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TECHNICAL SPECIFICATION

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Contents

Foreword

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

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

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x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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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 operations and information coding for the Non-Access Stratum (NAS) layer protocol for supporting the Location Services (LCS) in the NG-RAN.

The present document is applicable to the User Equipment (UE) and to the Access and Mobility Management Function (AMF) or Location Management Function (LMF) in the 5G System (5GS).

The present document is developed in accordance to the general principles stated in 3GPP TS 23.273 [2].

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 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

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

[4]   3GPP TS 37.355: "LTE Positioning Protocol (LPP)".

[4a]   3GPP TS 38.355: "Sidelink Positioning Protocol (SLPP); Protocol specification".

[5]   3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".

[6]   3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[7]   3GPP TS 38.305: "Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[8]   3GPP TS 22.261: "Service requirements for the 5G system; Stage 1".

[9]   3GPP TS 24.572: "User Plane Location Services (LCS) Protocols And Procedures; Stage 3".

[10]   3GPP TS 23.586: "Architectural Enhancements to support; Ranging based services and Sidelink Positioning".

[11]   3GPP TS 38.455: "NG-RAN; NR Positioning Protocol A (NRPPa)".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

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

For the purposes of the present document, the following terms and definitions given in 3GPP TS 22.261 [8] apply:

satellite NG-RAN

PRU ON/OFF state: This state is defined for a UE associated as a PRU with an LMF (i.e. after the successful completion of PRU association procedure). This state indicates whether the PRU functionality of the UE is activated (i.e. ON state) or deactivated (i.e. OFF state) while it is associated with an LMF.

UE operating as PRU: From the UE perspective, a UE which supports PRU functionality and operates as PRU. From the network perspective, the UE allowed to operate as a PRU based on the UE subscription data and the PRU state is ON.

3.2 Symbols

3.3 Abbreviations

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

5GCN	5G Core Network
5GS	5G System
AMF	Access and Mobility Management Function
DL	Downlink
IE	Information Element
GMLC	Gateway Mobile Location Centre
LCS	Location Services
LDR	Location Deferred Request
LMF	Location Management Function
LPP	LTE Positioning Protocol
MO-LR	Mobile Originated Location Request
MT-LR	Mobile Terminated Location Request
NAS	Non-access Stratum
PRU	Positioning Reference Unit
RSPP	Ranging and sidelink positioning protocol
SLPP	SideLink Positioning Protocol
SNPN	Stand-alone Non-Public Network
UE	User Equipment
UL	Uplink

4 General

4.1 Overview

4.1.1 NAS aspect

To enable transfer of Location Services (LCS) signaling messages between the 5G core network (5GCN) and the UE, two Payload container types are defined in the downlink (DL NAS TRANSPORT message) and the uplink (UL NAS TRANSPORT message or CONTROL PLANE SERVICE REQUEST message). The message protocol and procedures are described in 3GPP TS 24.501 [3].

4.1.2 LCS aspect

LCS uses the defined payload container to transfer LCS signalling messages between the UE and the network.

The corresponding LCS signaling messages include:

a) LTE Positioning Protocol (LPP) messages (see 3GPP TS 37.355 [4]):

- Both downlink and uplink LPP messages are supported.

- Routing information is transported as the Additional information IE in UL/DL NAS TRANSPORT message for LPP messages (see 3GPP TS 24.501 [3]).

a1) SideLink Positioning Protocol (SLPP) messages (see 3GPP TS 38.355 [4a]):

- Both downlink and uplink SLPP messages are supported.

- Routing information is transported as the Additional information IE in UL/DL NAS TRANSPORT message for SLPP messages (see 3GPP TS 24.501 [3]).

b) Location services messages:

- Messages for MO-LR operations (see 3GPP TS 24.080 [5]).

- Messages for LocationNotification operations (see 3GPP TS 24.080 [5]).

- Messages for EventReport operations (see 3GPP TS 24.080 [5]).

- Messages for PeriodicTriggeredInvoke operations (see 3GPP TS 24.080 [5]).

- Messages for CancelDeferredLocation operations (see 3GPP TS 24.080 [5]).

- Messages for MSCancelDeferredLocation operations (see 3GPP TS 24.080 [5]).

- Messages for LocationPrivacySetting operations (see 3GPP TS 24.080 [5]).

- Messages for PRU-Association operations (see 3GPP TS 24.080 [5]).

- Messages for SL-MO-LR operations (see 3GPP TS 24.080 [5]).

- Messages for SL-MT-LR operations (see 3GPP TS 24.080 [5]).

- Routing information associated with the LMF is transported as the Additional information IE in UL/DL NAS TRANSPORT message or CONTROL PLANE SERVICE REQUEST message (see clause 5.2.2.6.1) for Location services messages that are transported between the UE and the LMF (see 3GPP TS 24.501 [3]).

c) RSPP transport messages:

- Messages for ULRSPPTransport operations (see 3GPP TS 24.080 [5]).

- Messages for DLRSPPTransport operations (see 3GPP TS 24.080 [5]).

The Routing information transported as the Additional information IE can be Routing identifier in the current specification, which includes immediate routing identifier and deferred routing identifier. The immediate routing identifier transported as the Additional information IE is the Correlation ID, which is allocated by the AMF and can be used in the UL/DL NAS TRANSPORT message (see clause 5.2 and clause 5.3). The deferred routing identifier transported as the Additional information IE can be used in the UL NAS TRANSPORT and CONTROL PLANE SERVICE REQUEST message for the AMF routing the LCS messages to the particular LMF (see clause 5.2.2).

The messages for PeriodicTriggeredInvoke operations can be used to enable the location events reporting over user plane connection, and the messages for EventReport operations can be used for the cumulative event report, as described in clause 6.16.1 of 3GPP TS 23.273 [2]. The location events reporting over user plane connection is defined in 3GPP TS 24.572 [9]).

4.2 LCS Support capabilities

4.2.1 UE support of LCS

The UE announces to the network its ability to support LCS notification mechanism or LPP messages or both, using the 5GMM capability IE defined in 3GPP TS 24.501 [3].

The UE supporting LCS notification mechanism and LPP messages may support PRU (defined in 3GPP TS 38.305 [7]). The UE's ability to support PRU is stored in the UDM (see 3GPP TS 23.273 [2]) without any indication in 5GMM capability IE defined in 3GPP TS 24.501 [3].

A UE accessing 5G network via satellite NG-RAN shall not operate as a PRU.

4.2.2 Network support of LCS

The network announces to the UE its ability to support LCS in 5GC using the 5GS network feature support IE defined in 3GPP TS 24.501 [3]. The information is taken into account by the UE, in addition to UE's LCS capabilities, for the UE to determine whether to initiate MO-LR procedure in NG-RAN as specified in 3GPP TS 23.273 [3], clause 6.2.

NOTE: An SNPN can provide Location Services except for the cases of interworking with EPC, roaming, and direct access to SNPN via non-3GPP access, which are not supported in an SNPN.

5 Support of LCS signalling

5.1 General

This clause defines the NG-RAN LCS operations (clause 5.2) and the format and coding of the messages (clause 5.3).

The messages defined in this clause can be transported in the UL/DL NAS Transport message defined in 3GPP TS 24.501 [3].

5.2 LCS operations

5.2.1 Network initiated location services operations

5.2.1.1 Supplementary Services Location Notification

5.2.1.1.1 General

The supplementary services Location Notification operation enables the AMF to trigger the end-user notification verification process on the UE using NAS signalling. The supplementary services messages are transported using the DL NAS Transport message and the UL NAS Transport message defined in 3GPP TS 24.501 [3]. UE Location Privacy Indication information may be included in Location Notification Return Result to indicate whether subsequent LCS requests or ranging and sidelink positioning requests will be allowed or disallowed by the UE. Figure 5.2.1.1.1.1 illustrates an example of the NAS signalling transport applicable to a 5GC-MT-LR procedure for immediate or deferred location or to a SL-MT-LR procedure for immediate or deferred location.
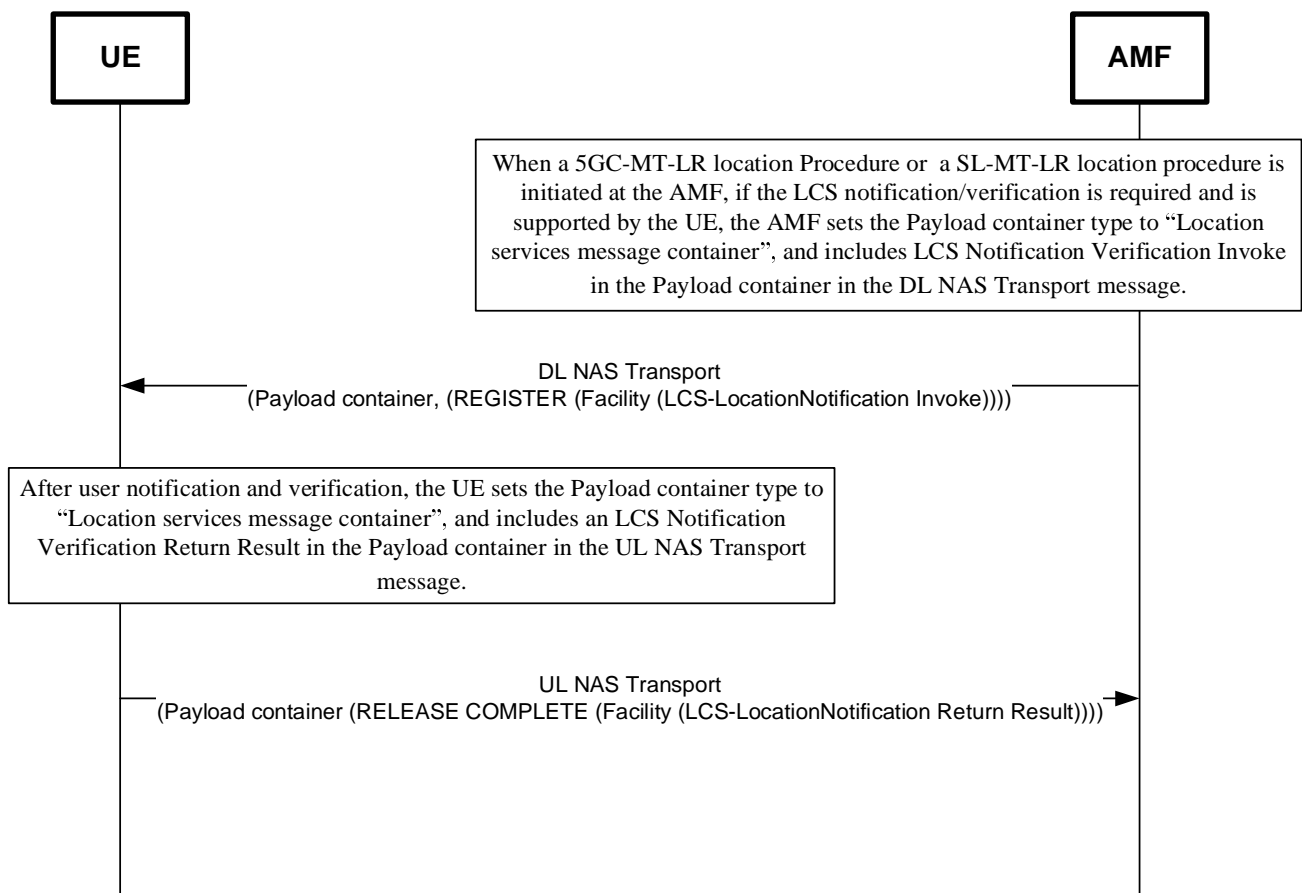
Figure 5.2.1.1.1.1: NAS signalling transport for Supplementary Services Location Notification

NOTE: The optional Additional information IE of the DL/UL NAS Transport message is not included when the LCS Location Notification signalling is transported in the Payload container.

5.2.1.1.2 Normal operation

The network invokes a location notification procedure by sending a REGISTER message containing an LCS-LocationNotification invoke component to the UE as defined in 3GPP TS 24.080 [5]. This may be sent either to request verification for a 5GC-MT-LR or to notify the UE about an already authorized 5GC-MT-LR.

In case of privacy verification for LCS or ranging and sidelink positioning, the UE shall respond to the request by sending a RELEASE COMPLETE message containing the user's response and optionally UE Location Privacy Indication information in a return result component (see figure 5.2.1.1.2.1). If rangingSlExt is included, the privacy verification is for ranging and sidelink positioning and the corresponding verification result for ranging and sidelink positioning is included in UE Location Privacy Indication information.

During the supplementary services Location Notification operation, the network shall run the timer T(LCSN) defined in 3GPP TS 24.080 [5]. This timer is started when the operation is sent, and stopped when a response is received from the UE. If the timer T(LCSN) expires in the network before any response from the UE (e.g. due to no response from the user), the network shall interpret this by applying the default treatment defined in 3GPP TS 23.273 [2] (i.e. disallow location if barred by subscription or allow location if allowed by subscription). The network may also terminate the dialogue by sending a RELEASE COMPLETE message.

In the case of location notification, the UE shall terminate the dialogue immediately by sending a RELEASE COMPLETE message containing a LocationNotification return result.

If the UE is unable to process the request received from the network, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

UE   Network

REGISTER

<--

Facility (Invoke = LCS-LocationNotification (notificationType, locationType, lcsClientExternalID, lcsClientName,
lcsCodeword, lcsServiceTypeId, deferredLocationExt, rangingSlExt))

RELEASE COMPLETE

-->

Facility (Return result = LCS-LocationNotification (verificationResponse, locationPrivacyIndication, validTimePeriod))

RELEASE COMPLETE

- ->

Facility (Return error (Error))

RELEASE COMPLETE

- ->

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

<- -
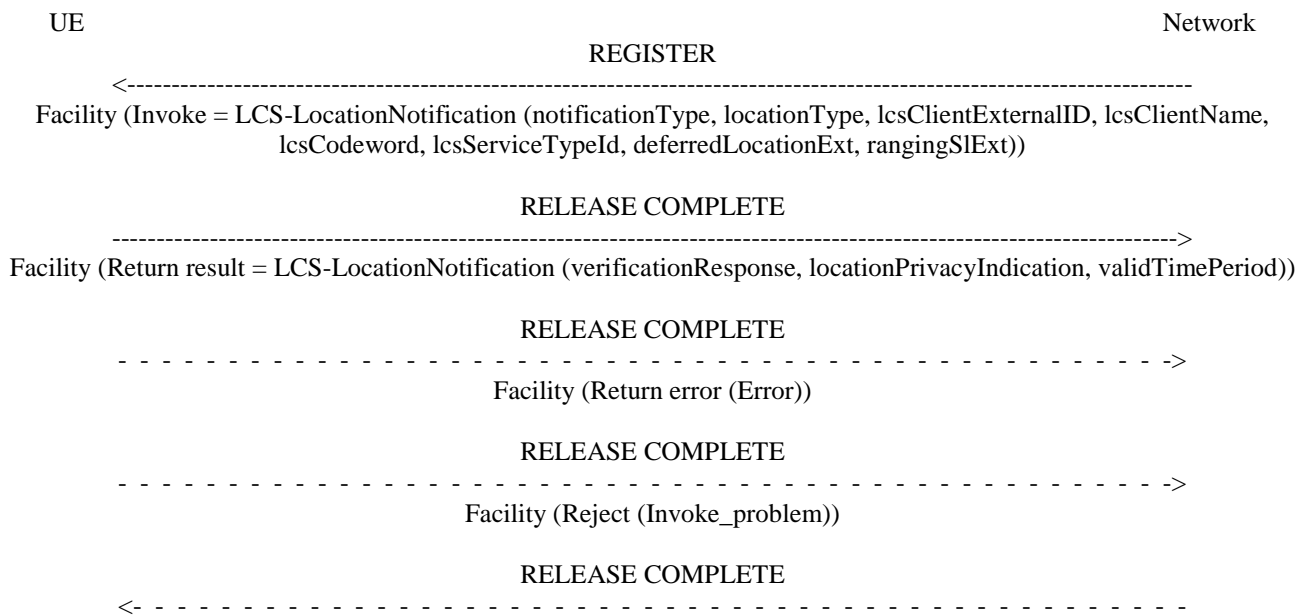
Figure 5.2.1.1.2.1: Location Notification

