The Cause information element is a type 6 information element.



**Figure 8.2.5-1: Cause information element**

**Table 8.2.5-1: Cause information element**

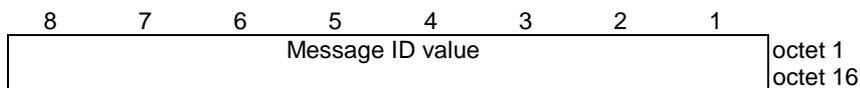
Message data is contained in octet 3 to octet n; Max value of 127 octets.

### 8.2.6 Message ID

The Message ID information element uniquely identifies a message.

The Message ID information element is coded as shown in Figure 8.2.6-1 and Table 8.2.6-1.

The Message ID information element is a type 3 information element with a length of 16 octets.



**Figure 8.2.6-1: Message ID value**

**Table 8.2.6-1: Message ID value**

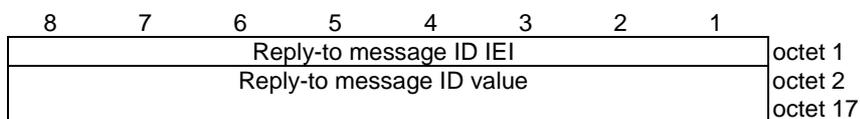
Message ID value (octet 1 to 16)  The Message ID contains a number uniquely identifying a message. The value is a universally unique identifier as specified in IETF RFC 4122 [r4122].
--

## 8.2.7 Reply-to message ID

The Reply-to message ID information element is used to associate a message within a conversation that is a reply to an existing message in a conversation.

The Reply-to message ID information element is coded as shown in Figure 8.2.7-1 and Table 8.2.7-1.

The Reply-to message ID information element is a type 3 information element with a length of 17 octets.



**Figure 8.2.y-1: Reply-to message ID value**

**Table 8.2.y-1: Reply-to message ID value**

Reply-to message ID value (octet 2 to 17)  The Reply-to message ID contains a number uniquely identifying a message. The value is a universally unique identifier as specified in IETF RFC 4122 [r4122].
--

# Annex A (normative): Timers

## A.1 General

This clause provides a brief description of the timers used in this specification.

## A.2 On network timers

The table A.2-1 provides a description of the timers used in this specification, specifies the timer values, describes the reason for starting of the timer, normal stop and the action on expiry.

**Table A.2-1: On network timers**

Timer	Timer value	Cause of start	Normal stop	On expiry
TLM-1 (subscription expiry)	The timer value is negotiated between SLM-C and SLM-S while creating or modifying subscription.	The SLM-S starts the timer upon sending response to create subscription request message towards SLM-C;	On sending response to delete subscription request message towards SLM-C;	Consider that the subscription associated with the timer is terminated and shall delete all data related to the subscription.
TLM-2 (notification interval)	The timer value is set by user in create subscription request message in <time-interval-length>element.	The SLM-S starts timer each time after sending location information notification.	On sending response to delete subscription request message towards SLM-C;	If any location information data is pending to be notified then the SLM-S sends the notification.

## Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-10	CT1#120	C1-196855				Draft skeleton provided by the rapporteur.	0.0.0
2019-10	CT1#120					Implementing the following p-CRs agreed by CT1: C1-196355, C1-196612, C1-196856, C1-196857	0.1.0
2019-11	CT1#121					Implementing the following p-CRs agreed by CT1: C1-198605, C1-198606, C1-198607, C1-198609, C1-198818, C1-198820 Corrections done by the rapporteur.	0.2.0
2020-03	CT1#122-e					Implementing the following p-CRs agreed by CT1: C1-200526, C1-200555, C1-200558, C1-200560, C1-200808, C1-200901, C1-200902, C1-201018, C1-201019 Corrections done by the rapporteur.	0.3.0
2020-03	CT-87e	CP-200169				Presentation to TSG CT for information and approval	1.0.0
2020-03	CT-87e					Version 16.0.0 created after approval	16.0.0
2020-06	CT-88e	CP-201129	0001		B	IANA registration template of SEAL location management	16.1.0
2020-06	CT-88e	CP-201129	0002		F	Removal of editor's note on MIME types	16.1.0
2020-06	CT-88e	CP-201129	0003		B	Resolution of editor's note on application unique ID	16.1.0
2020-06	CT-88e	CP-201129	0004		B	Structure and data semantics for query list of users based on location procedure	16.1.0
2020-06	CT-88e	CP-201129	0005	3	B	XML scheme for location reporting configuration procedure for SEAL location management	16.1.0
2020-06	CT-88e	CP-201129	0013		F	Correction of references	16.1.0
2020-06	CT-88e	CP-201129	0014		F	Resolution of the editor's note on access token	16.1.0
2020-06	CT-88e	CP-201129	0016	1	B	SIP based subscription procedures	16.1.0
2020-06	CT-88e	CP-201129	0017	1	F	Adding required XML elements for subscription	16.1.0
2020-06	CT-88e	CP-201129	0018	1	B	Timers used in location management	16.1.0
2020-09	CT-89e	CP-202163	0019		F	Miscellaneous editorial corrections	16.2.0
2020-09	CT-89e	CP-202163	0020	1	F	Updates to HTTP based location information subscription procedure	16.2.0
2020-09	CT-89e	CP-202163	0021	1	F	Updates to XML schema of configuration for SEAL location management	16.2.0
2020-09	CT-89e	CP-202163	0022	1	F	XML schema for location information report	16.2.0
2020-09	CT-89e	CP-202163	0023		F	XML schema for location based query	16.2.0
2020-09	CT-89e	CP-202163	0024	1	F	XML schema for location information notification	16.2.0
2020-09	CT-89e	CP-202163	0025		F	XML schema for location information request	16.2.0
2020-09	CT-89e	CP-202163	0026	1	F	XML schema for location information subscription	16.2.0
2020-09	CT-89e	CP-202163	0027		F	XML schema for location reporting trigger	16.2.0
2020-12	CT-90e	CP-203210	0028	3	F	Add the XML schema of identity	16.3.0
2020-12	CT-90e	CP-203210	0029	1	F	Update to the client-triggered or VAL server-triggered location reporting procedure	16.3.0
2020-12	CT-90e	CP-203210	0031	1	F	Correct location trigger configuration	16.3.0
2021-03	CT-91e	CP-210111	0033	1	F	Resolution of editor's note under clause 6.2	16.4.0
2021-09	CT-93e	CP-212138	0034	1	B	Off network Location Management - Basic Message Control and Message Format	17.0.0
2021-09	CT-93e	CP-212138	0035	1	B	Off network Location Management - Event-triggered location reporting procedure	17.0.0
2021-09	CT-93e	CP-212138	0036	1	B	Off network Location Management - On-demand location reporting	17.0.0
2021-12	CT-94e	CP-213052	0037	1	C	Message Id and Reply-to Message Id for SEAL offnetwork location management protocol	17.1.0
2021-12	CT-94e	CP-213031	0039	-	B	Reference update for HTTP/1.1 protocol	17.1.0
2022-03	CT-94e	CP-220245	0040	1	C	Updates to Location information subscription procedure	17.2.0
2022-03	CT-94e	CP-220245	0041	-	B	Location area monitoring information procedure	17.2.0

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# History

<b>Document history</b>		
V17.2.0	May 2022	Publication