5.2.1.2   Positioning Information Transport

The AMF sends an LPP message and an associated Correlation Identifier in the DL NAS Transport message (refer to
3GPP TS 24.501 [3] and 3GPP TS 23.273 [2] clause 6.11.1) to a UE, or a UE operating as PRU, or both.
Figure 5.2.1.2.1 illustrates an example of the NAS signalling transport for downlink LPP messages.
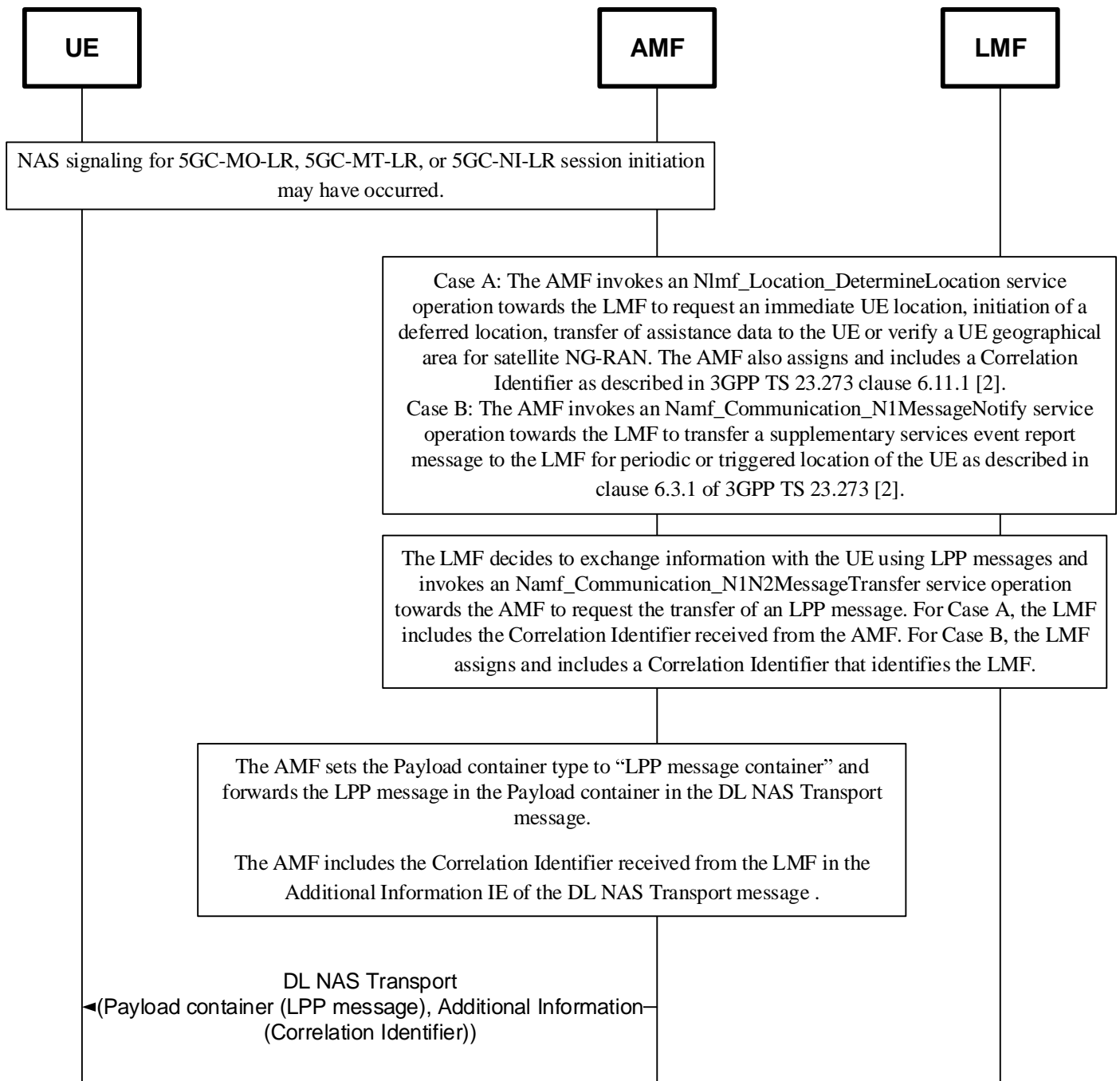
Figure 5.2.1.2.1: NAS signalling transport for downlink LPP messages

NOTE 1: If a scheduled location time is received in the LPP message, the UE in 5GMM-IDLE mode can initiate a service request procedure shortly before the scheduled location time.

NOTE 2: If the LMF determines that simultaneous measurements for UE and PRU(s) are needed, the LMF may send the time window(s) rather than the scheduled location time in the LPP messages to the UE, PRU(s) and NG-RAN. Definition of the time window and the associated configuration parameters are specified in TS 37.355 [4] and TS 38.455 [11].

5.2.1.3 Supplementary Services Periodic or Triggered Location

5.2.1.3.1 General

The supplementary services LCS PeriodicTriggered Invoke operation enables the LMF to initiate periodic or triggered location event reporting by a target UE as described in clause 6.3.1 of 3GPP TS 23.273 [2]. The supplementary services

LCS PeriodicTriggered Invoke message is transferred to the target UE via the serving AMF in a DL NAS Transport message. A response from the target UE is similarly returned to the LMF via the serving AMF and is transferred to the AMF in an UL NAS Transport message. If the LCS PeriodicTriggered Invoke message in the Payload container IE of a DL NAS TRANSPORT message includes the deferred routing identifier, the UE shall include the deferred routing identifier in the Additional information IE of a UL NAS TRANSPORT message during the subsequent procedures as specified in clause 5.2.2.

Figure 5.2.1.3.1.1 illustrates an example of the NAS signalling transport for initiation of periodic or triggered location.
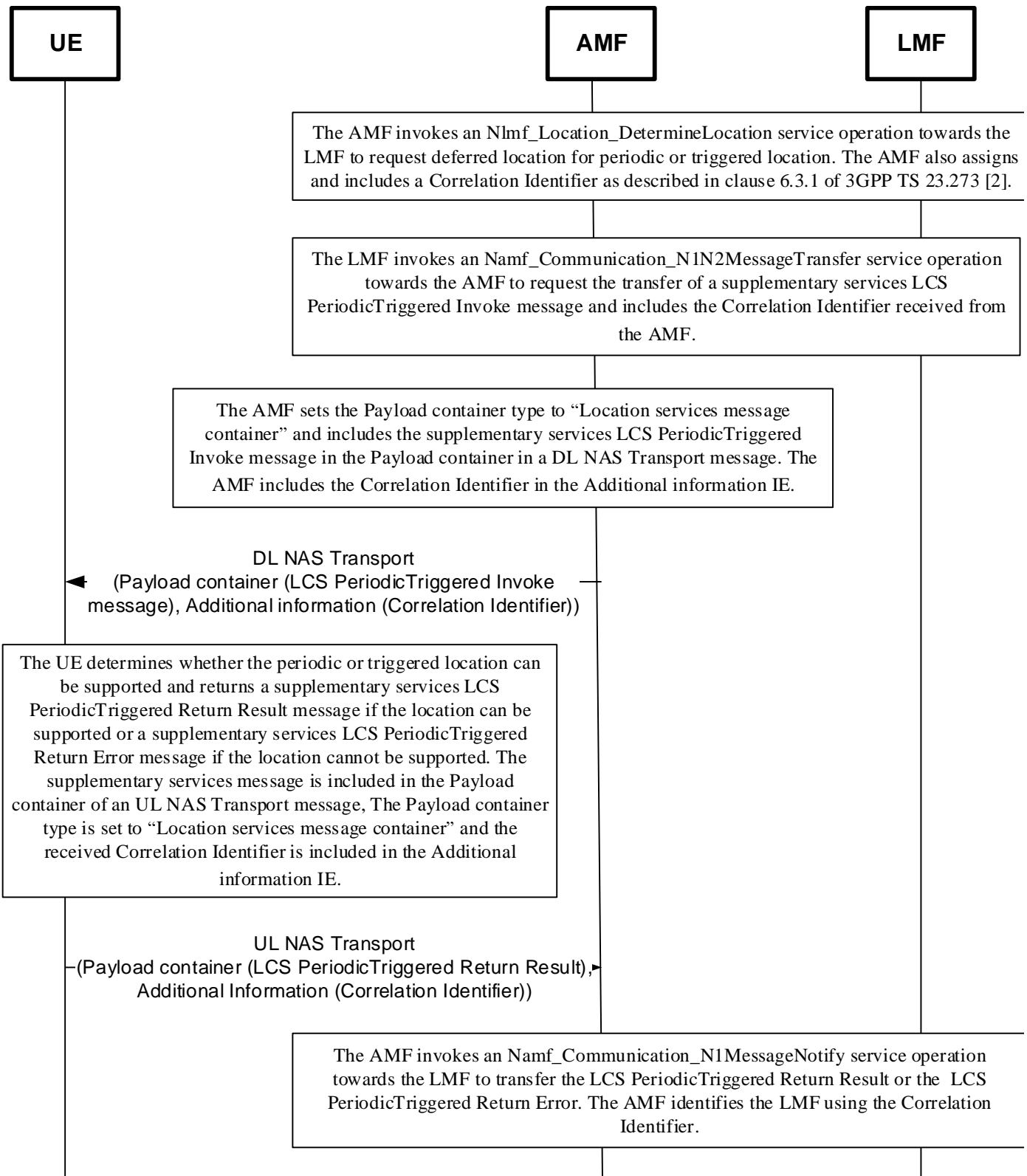
Figure 5.2.1.3.1.1: NAS signalling transport for LCS PeriodicTriggered messages

NOTE: If a scheduled location time is received in the LCS PeriodicTriggered Invoke message, the UE in 5GMM-IDLE mode can initiate a service request procedure shortly before the scheduled location time.

5.2.1.3.2   Normal operation

The LMF sends a REGISTER message to the UE containing the supplementary services LCS PeriodicTriggered Invoke component as defined in 3GPP TS 24.080 [5]. The REGISTER message is transported to the UE via the serving AMF as described in figure 5.2.1.3.1.1.

If the UE can support the periodic or triggered location, the UE returns a RELEASE COMPLETE message to the LMF containing an LCS PeriodicTriggered return result. The RELEASE COMPLETE message is transported to the LMF via the serving AMF as described in figure 5.2.1.3.1.1.

For supporting of the location events reporting over user plane connection, as described in clause 6.16.1 of 3GPP TS 23.273 [2], the LMF provides the UE with the following:

   a)   the endpoint address for the location reporting over user plane connection;

   b)   the security information for the location reporting over user plane connection;

   c)   the cumulative event report timer, if available; or

   d)   the maximum number of events reporting counter, if available.

If the UE receives the cumulative event report timer or the maximum number of events reporting counter from the LMF, the UE shall perform the UE initiated Event Reporting procedure as defined in subclause 5.2.2.4 with including the indication for the cumulative event report.

If the UE is unable to process or support the request received from the network, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component or reject component. Error values are specified in 3GPP TS 24.080 [5].

During the supplementary services periodic or triggered location operation, the network shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the UE. If this timer expires the network shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message.

Figure 5.2.1.3.2.1 illustrates the signalling for normal operation between the UE and the network.

UE **Network**
REGISTER

<---
Facility (Invoke = LCS-PeriodicTriggered (referenceNumber, lcs-Qos, mappedLcs-Qos, periodicLocation,
areaEventReporting, eventReportAllowedArea, motionEventReporting, referenceNumberExt, h-gmlc-callBackUri,
supportedGADShapes, deferredRoutingIdentifier, reportingAccessTypes, multiplePositioningProtocolPDUs,
controlPlane-CIoT-5GS-Optimisation, scheduledLocTime, userPlaneReportAFAddr, timerCriteria, counterCriteria, h-
gmlc-address, reportingIndication))

RELEASE COMPLETE
-->
Facility (Return result = LCS-PeriodicTriggered)

RELEASE COMPLETE
- ->
Facility (Return error (Error))

RELEASE COMPLETE
- ->
Facility (Reject (Invoke_problem))

RELEASE COMPLETE
<- -

Figure 5.2.1.3.2.1: Periodic or Triggered Location Invocation

NOTE 1: The mappedLcs-QoS is obtained by the UE in 5GS and used for location service continuity from 5GS to
EPS for periodic or triggered location event reporting.

NOTE 2: If h-gmlc-address as defined in 3GPP TS 24.080 [5] is received in the LCS PeriodicTriggered Invoke
message, it is used for a EPC-(H)GLMC during the procedure of location service continuity between EPS
and 5GS.

NOTE 3: If reportingIndication as defined in 3GPP TS 24.080 [5] is received in the LCS PeriodicTriggered Invoke
message, the reportingIndication is used for determining whether the Event Reporting procedure is
triggered when the UE is inside or outside the eventReportAllowedArea.

5.2.1.4 Supplementary Services Cancel Deferred Location

5.2.1.4.1 General

The supplementary services Cancel Deferred Location operation enables the AMF to cancel ongoing periodic or
triggered location in a target UE using NAS signalling as described in 3GPP TS 23.273 [2] clause 6.3.3. The
supplementary services Cancel Deferred Location messages are transported using the DL NAS TRANSPORT message
and the UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. Figure 5.2.1.4.1-1 illustrates an example of
the NAS signalling transport.

~~~
┌────────┐                                                                    ┌────────┐
│   UE   │                                                                    │  AMF   │
└────────┘                                                                    └────────┘
    │                                                                             │
    │         ┌──────────────────────────────────────────────────────────────┐  │
    │         │  The AMF receives a request from a GMLC to cancel ongoing      │  │
    │         │  periodic or triggered location in the UE. The request         │  │
    │         │  includes the (H)GMLC contact address and the LDR reference     │  │
    │         │  number. Once the UE is in CM CONNECTED state (see              │  │
    │         │  3GPP TS 23.273 clause 6.3.3), the AMF sends a DL NAS TRANSPORT  │  │
    │         │  message to the UE. The Payload container type indicates        │  │
    │         │  "Location services message container". The Payload container   │  │
    │         │  includes the supplementary services                            │  │
    │         │  LCS-CancelDeferredLocation Invoke.                             │  │
    │         └──────────────────────────────────────────────────────────────┘  │
    │                               DL NAS TRANSPORT                              │
    │◄────────────────────────────────────────────────────────────────────────  │
    │    (Payload container, (REGISTER (Facility (LCS-CancelDeferredLocation Invoke)))) │
    │                                                                             │
┌───────────────────────────────────────────────────────────┐                   │
│  The UE cancels the periodic or triggered location if     │                   │
│  still ongoing. For successful cancelation, the UE         │                   │
│  returns a supplementary services LCS-                      │                   │
│  CancelDeferredLocation return result. For unsuccessful     │                   │
│  cancelation, the UE returns a supplementary services       │                   │
│  LCS-CancelDeferredLocation return error.                   │                   │
│  The UE sends a UL NAS TRANSPORT message to the AMF and     │                   │
│  includes the supplementary services message in the         │                   │
│  Payload container. The Payload container type is set to    │                   │
│  "Location services message container".                     │                   │
└───────────────────────────────────────────────────────────┘                   │
    │                                                                             │
    │                               UL NAS TRANSPORT                              │
    │  ─────────────────────────────────────────────────────────────────────────►│
    │  (Payload container (RELEASE COMPLETE (Facility (LCS-CancelDeferredLocation Return Result)))) │
    │                                                                             │
~~~

Figure 5.2.1.4.1.1: NAS signalling transport for Cancel Deferred Location

NOTE: The optional Additional information IE of the DL/UL NAS Transport message is not included when the LCS CancelDeferredLocation signalling is transported in the Payload container.

5.2.1.4.2   Normal operation

The AMF invokes a cancel deferred location procedure by sending a REGISTER message containing an LCS-CancelDeferredLocation invoke component to the UE as defined in 3GPP TS 24.080 [5].

The UE shall terminate the ongoing periodic or triggered location if this can be identified from the information in the LCS-CancelDeferredLocation invoke component.

The UE shall then return a RELEASE COMPLETE message containing an LCS-CancelDeferredLocation return result component (see figure 5.2.1.4.2.1).

If the UE is unable to process the request received from the network or cannot identify the ongoing periodic or triggered location to be terminated, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the supplementary services cancel deferred location operation, the network shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the UE. If this timer expires the network shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message.

UE	Network

REGISTER
<--
Facility (Invoke = LCS-CancelDeferredLocation (referenceNumberExt, h-gmlc-callBackUri))

RELEASE COMPLETE
-->
Facility (Return result = LCS-CancelDeferredLocation)

RELEASE COMPLETE
- ->
Facility (Return error (Error))

RELEASE COMPLETE
- ->
Facility (Reject (Invoke_problem))

RELEASE COMPLETE
<- -

Figure 5.2.1.4.2.1: Cancel Deferred Location

5.2.1.5 Network initiated PRU disassociation procedure

5.2.1.5.1 General

The supplementary services PRU disassociation operation enables the LMF to disassociate the associated PRU by using NAS signalling as decribed in clause 6.17.2 of 3GPP TS 23.273 [2]. The NAS signaling are transported using the DL NAS Transport message and the Uplink NAS Transport message defined in 3GPP TS 24.501 [3]. The LMF may invoke this procedure prior to the event of becoming unavailable LMF (e.g., for maintenance, removal or replacement of the LMF).

Figure 5.2.1.5.1-1 illustrates an example of the NAS signaling transport for a PRU disassociation procedure.
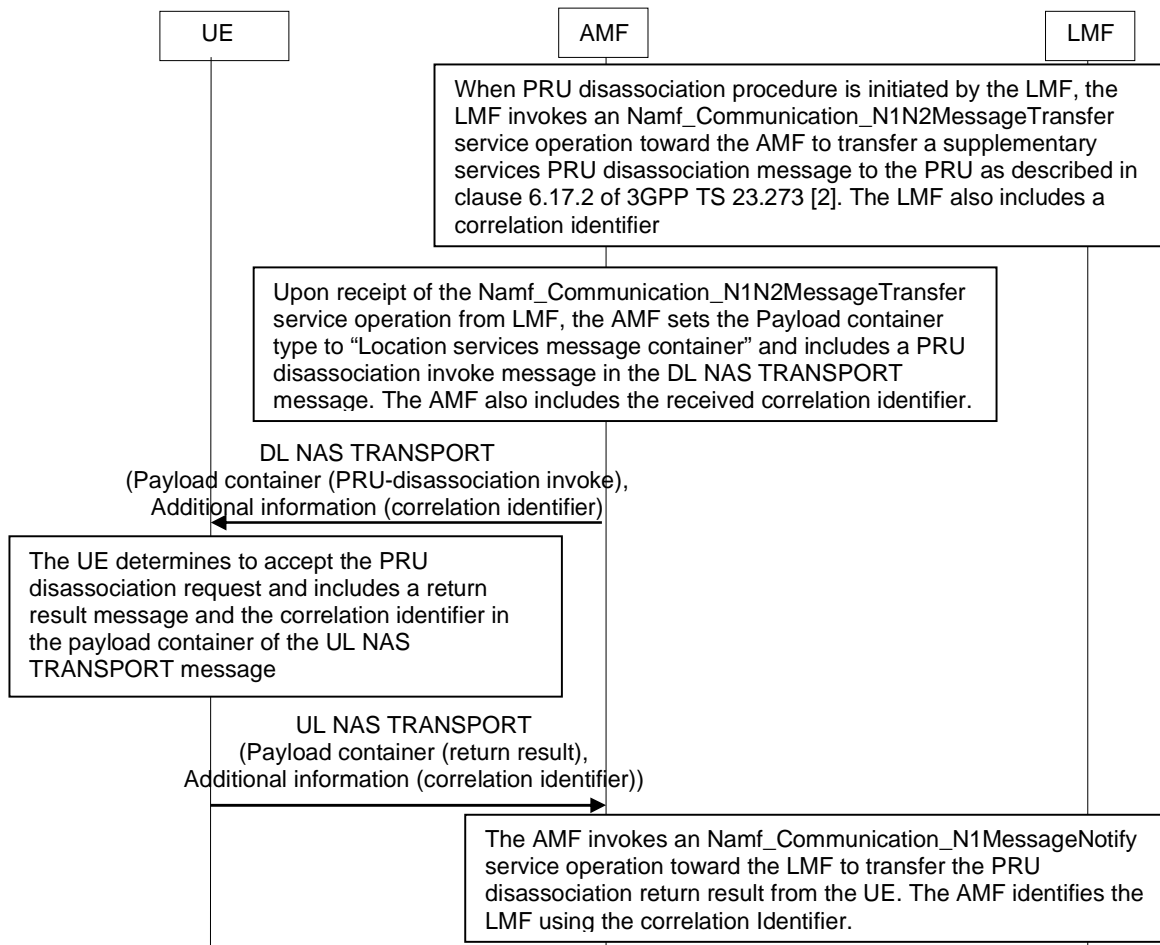
Figure 5.2.1.5.1-1: NAS signalling transport for network initiated PRU disassociation procedure

5.2.1.5.2 Normal operation

The LMF invokes a PRU disassociation procedure by invoking PRU disassociation operation to the associated UE operating as PRU as defined in 3GPP TS 24.080 [5].

The UE operating as PRU shall terminate the PRU association with the serving PLMN if this can be identified from the information in the PRU-disassociation invoke component. The UE shall then return a RELEASE COMPLETE message containing a PRU-disassociation return result component (see figure 5.2.1.5.2.1). If the UE operating as PRU receives a new routing ID for a new serving LMF in the PRU-disassociation invoke component from the LMF, the UE operating as PRU may perform a PRU association procedure with the new serving LMF as described in clause 5.2.2.7.

UE   Network

<div align="center">REGISTER</div>

<--

<div align="center">Facility (Invoke = PRU-disassociation(newLmfRoutingId))</div>

<div align="center">RELEASE COMPLETE</div>

-->

<div align="center">Facility (Return result = PRU-disassociation)</div>
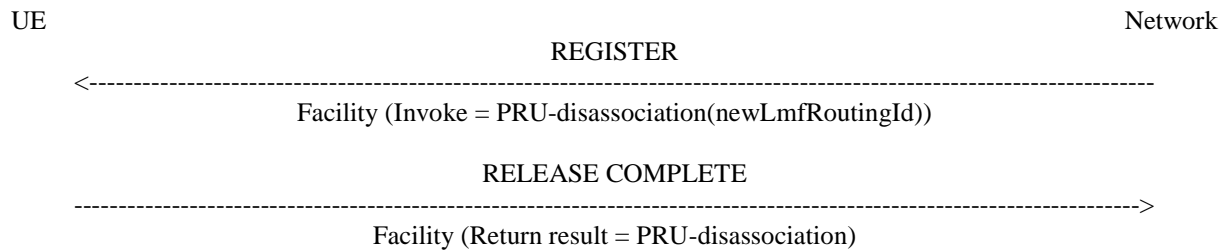
<div align="center">**Figure 5.2.1.5.2.1: Network initiated PRU disassociation procedure**</div>

NOTE 1: The following IE defined in PRU-disassociation operations in 3GPP TS 24.080 [5] is used for NG-RAN LCS:

- newLmfRoutingId

5.2.1.6 Sidelink Positioning Information Transport

The AMF sends an SLPP message and an associated Correlation Identifier in the DL NAS TRANSPORT message (refer to 3GPP TS 24.501 [3], 3GPP TS 23.586 [10], 3GPP TS 23.273 [2] clause 6.20). Figure 5.2.1.6 illustrates an example of the NAS signalling transport for downlink SLPP messages.
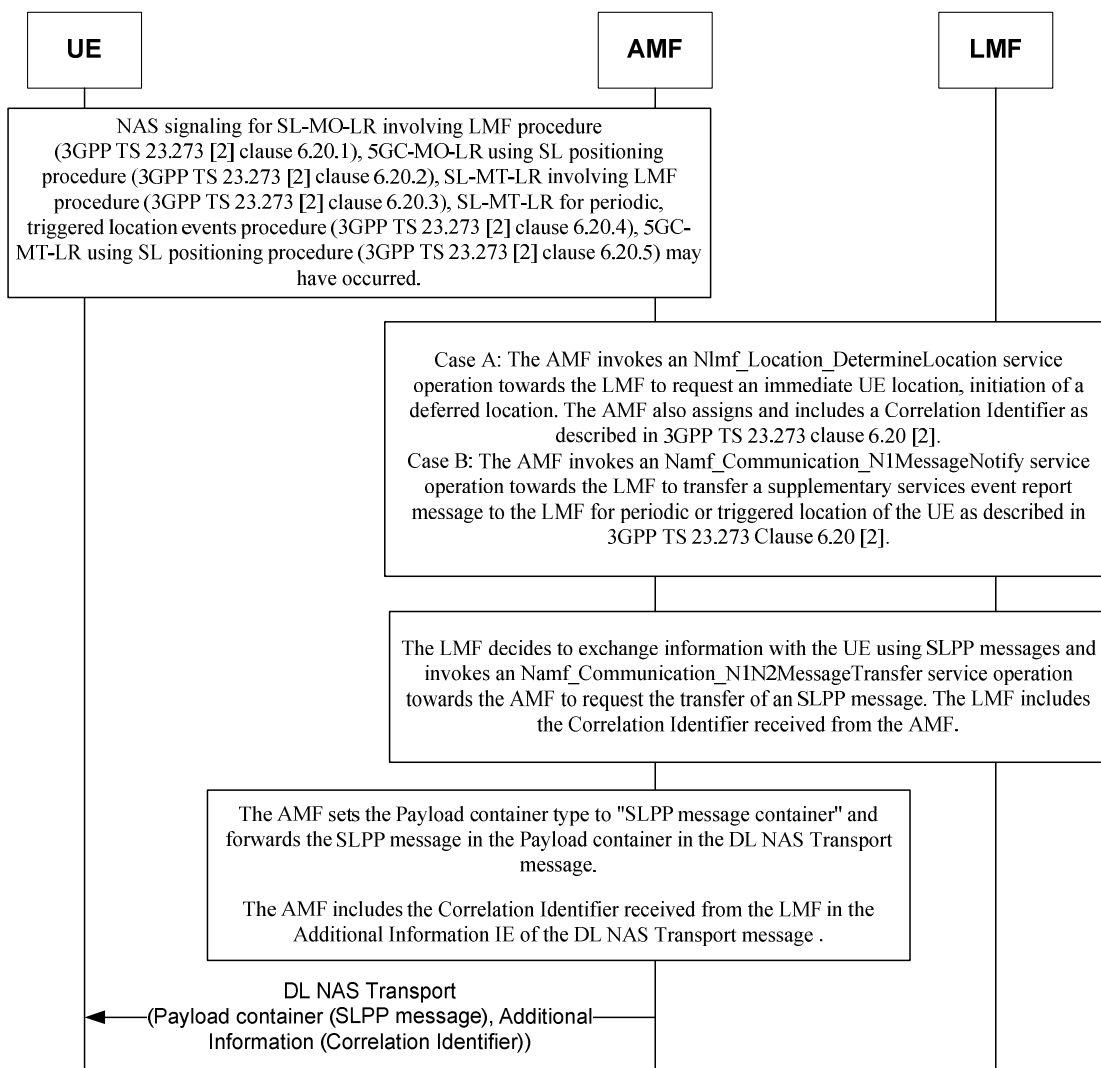
Figure 5.2.1.6.1: NAS signalling transport for downlink SLPP messages

5.2.1.7 Network initiated RSPP supplementary information transport

5.2.1.7.1 General

The network initiated RSPP supplementary information transport procedure enables the LMF to transfer the RSPP supplementary information to the target UE for capability exchange, assistance data exchange or location information exchange as decribed in clause 6.20.1, clause 6.20.2, clause 6.20.3, clause 6.20.4 or clause 6.20.5 of 3GPP TS 23.273 [2].

The LCS message carrying the DLRSPPTransport invoke component is transferred from the LMF to the receiving UE via the serving AMF in a DL NAS TRANSPORT message. An acknowledgement message from the receiving UE is returned to the LMF via the serving AMF and is transferred to the AMF in an UL NAS TRANSPORT message.

5.2.1.7.2 Normal operation

In order to initate the network initiated RSPP supplementary information transport procedure, the LMF shall send a REGISTER message to the UE containing the DLRSPPTransport invoke component as defined in 3GPP TS 24.080 [5].

In the DLRSPPTransport invoke component included in the REGISTER message, the LMF shall include rangingSLPPList IE. In the rangingSLPPList, the LMF:

a) may include the embedded SLPP message as defined in 3GPP TS 38.355 [4a] for the receiving UE;

b) shall include the embedded SLPP message(s) as defined in 3GPP TS 38.355 [4a] for the related SL reference UE(s) or the related located UE(s) with the associated application layer ID(s);

NOTE: The SLPP message(s) sent by the LMF include the SLPP message(s) to request capability, to provide assistance data or to request location information as defined in 3GPP TS 38.355 [4a].

c) may include the indication of network assisted sidelink positioning if LMF determines to apply UE based sidelink positioning;

d) may include the scheduled location time; and

e) may include the relatedUEInfo IE indicating information of candidate located UE(s) when the required location result is absolute location.

The receiving UE shall then return a RELEASE COMPLETE message containing a DLRSPPTransport return result component (see Figure 5.2.1.7.2-1) if the receiving UE accepts the DLRSPPTransport invoke component.

If the receiving UE does not accept the DLRSPPTransport invoke component, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the network initiated RSPP supplementary information transport operation, the network shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the UE. If this timer expires the network shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message.
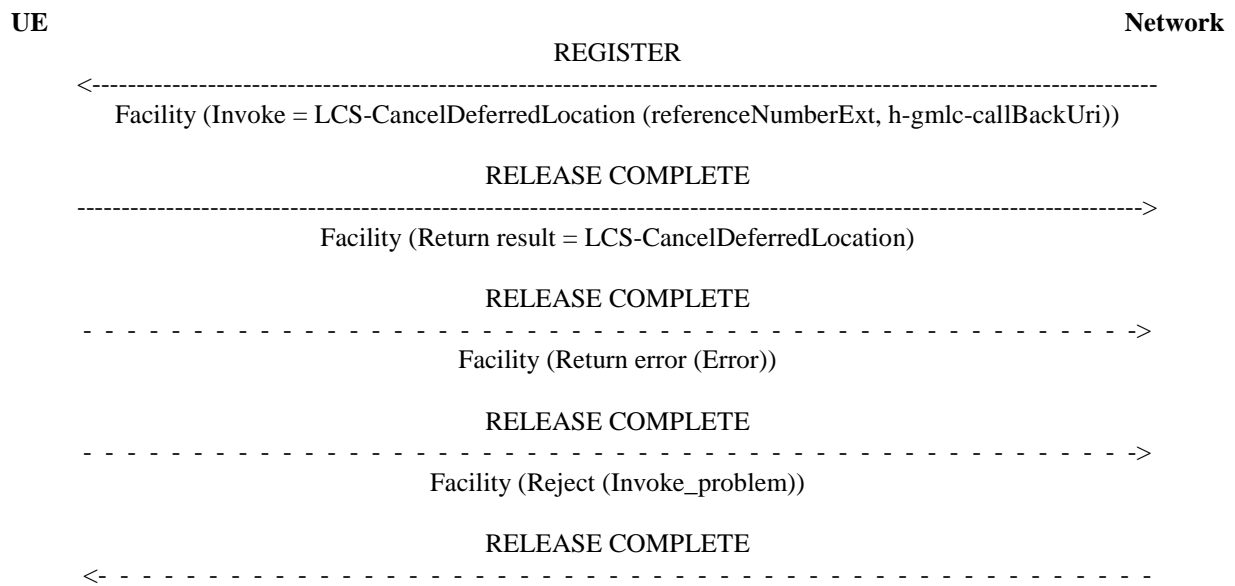
Figure 5.2.1.7.2.1 illustrates the signalling for normal operation between the UE and the network.

UE		Network

REGISTER

<--

Facility (Invoke = LCS-DLRSPPTransport (rangingSLPPList, scheduledLocTime, ueBased, relatedUEInfo))

RELEASE COMPLETE

-->

Facility (Return result = LCS-DLRSPPTransport ())

RELEASE COMPLETE

- ->

Facility (Return error (Error))

RELEASE COMPLETE

- ->

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

<- -

Figure 5.2.1.7.2.1: Network initiated RSPP supplementary information transport procedure

NOTE 1: Only the following IEs defined in DLRSPPTransport operations in 3GPP TS 24.080 [5] are used for ranging and sidelink positioning:

- rangingSLPPList

- scheduledLocTime

- ueBased

- relatedUEInfo

NOTE 2: The rangingSLPPList IE is added to DLRSPPTransport to allow for passing multiple SLPP messages for the UE connecting with the LMF and/or the other related UE. Its ASN.1 description is given in 3GPP TS 24.080 [5].

5.2.1.8 Sidelink mobile terminating location request

5.2.1.8.1 General

The sidelink mobile terminating location request procedure enables the LMF to obtain location information as decribed in clause 6.20.2, clause 6.20.3, clause 6.20.4 or clause 6.20.5 of 3GPP TS 23.273 [2].

The LCS message carrying the LCS-SLMTLR invoke component is transferred from the LMF to the target UE via the serving AMF in a DL NAS TRANSPORT message. A response from the target UE is returned to the LMF via the serving AMF and is transferred to the AMF in an UL NAS TRANSPORT message.

5.2.1.8.2 Normal operation

In order to initiate the sidelink mobile terminating location request procedure, the LMF shall send a REGISTER message to the UE containing the LCS-SLMTLR invoke component as defined in 3GPP TS 24.080 [5] as described in clause 6.20.2, clause 6.20.3, clause 6.20.4 or clause 6.20.5 of 3GPP TS 23.273 [2]. In the LCS-SLMTLR invoke component, the LMF:

- shall include the relatedUEInfo IE indicating information of candidate located UE(s) when the required location result is absolute location or indicating information of candidate SL reference UE(s) when the required location result is relative location;

- shall include the locatedUEselect IE indicating whether the target UE or the LMF is to select the located UE(s) when the required location result is absolute location; and

- may include the coordinateID IE indicating local coordinate(s) when the required location result is absolute location. The coordinateID IE is used to determine the target UE location in local coordinates.

If the UE accepts the LCS-SLMTLR invoke component, the UE shall send a RELEASE COMPLETE message to the LMF containing the LCS-SLMTLR return result component. In the LCS-SLMTLR return result component, the UE:

- shall include the relatedUEInfo IE containing information of the related UEs for the ranging and sidelink positioning discovered by the UE, if the LCS-SLMTLR invoke component includes the locatedUEselect IE indicating that the LMF is to select the located UE(s);

- shall include the relatedUEInfo IE containing information of the related UEs for the ranging and sidelink positioning selected by the UE, if the LCS-SLMTLR invoke component includes the locatedUEselect IE indicating that target UE is to select the located UE(s); and

- may include the rangingSLPPList IE containing the embedded SLPP message providing sidelink positioning capabilities of the related UEs as defined in 3GPP TS 38.355 [4a].

If the UE is unable to process or support the request received from the network, the UE shall send a RELEASE COMPLETE message containing a return error component or reject component. Error values are specified in 3GPP TS 24.080 [5].

During the sidelink mobile terminating location request operation, the network shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the UE. If this timer expires the network shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message.

Figure 5.2.1.8.2.1 illustrates the signalling for normal operation between the UE and the network.
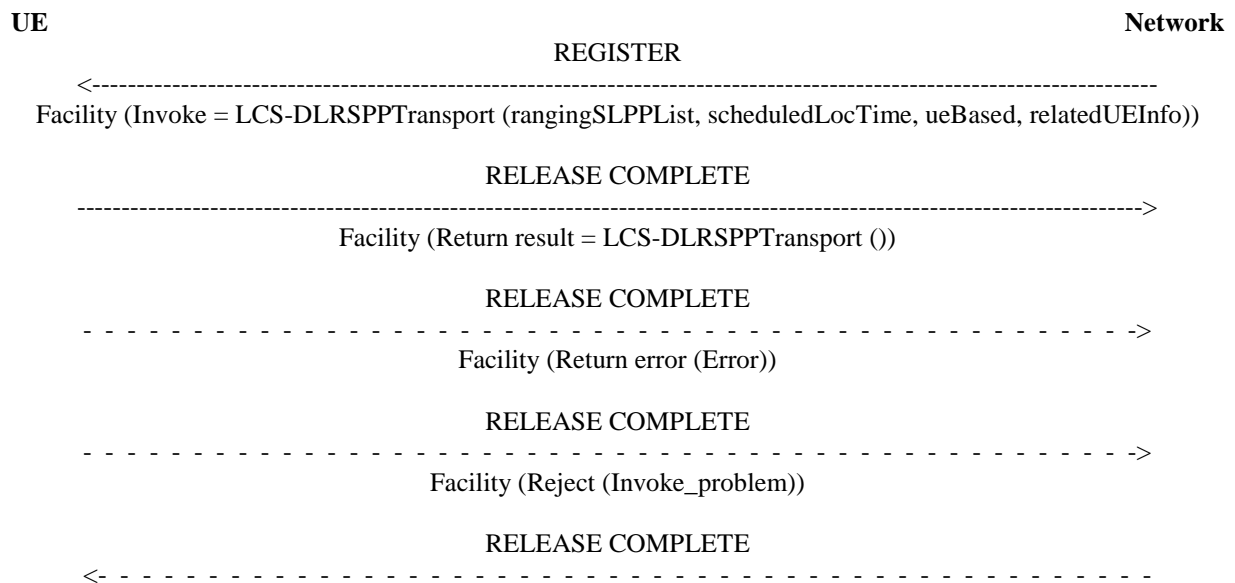
UE **Network**

REGISTER

<--

Facility (Invoke = LCS-SLMTLR (slmtlr-Type, supportedGADShapes, relatedUEInfo, locatedUEselect, coordinateID))

RELEASE COMPLETE

-->

Facility (Return result = LCS-SLMTLR(relatedUEInfo, rangingSLPPList))

RELEASE COMPLETE

- ->

Facility (Return error (Error))

RELEASE COMPLETE

- ->

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

<- -
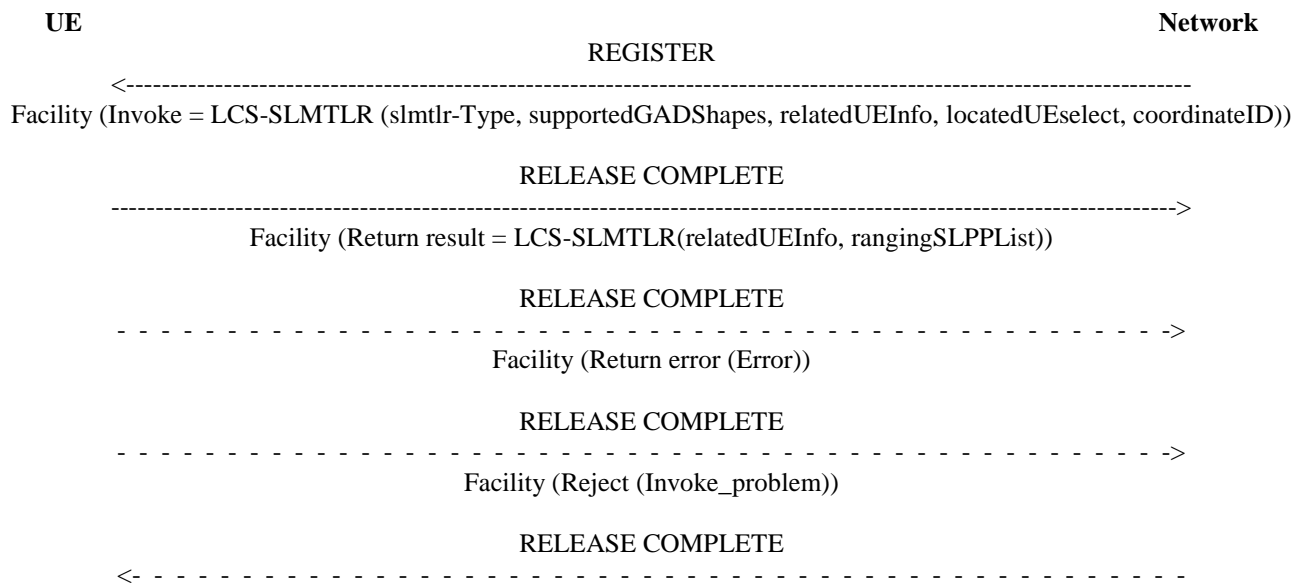
Figure 5.2.1.8.2.1: Sidelink mobile terminating location request procedure

NOTE 1: Only the following IEs defined in SL-MT-LR operations in 3GPP TS 24.080 [5] are used for ranging and sidelink positioning:

- slmtlr-Type

- supportedGADShapes

- relatedUEInfo

- locatedUEselect

- coordinateID

- rangingSLPPList

NOTE 2: The rangingSLPPList IE is added to the SL-MT-LR Response to allow for passing multiple UE positioning information SLPP messages (e.g. UE capabilities) to the LMF. Its ASN.1 description is given in 3GPP TS 24.080 [5].

5.2.2 Mobile initiated location services operations

5.2.2.1 Mobile Originated Location Request(MO-LR)

5.2.2.1.1 General

The supplementary services MO-LR operation enables the UE to launch MO positioning session or request location assistance data using NAS signaling. The NAS signaling are transported using the DL NAS TRANSPORT message and the UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. Figure 5.2.2.1.1-1 illustrates an example of the NAS signaling transport for an MO-LR session.
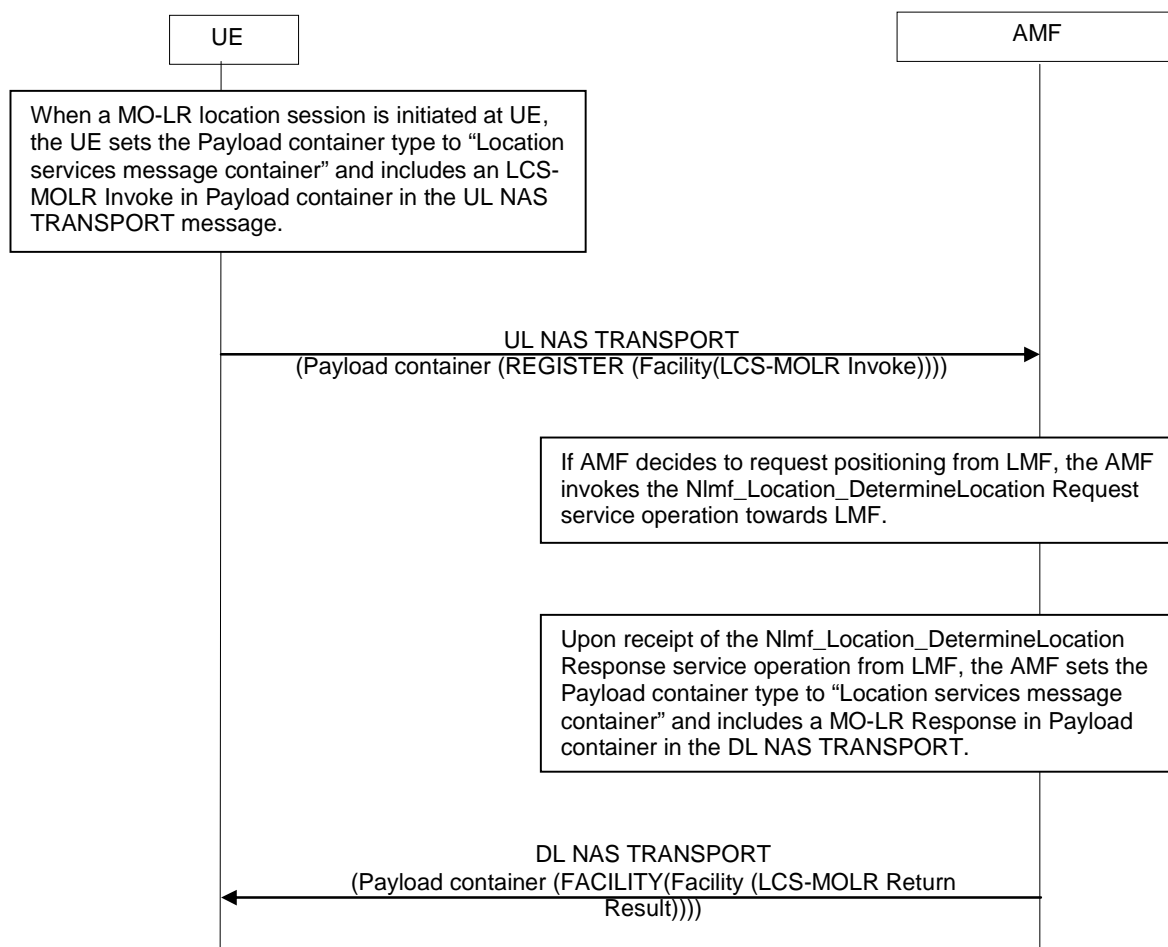
Figure 5.2.2.1.1-1: NAS signaling transport for MO-LR

NOTE: The optional Additional information IE of the UL/DL NAS TRANSPORT message is not included when the MO-LR signaling is transported in the Payload container.

5.2.2.1.2 Normal operation

The UE invokes a MO-LR by sending a REGISTER message to the network containing a LCS-MOLR invoke component. SS Version Indicator value 1 or above shall be used.

The receiving network entity shall initiate the handling of location request in the network. The network shall pass the result of the location procedure to the UE by sending a FACILITY message to the UE containing a LCS-MOLR return result component. When location estimate is kept in the network entity and this information satisfies the requested accuracy and the requested maximum age of location, then the network may reuse this information and the positioning measurement procedure may be skipped.

The network shall pass the result of the location procedure to the UE only if the location estimate is given in a format that the UE supports, as indicated by either the presence (and content) or the absence of the parameter supportedGADShapes, which may be sent by the UE in the LCS-MOLR operation.

The UE may terminate the dialogue by sending a RELEASE COMPLETE message in the case of single location request (see figure 5.2.2.1.1-1). The UE may also initiate another location request operation by sending a FACILITY message to the network containing a LCS-MOLR invoke component (see figure 5.2.2.1.1-2). After the last location request operation the UE shall terminate the dialogue by sending a RELEASE COMPLETE message.

If the network is unable to successfully fulfil the request received from the UE (e.g. to provide a location estimate or location assistance information), it shall clear the transaction by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5]. If the network is unable to provide a location estimate due to lack of support in the UE for the type of shape of the location estimate, then it shall use the error Facility Not Supported.

If the network has returned a result to the UE in a FACILITY message but, after some PLMN administered time period has elapsed, has not received either a new location request operation in a FACILITY message or a RELEASE COMPLETE message from the UE, the network may clear the transaction by sending a RELEASE COMPLETE message.

During the MO-LR operation the UE shall run a timer T(LCSL). This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message, and shall inform the user of the failure.

UE **Network**

REGISTER

--->

Facility (Invoke = LCS-MOLR (molr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, ageOfLocationInfo, locationType, pseudonymIndicator, h-gmlc-address,multiplePositioningProtocolPDUs, scheduledLocTime))

FACILITY

<--

Facility (Return result = LCS-MOLR (locationEstimate, velocityEstimate, add-LocationEstimate, decipheringKeys))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

--->

Figure 5.2.2.1.2-1: Single mobile originated location request

UE **Network**

REGISTER

-->

Facility (Invoke = LCS-MOLR Request (molr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, ageOfLocationInfo, locationType, pseudonymIndicator, h-gmlc-address, multiplePositioningProtocolPDUs, scheduledLocTime))

FACILITY

<---

(Return result = LCS-MOLR (locationEstimate, velocityEstimate, add-LocationEstimate, decipheringKeys))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

FACILITY

-->

Facility (Invoke = LCS-MOLR (molr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, ageOfLocationInfo, locationType, pseudonymIndicator, h-gmlc-address, multiplePositioningProtocolPDUs))

FACILITY

<---

(Return result = LCS-MOLR (locationEstimate, velocityEstimate, add-LocationEstimate, decipheringKeys))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

-->

Figure 5.2.2.1.2-2: Multiple mobile originated location requests

NOTE 1: Only the following IEs defined in MO-LR operations in 3GPP TS 24.080 [5] are used for NG-RAN LCS:

- molr-Type

- lcs-QoS

- lcsServiceTypeID

- ageOfLocationInfo

- locationType

- mlc-Number

- lcsClientExternalID

- pseudonymIndicator

- supportedGADShapes

- multiplePositioningProtocolPDUs

- locationEstimate

- add-LocationEstimate

- h-gmlc-address

- decipheringKeys

- scheduledLocTime

- velocityEstimate

NOTE 2: The multiplePositioningProtocolPDUs IE is added to the MO-LR Request to allow for passing multiple UE positioning information LPP messages (e.g. UE location measurements or UE capabilities) to the LMF for NG-RAN LCS. Its ASN.1 description is given in 3GPP TS 24.080 [5], where the maximum number of LPP messages is specified. There is one or more types of multiple LPP messages can be encapsulated in one multiplePositioningProtocolPDUs IE.

5.2.2.2   UE initiated Cancel Deferred Location

5.2.2.2.1   General

The supplementary services MSCancelDeferredLocation operation enables the UE to cancel ongoing periodic or triggered location in a target LMF using NAS signalling as described in 3GPP TS 23.273 clause 6.3.2 [2]. The supplementary services MCancelDeferredLocation messages are transported using the UL NAS TRANSPORT message and the DL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. The deferred routing identifier in the Additional information IE of the UL NAS TRANSPORT message for the cancellation of periodic or triggered location event reporting can be an LMF ID.
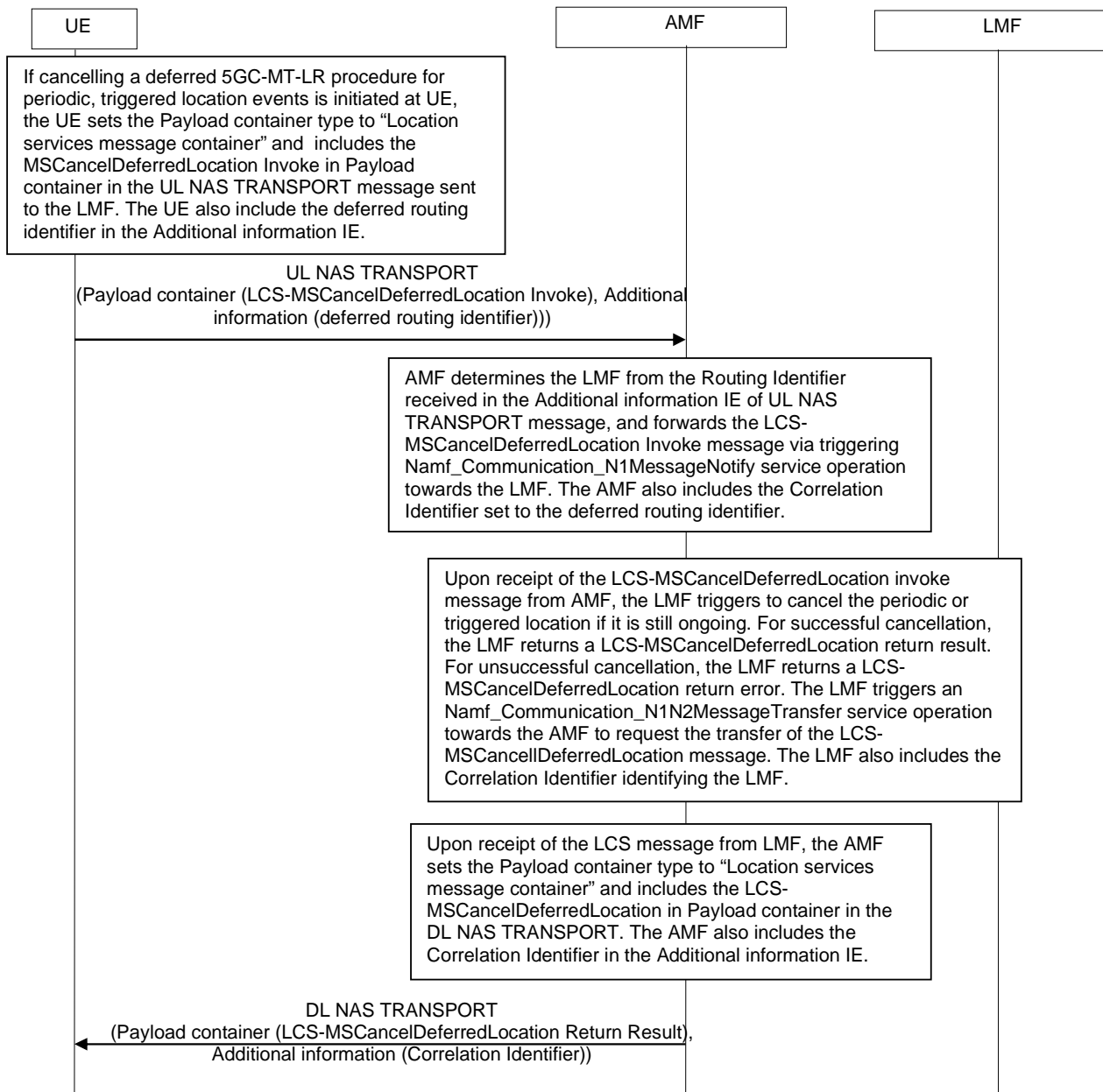
Figure 5.2.2.2.1-1: NAS signalling transport for UE initiated Cancel Deferred Location

5.2.2.2.2 Normal operation

The UE invokes a cancel deferred location procedure by sending a REGISTER message containing a LCS-MSCancelDeferredLocation invoke component to the LMF as defined in 3GPP TS 24.080 [5].

The LMF shall terminate the ongoing periodic or triggered location if this can be identified from the information in the LCS-MSCancelDeferredLocation invoke component.

The LMF shall then return a RELEASE COMPLETE message containing an LCS-MSCancelDeferredLocation return result component (see Figure 5.2.2.2.2-1).

NOTE: If the UE has requested the cancellation of the deferred location procedure for the location events reporting over user plane connection and the UE receives the acknowledgment of the cancellation from the LMF, the UE releases the user plane connection to the LCS Client or AF if the release has not been yet initiated.

If the LMF is unable to process the request received from the UE or can not identify the ongoing periodic or triggered location to be terminated, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the UE initiated cancel deferred location operation, the UE shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed. The UE may terminate the dialogue by sending a RELEASE COMPLETE message, and informs the user of the failure.
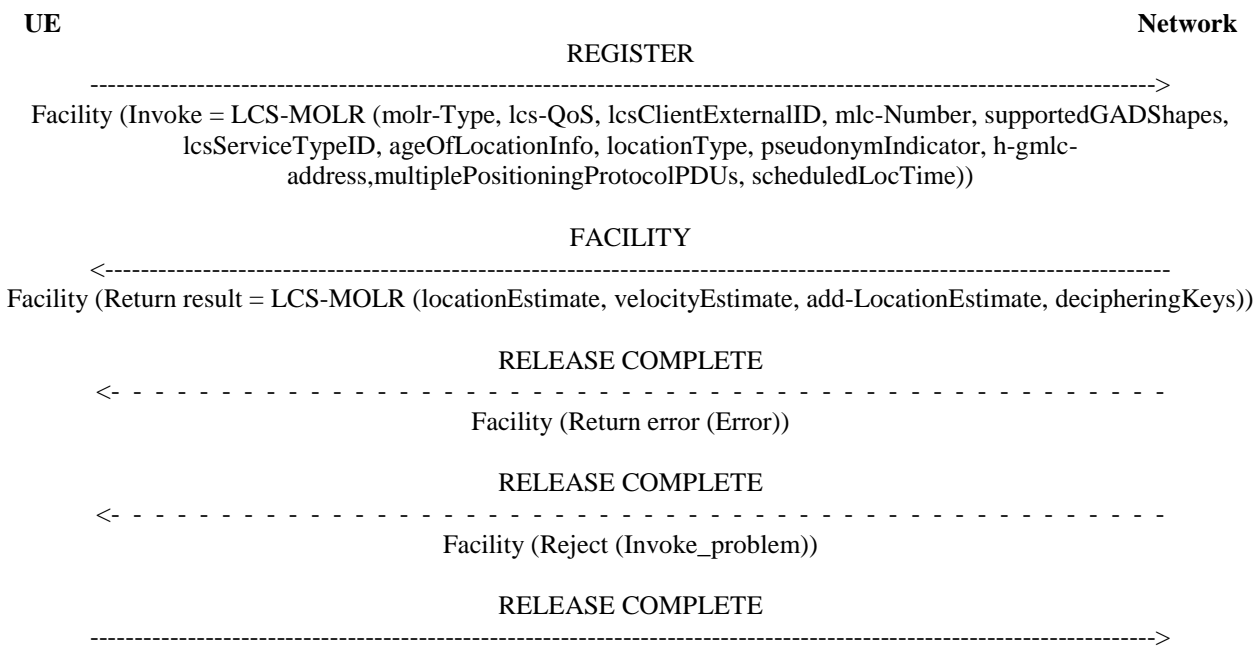
UE   **Network**
                                                       REGISTER
--->
            Facility (Invoke = LCS-MSCancelDeferredLocation (referenceNumberExt, h-gmlc-callBackUri))

                                                  RELEASE COMPLETE
<--
                         Facility (Return result = LCS-MSCancelDeferredLocation)

                                                  RELEASE COMPLETE
<- -
                                       Facility (Return error (Error))

                                                  RELEASE COMPLETE
<- -
                                       Facility (Reject (Invoke_problem))

                                                  RELEASE COMPLETE
- ->
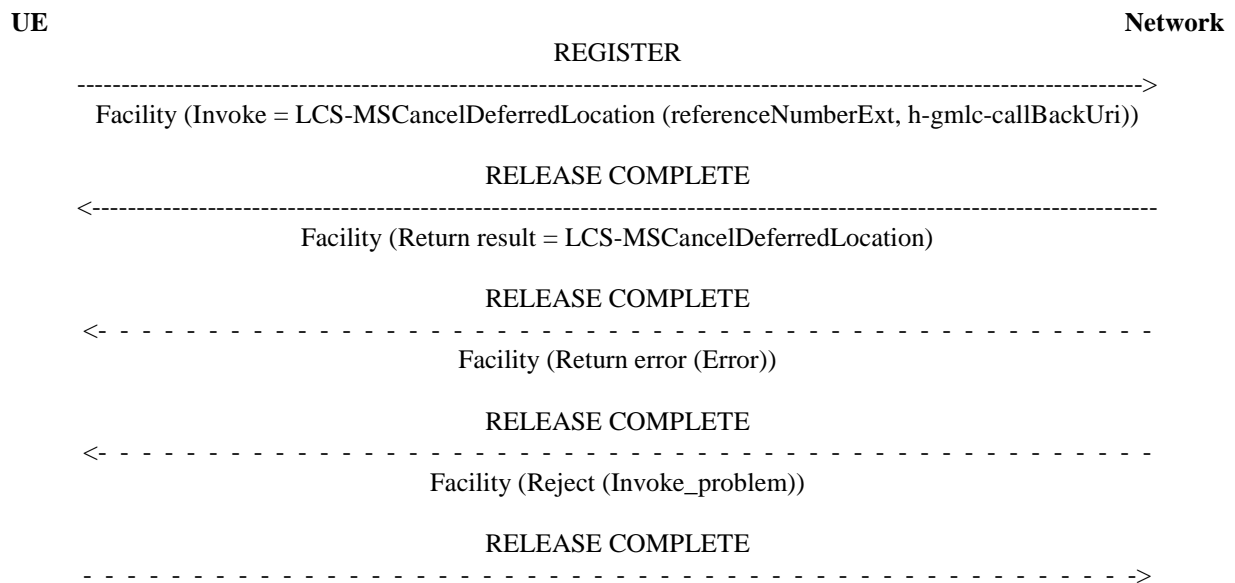
Figure 5.2.2.2.2-1: Cancel Deferred Location

NOTE: Only the following IEs defined in MSCancelDeferredLocation operations in 3GPP TS 24.080 [5] are used for NG-RAN LCS:

- referenceNumberExt

- h-gmlc-callBackUri

5.2.2.3   UE initiated Positioning Information Transport

The UE sends LPP message and the associated Routing identifier in the UL NAS TRANSPORT message (refer to 3GPP TS 24.501 [3] and 3GPP TS 23.273 [2] clause 6.11.1). Figure 5.2.2.3-1 illustrates an example of the NAS signalling transport for uplink LPP messages.
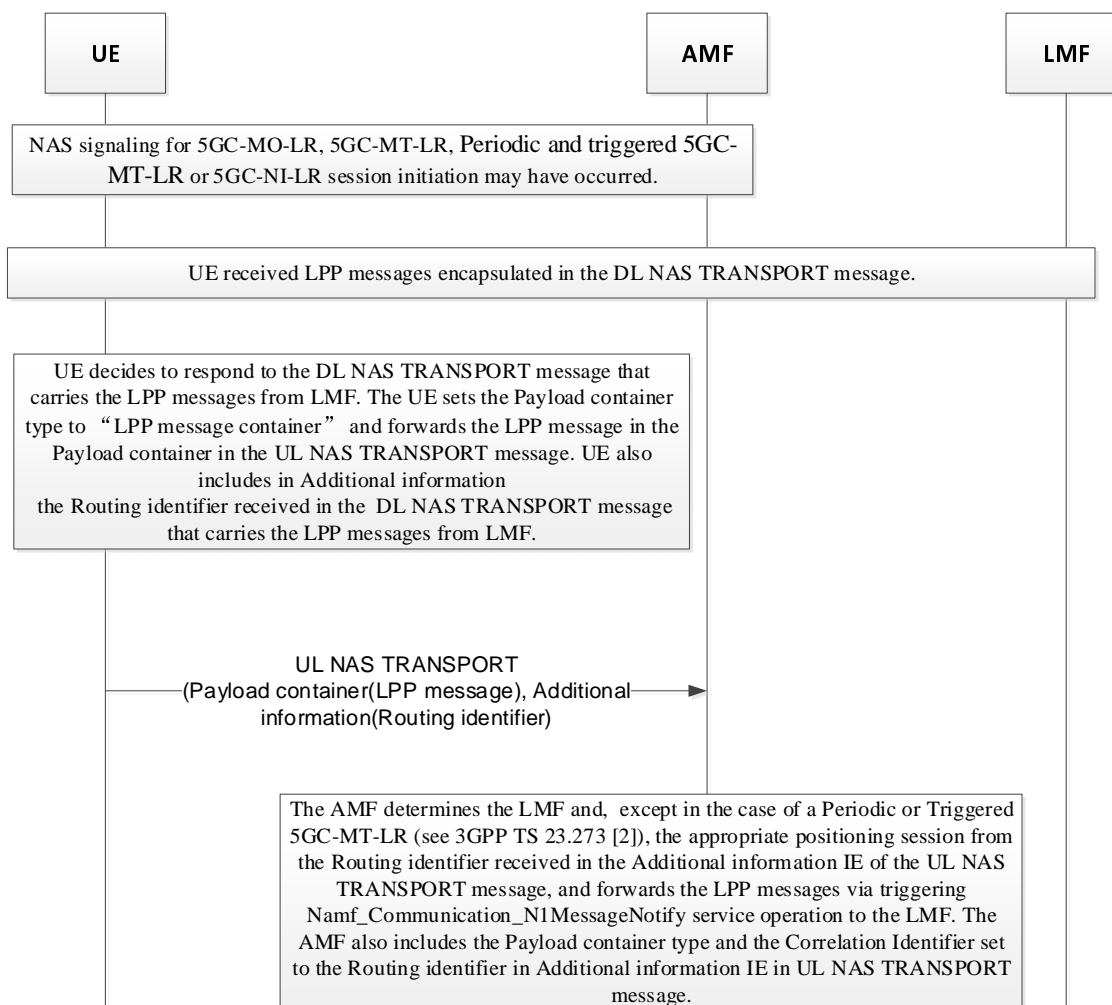
Figure 5.2.2.3-1: NAS signalling transport for uplink LPP messages

5.2.2.4   UE initiated Event Reporting Procedure

5.2.2.4.1   General

The supplementary services EventReport operation enables the UE to report the periodic or triggered location event invoked by the LMF via LCS PeriodicTriggered Invoke operation as described in clause 6.3.1 of 3GPP TS 23.273 [2] when some certain events are detected in the UE. The UE sends supplementary services EventReport message when the UE is inside or outside the eventReportAllowedArea based on the reportingIndication if received in LCS PeriodicTriggered Invoke message as described in clause 5.2.1.3. The supplementary services EventReport message is transferred to the LMF via the serving AMF in a UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. A response from the LMF may be returned to the UE via the serving AMF and be transferred to the UE in a DL NAS TRANSPORT message. The deferred routing identifier in the Additional information IE of the UL NAS TRANSPORT for reporting the periodic or triggered location event can be an LMF ID. If the serving LMF is changed, the deferred routing identifier may be included in the EventReport Acknowledgement message (refer to clause 6.3.1 of 3GPP TS 23.273 [2]).

The supplementary services EventReport message enables the UE to send the cumulative event report over control plane for the periodic or triggered location event with user plane connection invoked by the LMF as described in clause 6.16.1 of 3GPP TS 23.273 [2]. If the cumulative event report timer is expired or the maximum number of events reporting counter is reached, based on the received value from the LMF, the UE sets the eventType to active status of location reporting over user plane connection and includes the number of location reporting over user plane connection for the cumulative event report in the supplementary services EventReport message as defined in 3GPP TS 24.080 [5].

Figure 5.2.2.4.1-1 illustrates an example of the NAS signalling transport for EventReport messages,
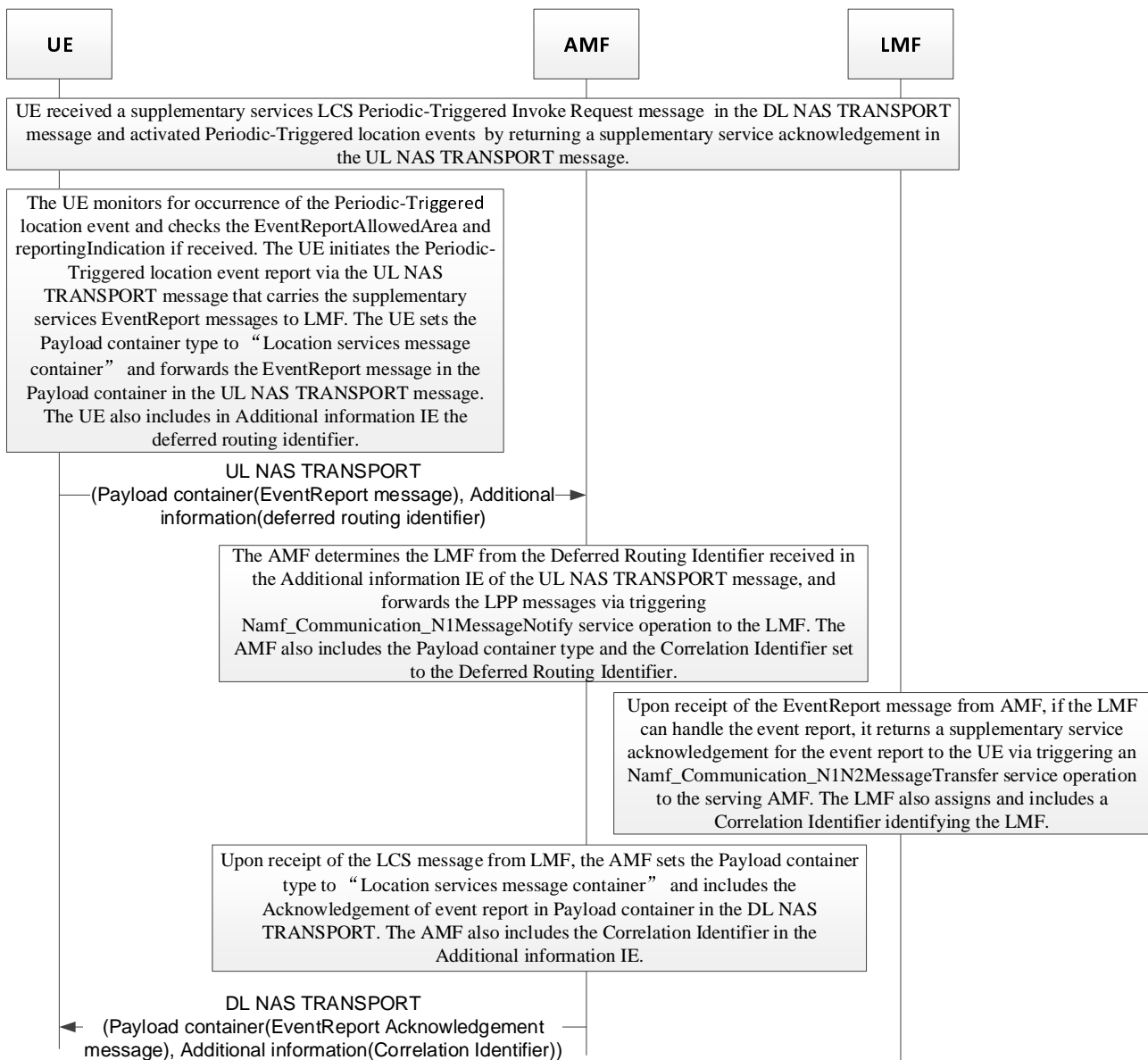
Figure 5.2.2.4.1-1: NAS signalling transport for EventReport messages

5.2.2.4.2 Normal operation

The UE invokes an EventReport procedure by sending a REGISTER message containing an EventReport component to the LMF as defined in 3GPP TS 24.080 [5].

The LMF shall return a supplementary services acknowledgement of event report if it can handle this event report.

The LMF shall then return a RELEASE COMPLETE message containing an EventReport Acknowledge component (see Figure 5.2.2.4.2-1).

If the LMF is unable to process the request received from the UE or cannot identify the ongoing periodic or triggered location to be terminated, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the UE initiated event reporting procedure operation, the UE shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed. The UE may terminate the dialogue by sending a RELEASE COMPLETE message, and informs the user of the failure.

UE **Network**
REGISTER
-->
Facility (Invoke = LCS-EventReport (eventType, referenceNumberExt, h-gmlc-callBackUri, lcs-QoS, locationInfo, supportedGADShapes, multiplePositioningProtocolPDUs, terminationCause, cumulativeEventReport))

RELEASE COMPLETE
<---
Facility (Return result = LCS-EventReport Acknowledgement)

RELEASE COMPLETE
<- -
Facility (Return error (Error))

RELEASE COMPLETE
<- -
Facility (Reject (Invoke_problem))

RELEASE COMPLETE
- ->

Figure 5.2.2.4.2-1: EventReport

NOTE: Only the following identifiers defined in EventReport operations in 3GPP TS 24.080 [5] are used for NG-RAN LCS:

- eventType

- referenceNumberExt

- h-gmlc-callBackUri

- lcs-QoS

- locationInfo

- supportedGADShapes

- multiplePositioningProtocolPDUs

- terminationCause

- cumulativeEventReport

5.2.2.5 UE Location Privacy Setting Procedure

5.2.2.5.1 General

The supplmentary services LocationPrivacySetting operation enables the UE to update the UE Location Privacy Indication information via UE Location Privacy Setting procedure as described in clause 6.12.1 of 3GPP TS 23.273 [2] when the UE has generated or updated the UE Location Privacy Indication. The supplementary services LocationPrivacySetting message is transferred to the serving AMF in a UL NAS TRANSPORT message and an acknowledgement from the serving AMF may be returned to the UE in DL NAS TRANSPORT message defined in 3GPP TS 24.501 [3].

Figure 5.2.2.5.1-1 illustrates an example of the NAS signalling transport for UE Location Privacy Setting procedure,
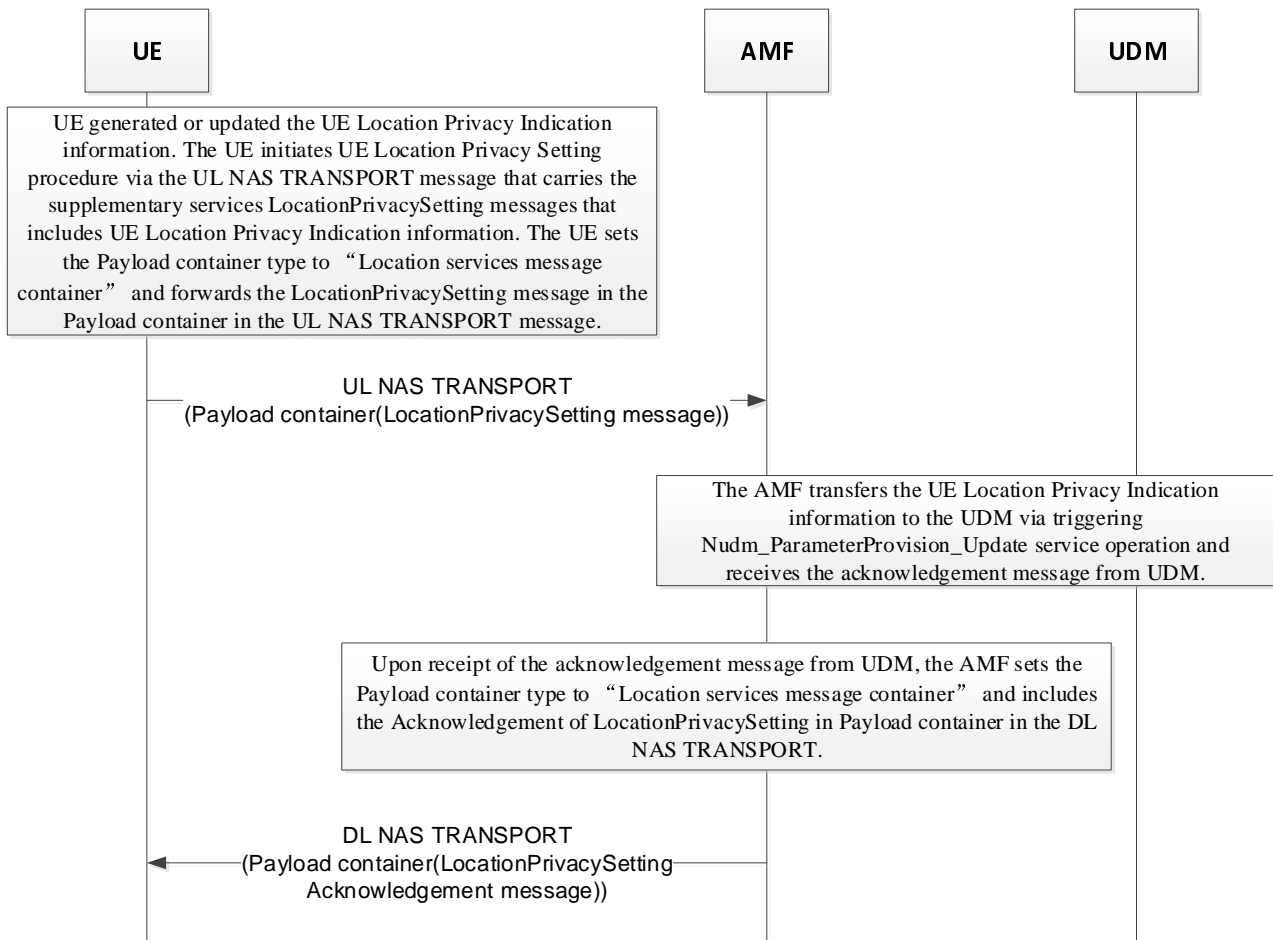
Figure 5.2.2.5.1-1: NAS signalling transport for LocationPrivacySetting messages

5.2.2.5.2   Normal operation

The UE invokes a Location Privacy Setting procedure by sending a REGISTER message containing an LocationPrivacySetting message as defined in 3GPP TS 24.080 [5]. UE's Location Privacy Indication information is included in LocationPrivacySetting message.

The AMF shall transfer the UE Location Privacy Indication information in LocationPrivacySetting message to UDM and response a supplementary services acknowledgement of LocationPrivacySetting message.

The AMF shall then return a RELEASE COMPLETE message containing a LocationPrivacySetting Acknowledgement component (see figure 5.2.2.5.2-1) if it can handle this LocationPrivacySetting message correctly.

If the AMF is unable to process the request received from the UE or cannot identify that provisioning the parameters of UE Location Privacy Setting information to UDM is executed successfully, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the UE initiated location privacy setting procedure operation, the UE shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed. The UE may terminate the dialogue by sending a RELEASE COMPLETE message, and informs the user of the failure.
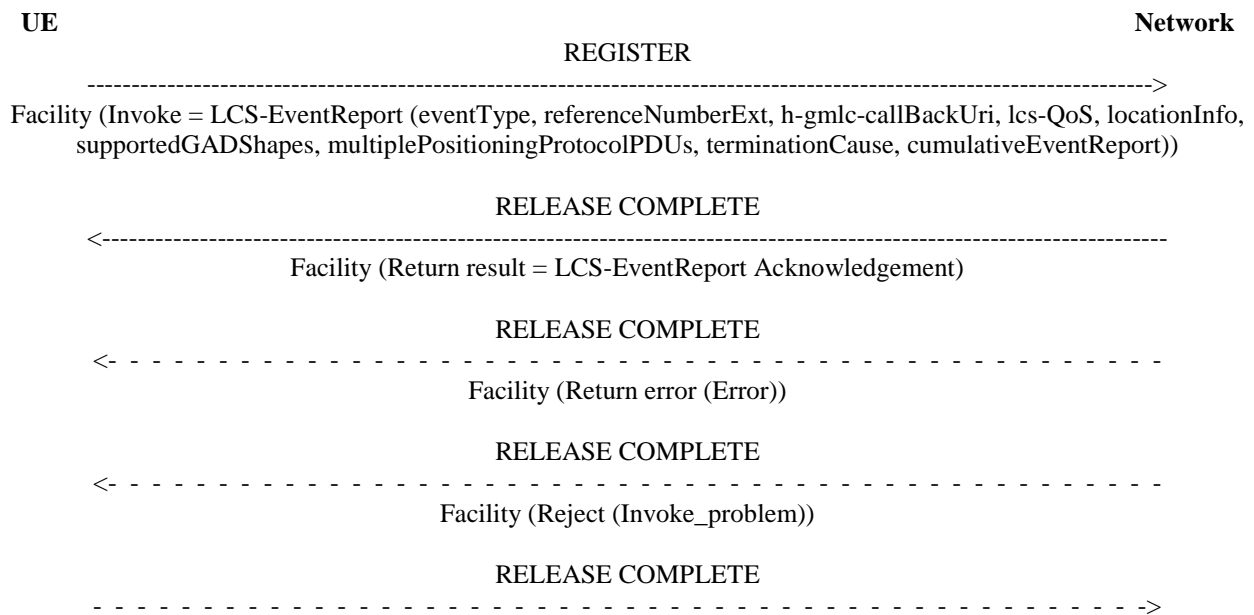
UE **Network**

REGISTER

--->

Facility (Invoke = LCS-LocationPrivacySetting (locationPrivacyIndication, validTimePeriod,
eventReportExpectedArea, areaUsageIndication)

RELEASE COMPLETE

<--

Facility (Return result = LCS-LocationPrivacySetting Acknowledgement)

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

- ->
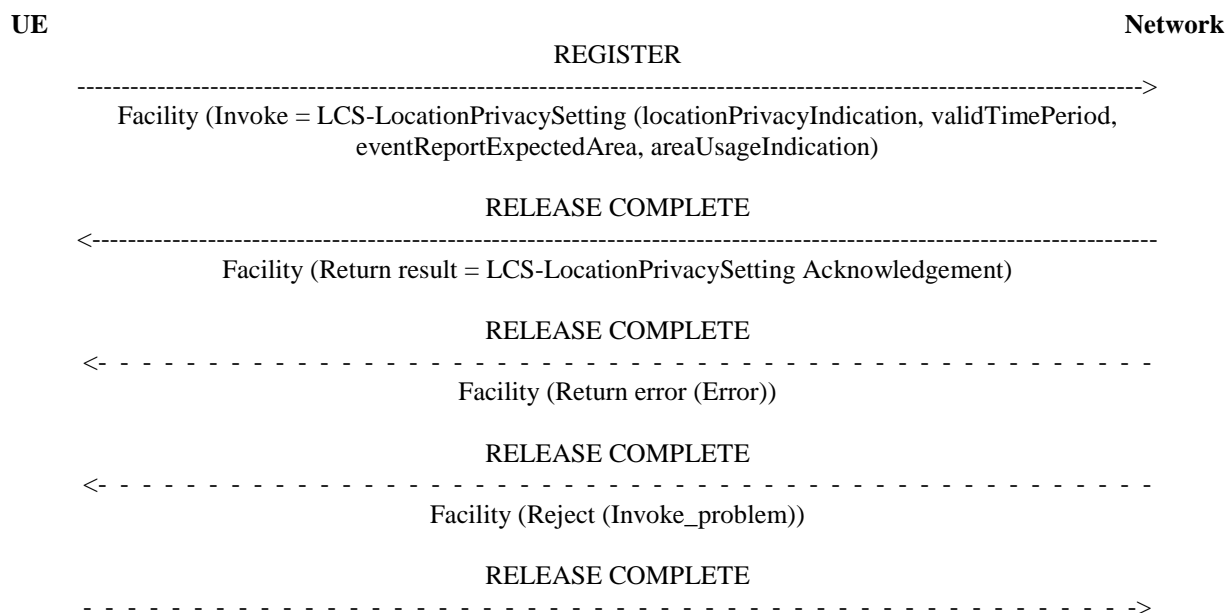
Figure 5.2.2.5.2-1: LocationPrivacySetting

NOTE: Only the following identifiers defined in LocationPrivacySetting operations in 3GPP TS 24.080 [5] are
used for NG-RAN LCS:

- locationPrivacyIndication

- validTimePeriod

- eventReportExpectedArea

- areaUsageIndication

5.2.2.6 UE initiated Event Reporting Procedure for Low Power Event Reporting and Triggered 5GC-MT-LR

5.2.2.6.1 General

The supplementary services EventReport operation enables the UE to report the periodic or triggered location event
invoked by the LMF via LCS PeriodicTriggered Invoke operation as described in clause 6.7.1 of 3GPP TS 23.273 [2]
when certain events are detected in the UE and when the UE supports and the LMF allows the use of Control Plane
CIoT 5GS Optimisation. The supplementary services EventReport message is transferred to the LMF via the serving
AMF in a CONTROL PLANE SERVICE REQUEST message defined in 3GPP TS 24.501 [3]. A response from the
LMF may be returned to the UE via the serving AMF and be transferred to the UE in a DL NAS TRANSPORT
message defined in 3GPP TS 24.501 [3]. The deferred routing identifier in the Additional information IE of the
CONTROL PLANE SERVICE REQUEST message for reporting the periodic or triggered location event can be an
LMF ID. If the serving LMF is changed, the deferred routing identifier may be included in the EventReport
Acknowledgement message (refer to clause 6.7.2 of 3GPP TS 23.273 [2]).

Figure 5.2.2.6.1-1 illustrates an example of the NAS signalling transport for EventReport messages,

```
  ┌──────┐                          ┌──────┐                          ┌──────┐
  │  UE  │                          │ AMF  │                          │ LMF  │
  └──────┘                          └──────┘                          └──────┘
```

UE received a supplementary services LCS Periodic-Triggered Invoke Request message in the DL NAS TRANSPORT message and activated Periodic-Triggered location events by returning a supplementary service acknowledgement in the UL NAS TRANSPORT message. The supplementary services LCS Periodic-Triggered Invoke Request message indicates that the UE is allowed to use Control Plane CIoT 5GS Optimisation for sending event reports.

The UE monitors for occurrence of the Periodic-Triggered location event. The UE initiates the Periodic-Triggered location event report via the CONTROL PLANE SERVICE REQUEST message that carries the supplementary services EventReport message to LMF. The UE sets the Data type (when the CIoT small data container IE is used) or the Payload Container type (in other cases) to "Location services message container" and forwards the EventReport message in the CIoT small data container IE or Payload container IE, in each case respectively, in the CONTROL PLANE SERVICE REQUEST message. The UE also includes in an Additional information IE the deferred routing identifier, See TS 24.501 clause 5.6.1.2.2 for additional details.

CONTROL PLANE SERVICE REQUEST
(Payload container or CIoT small data container
(EventReport message), Additional
information(deferred routing identifier)

The AMF determines the LMF from the Deferred Routing Identifier received in the Additional information IE of the CONTROL PLANE SERVICE REQUEST message, and forwards the Event Report Message via triggering Namf_Communication_N1MessageNotify service operation to the LMF. The AMF also includes the CIoT small data container Data type or the Payload container type (depending on which was included), the Correlation Identifier set to the Deferred Routing Identifier and includes an indication of Control Plane CIoT 5GS Optimisation.

Upon receipt of the EventReport message from AMF, if the LMF can handle the event report, it returns a supplementary service acknowledgement for the event report to the UE via triggering an Namf_Communication_N1N2MessageTransfer service operation to the serving AMF.

Upon receipt of the LCS message from LMF, the AMF sets the Payload container type to "Location services message container" and includes the Acknowledgement of the event report in the Payload container in the DL NAS TRANSPORT.

SERVICE ACCEPT

DL NAS TRANSPORT
(Payload container(EventReport Acknowledgement
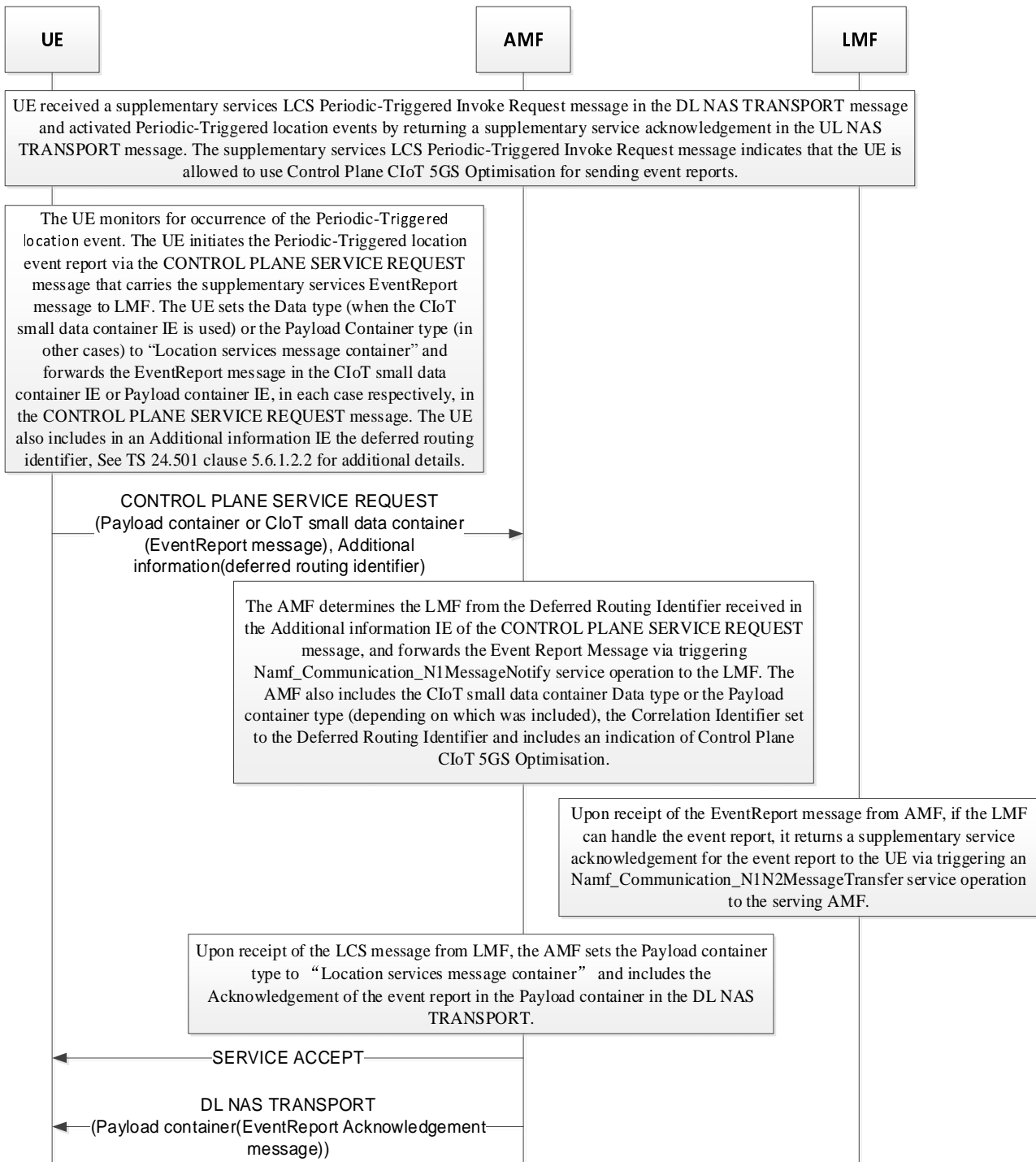message))

Figure 5.2.2.6.1-1: NAS signalling transport for EventReport messages using Low Power Event Reporting and Triggered 5GC-MT-LR

5.2.2.6.2 Normal operation

Normal operation is as described for the UE initiated Event Reporting Procedure in clause 5.2.2.4.2.

5.2.2.7 PRU association procedure

5.2.2.7.1 General

The supplementary services PRU association operation enables the PRU to associate with a serving LMF by using NAS signalling as decribed in clause 6.17.1 of 3GPP TS 23.273 [2]. The NAS signaling are transported using the DL NAS TRANSPORT message and the UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3].

The supplementary services PRU association operation also enables to perform a PRU association update to inform the serving LMF of the continued availability of the PRU or to inform the serving LMF of change to the location of the PRU (e.g. a change of tracking area or change of serving AMF), a change of the PRU positioning capabilities or a change to the PRU ON/OFF state.

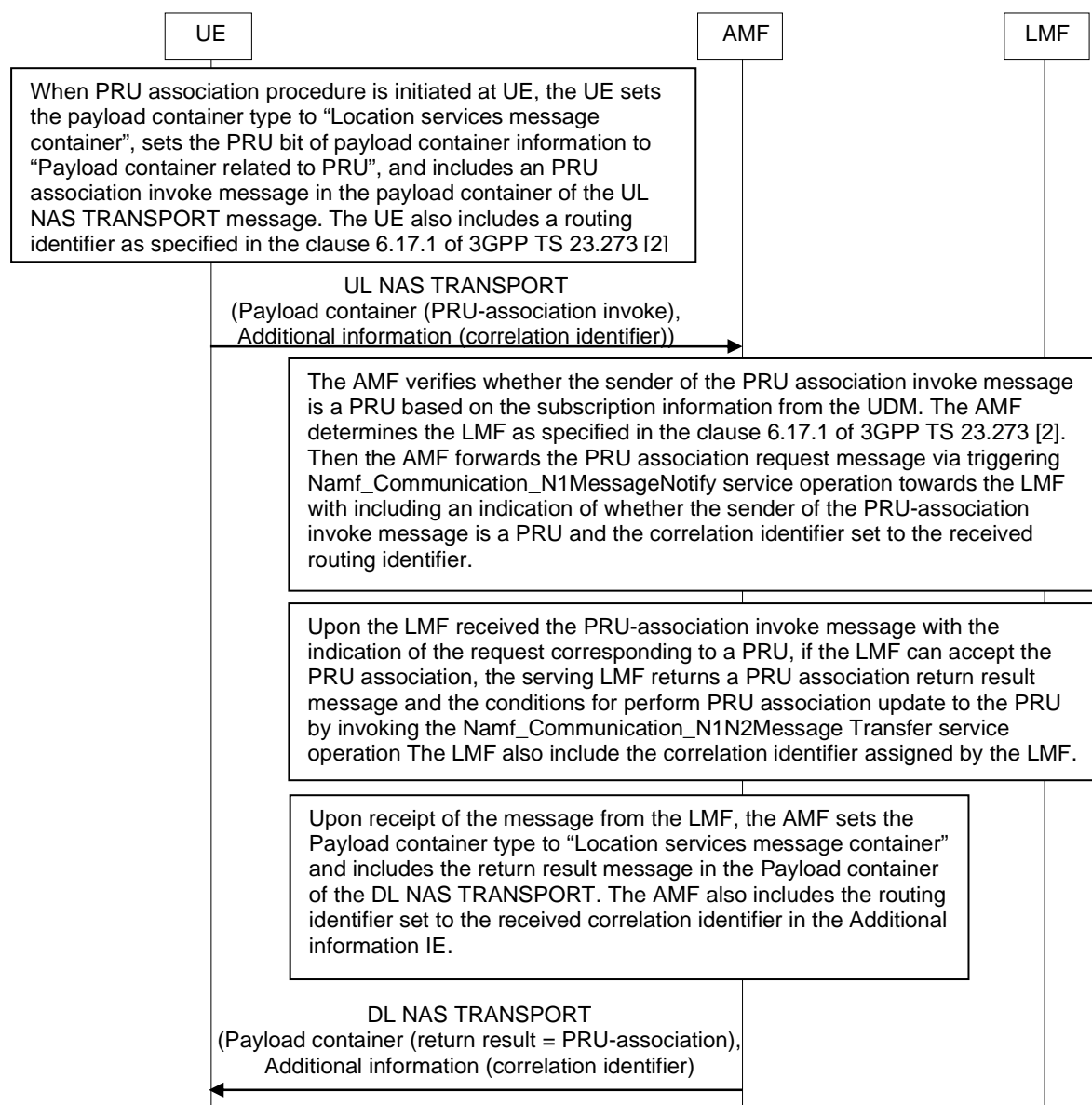Figure 5.2.2.7.1-1 illustrates an example of the NAS signaling transport for a PRU association procedure.

Figure 5.2.2.7.1-1: NAS signalling transport for PRU association procedure

5.2.2.7.2 Normal operation

The UE operating as PRU invokes a PRU association procedure by sending a REGISTER message containing a PRU-association invoke component to the serving LMF as defined in 3GPP TS 24.080 [5]. The PRU-association invoke component shall include a type for the PRU association request whether it is initial PRU association request or PRU association update, the positioning capabilities of the UE operating as PRU, PRU ON/OFF state, and optionally the location information if available. The UE operating as PRU may include the pre-configured routing ID for an initial association, or the routing ID received from the previous PRU association procedure in the UL NAS TRANSPORT message.

The LMF shall return a RELEASE COMPLETE message containing a PRU-association return result component if the LMF accepts the PRU association. The PRU-association return result component shall indicate the conditions for performing PRU association updates with the serving LMF. The conditions for performing PRU association update may include a periodic PRU association update timer and PRU association update based on a change of PRU location, change of PRU TAI, change of serving AMF.

If the LMF is unable to process the PRU-association invoke component received from the UE operating as PRU as specified in clause 6.17.1 of 3GPP TS 23.273 [2], the LMF shall return a RELEASE COMPLETE message containing reject component. The reject component may include routing ID of the serving LMF if new LMF is selected to serve the UE operating as PRU.
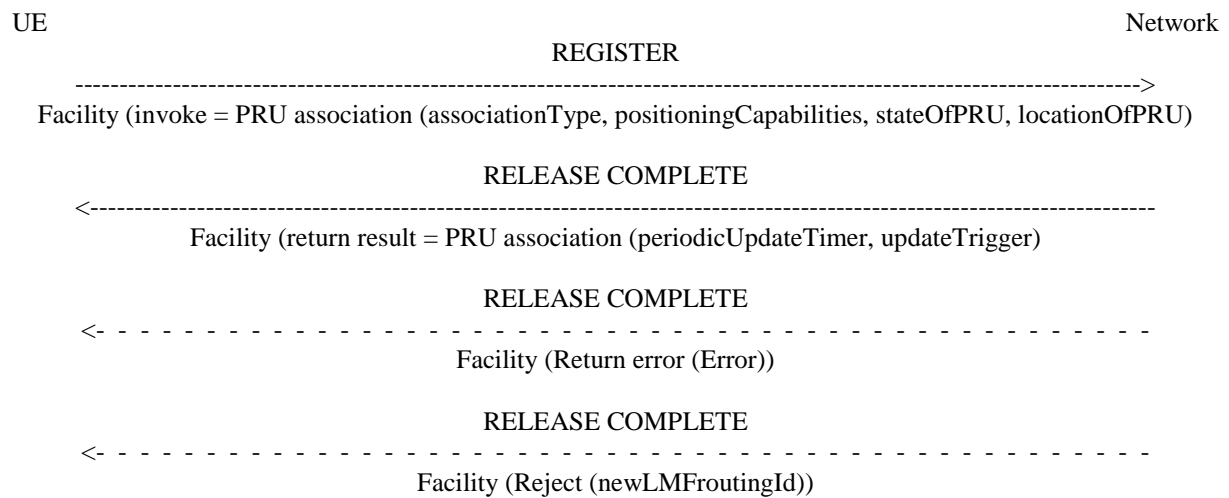
UE   Network

REGISTER

--->

Facility (invoke = PRU association (associationType, positioningCapabilities, stateOfPRU, locationOfPRU)

RELEASE COMPLETE

<--

Facility (return result = PRU association (periodicUpdateTimer, updateTrigger)

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (newLMFroutingId))

Figure 5.2.2.7.2.1: PRU association procedure

5.2.2.8 UE initiated PRU disassociation procedure

5.2.2.8.1 General

The supplementary services PRU disassociation operation enables the PRU to disassociate from a serving LMF by using NAS signalling as decribed in clause 6.17.3 of 3GPP TS 23.273 [2]. The NAS signaling are transported using the DL NAS TRANSPORT message and the UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. The UE operating as PRU may invoke this procedure prior to the event of becoming unavailable PRU (e.g., for a software upgrade or power down).

Figure 5.2.2.8.1-1 illustrates an example of the NAS signaling transport for a PRU disassociation procedure.
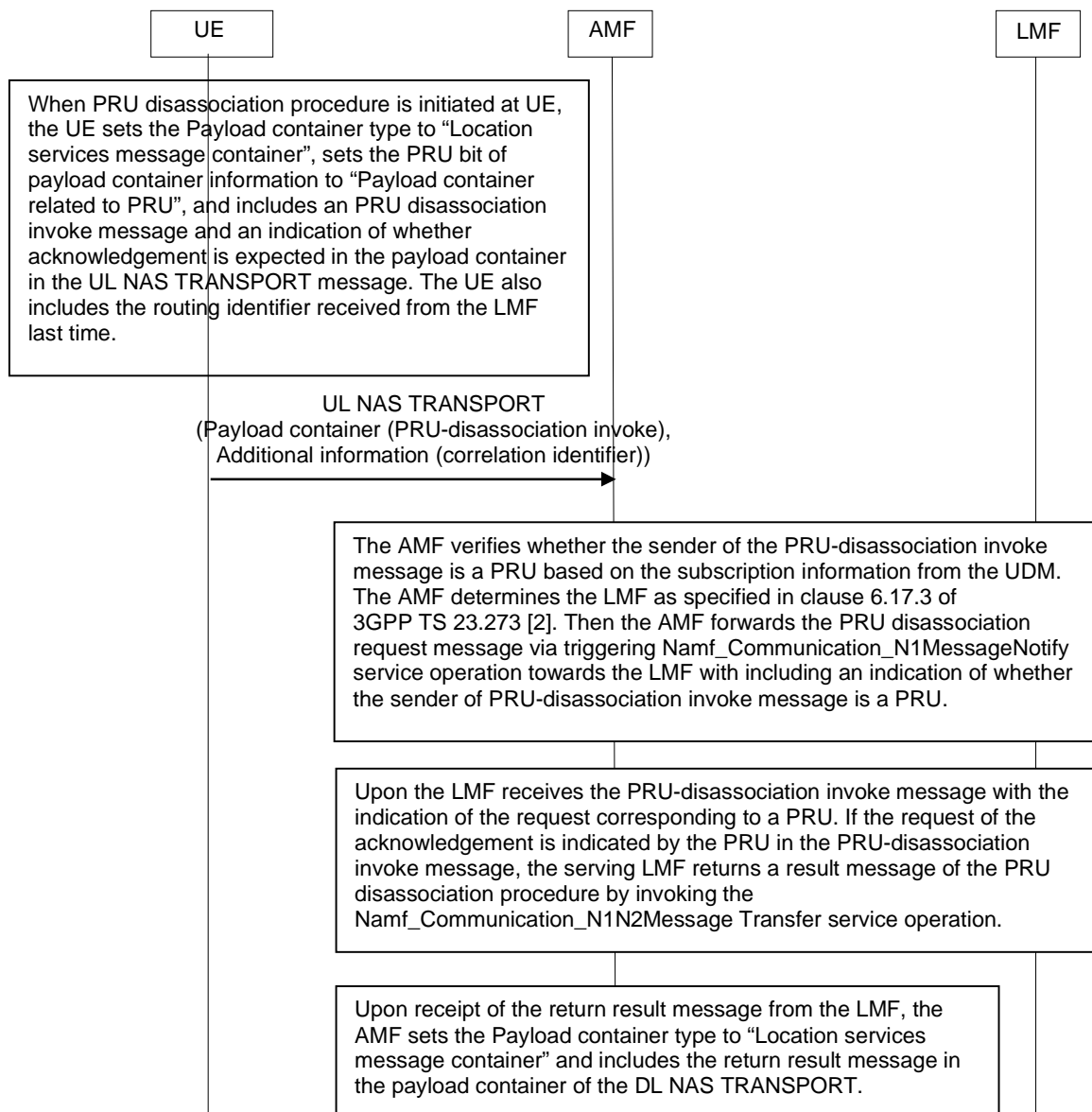
Figure 5.2.2.8.1-1: NAS signalling transport for UE initiated PRU disassociation procedure

5.2.2.8.2 Normal operation

The UE operating as PRU invokes a PRU disassociation procedure by invoking PRU-disassociation operation to the serving LMF as defined in 3GPP TS 24.080 [5]. The PRU-disassociation invoke component shall include an indication whether an acknowledgement from the LMF is expected or not. The UE operating as PRU shall include the routing ID received from the previous PRU association procedure in the UL NAS TRANSPORT message.

The LMF shall terminate the PRU association with the associated UE operating as PRU if this can be identified from the information in the PRU-disassociation invoke component. The LMF shall then return a RELEASE COMPLETE message containing a PRU-disassociation return result component (see figure 5.2.2.8.2-1). If the UE operating as PRU has not indicated that an acknowledgement is expected, the LMF may disassociate the UE operating as PRU locally without return the RELEASE COMPLETE message.
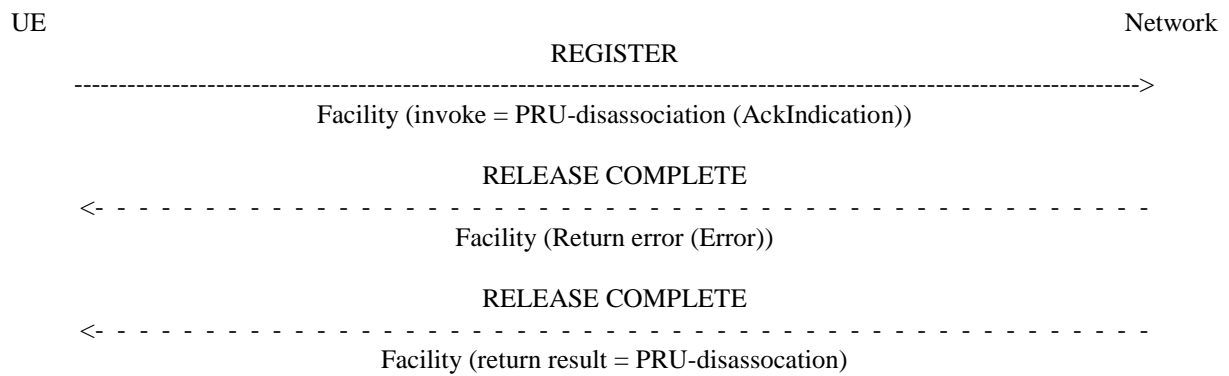
UE   Network

REGISTER

-->

Facility (invoke = PRU-disassociation (AckIndication))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (return result = PRU-disassocation)

Figure 5.2.2.8.2-1: UE initiated PRU disassociation procedure

5.2.2.9 Sidelink Mobile Originated Location Request (SL-MO-LR)

5.2.2.9.1 General

The supplementary services SL-MO-LR operation enables the target UE to launch the ranging and sidelink MO positioning session or request location assistance data using NAS signaling. The NAS signaling is transported using the DL NAS TRANSPORT message and the UL NAS TRANSPORT message defined in 3GPP TS 24.501 [3]. Figure 5.2.2.9.1-1 illustrates an example of the NAS signaling transport for an SL-MO-LR.

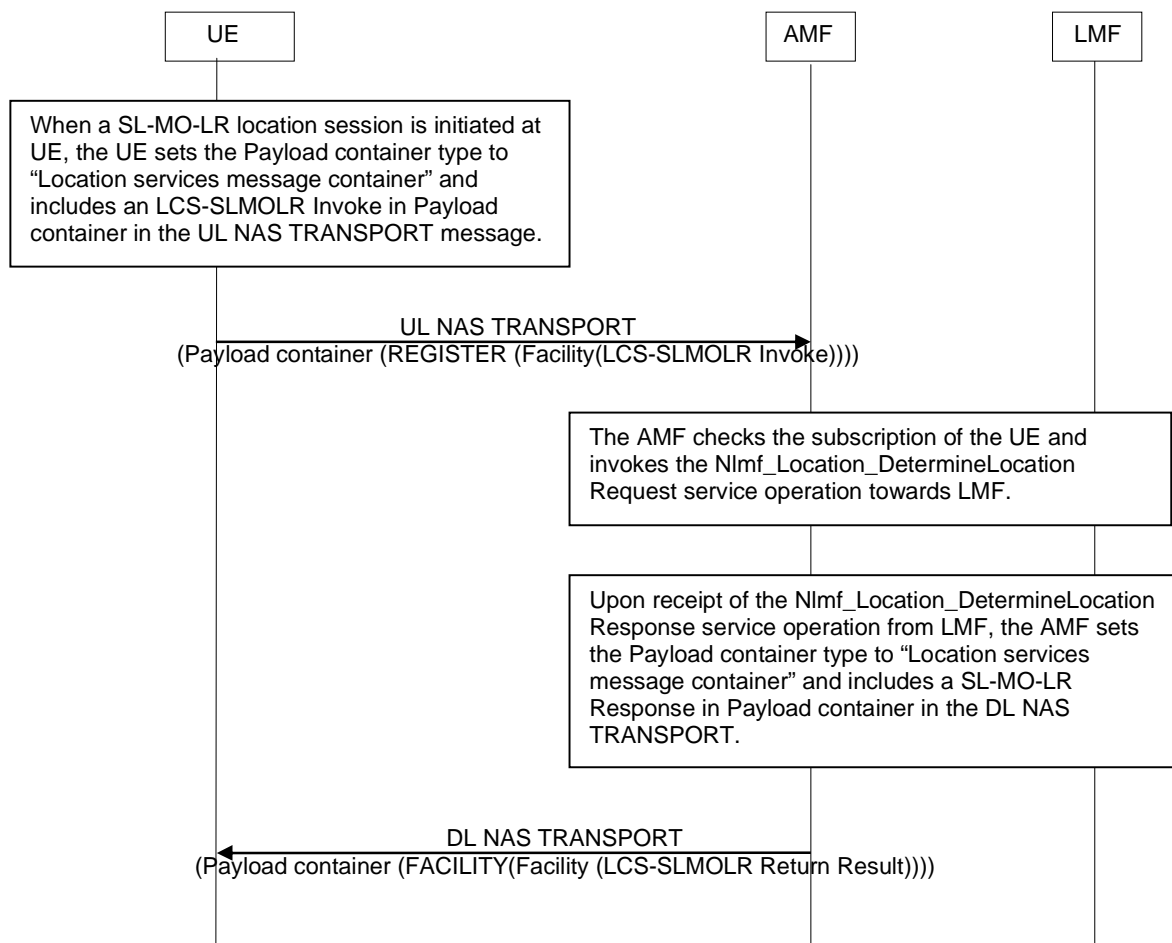The SL-MO-LR operation can be triggered by a target UE as specified in clause 6.20.1 of 3GPP TS 23.273 [2].

UE		AMF	LMF

When a SL-MO-LR location session is initiated at UE, the UE sets the Payload container type to "Location services message container" and includes an LCS-SLMOLR Invoke in Payload container in the UL NAS TRANSPORT message.

UL NAS TRANSPORT
(Payload container (REGISTER (Facility(LCS-SLMOLR Invoke))))

The AMF checks the subscription of the UE and invokes the Nlmf_Location_DetermineLocation Request service operation towards LMF.

Upon receipt of the Nlmf_Location_DetermineLocation Response service operation from LMF, the AMF sets the Payload container type to "Location services message container" and includes a SL-MO-LR Response in Payload container in the DL NAS TRANSPORT.

DL NAS TRANSPORT
(Payload container (FACILITY(Facility (LCS-SLMOLR Return Result))))

Figure 5.2.2.9.1-1: NAS signalling transport for successful SL-MO-LR

NOTE: The Additional information IE of the UL/DL NAS TRANSPORT message is not included when the SL-MO-LR signaling is transported in the Payload container.

5.2.2.9.2   Normal operation

The UE invokes a SL-MO-LR by sending a REGISTER message to the network containing a LCS-SLMOLR invoke component. SS Version Indicator value 1 or above shall be used.

The receiving network entity shall initiate the handling of location request in the network. The network shall pass the result of the location procedure to the UE by sending a FACILITY message to the UE containing a LCS-SLMOLR return result component. When location estimate is kept in the network entity and this information satisfies the requested accuracy and the requested maximum age of location, then the network may reuse this information and the positioning measurement procedure may be skipped.

The network shall pass the result of the location procedure to the UE only if the location estimate is given in a format that the UE supports, as indicated by either the presence (and content) or the absence of the parameter supportedGADShapes, which may be sent by the UE in the LCS-SLMOLR operation.

The UE may terminate the dialogue by sending a RELEASE COMPLETE message in the case of single location request (see figure 5.2.2.9.2-1). The UE may also initiate another location request operation by sending a FACILITY message to the network containing a LCS-SLMOLR invoke component (see figure 5.2.2.9.2-2). After the last location request operation the UE shall terminate the dialogue by sending a RELEASE COMPLETE message.

When the network is congested and if the network decides not to perform the location procedure, the network may allow UE only ranging and sidelink positioning for a given time duration by sending a RELEASE COMPLETE message to the UE containing an LCS-SLMOLR return result component including a ueOnlyRSLPosAllowed IE. The network shall provide the time duration in the ueOnlyRSLPosAllowed IE.

Upon receiving the LCS-SLMOLR return result component including a ueOnlyRSLPosAllowed IE, the UE may perform the UE only sidelink positioning procedure as specified in clause 6.6 of 3GPP TS 23.586 [10] within the time duration provided in the ueOnlyRSLPosAllowed IE.

If the network is unable to successfully fulfil the request received from the UE (e.g. to provide a location estimate or location assistance information), it shall clear the transaction by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5]. If the network is unable to provide a location estimate due to lack of support in the UE for the type of shape of the location estimate, then it shall use the error Facility Not Supported.

If the network has returned a result to the UE in a FACILITY message but, after some PLMN administered time period has elapsed, has not received either a new location request operation in a FACILITY message or a RELEASE COMPLETE message from the UE, the network may clear the transaction by sending a RELEASE COMPLETE message.

During the SL-MO-LR operation, the UE shall run a timer T5101. This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed, and may terminate the dialogue by sending a RELEASE COMPLETE message, and shall inform the user of the failure.

In the LCS-SLMOLR invoke component included in the REGISTER or FACILITY message, the UE:

    a)   shall include the slmolr-Type IE set to rangingSidelink;

    b)   shall include the relatedUEInfo IE containing one entry for each of the one or more SL reference UEs or located UEs, containing application layer ID of the SL reference UE and the slReferenceUE role or application layer ID of the located UE and the locatedUE role;

    c)   shall include the calculationAssistIndicator IE, if the UE needs the location calculation assistance;

    d)   shall include the preferredRangingResult IE set to absoluteLocationIndicator, absoluteVelocityIndicator, relativeLocationIndicator, rangeDirection, relativeVelocityIndicator or any combination of them;

    e)   shall include the lcs-QoS IE; and

    g)   may include the lcsClientExternalID IE indicating identity of the LCS client or the AF. If the lcsClientExternalID is included, the UE may include the mlc-Number IE indicating the GMLC via which the

LCS client or the AF is to be be accessed, may include the lcsServiceTypeID IE and may include pseudonymIndicator to indicate that the pseudonym is needed.

When the network receives the LCS-SLMOLR invoke component included in the REGISTER or FACILITY message, the network shall perform the "procedures of SL-MO-LR involving LMF" as specified in 3GPP TS 23.273 [2].

If the network accepts the LCS-SLMOLR invoke component, the network shall return a FACILITY message to the UE containing LCS-SLMOLR return result component (see figure 5.2.2.9.2-1 and figure 5.2.2.9.2-2). In the LCS-SLMOLR return result component, the network:

   a) may include the absoluteLocation IE, if the absoluteLocationIndicator is requested in the preferredRangingResult IE;

   b) may include the absoluteVelocity IE, if the absoluteVelocityIndicator is requested in the preferredRangingResult IE;

   c) may include the relativeResult IE, if the relativeLocationIndicator, rangeDirection, relativeVelocityIndicator or any combination of them are requested in the preferredRangingResult IE; and
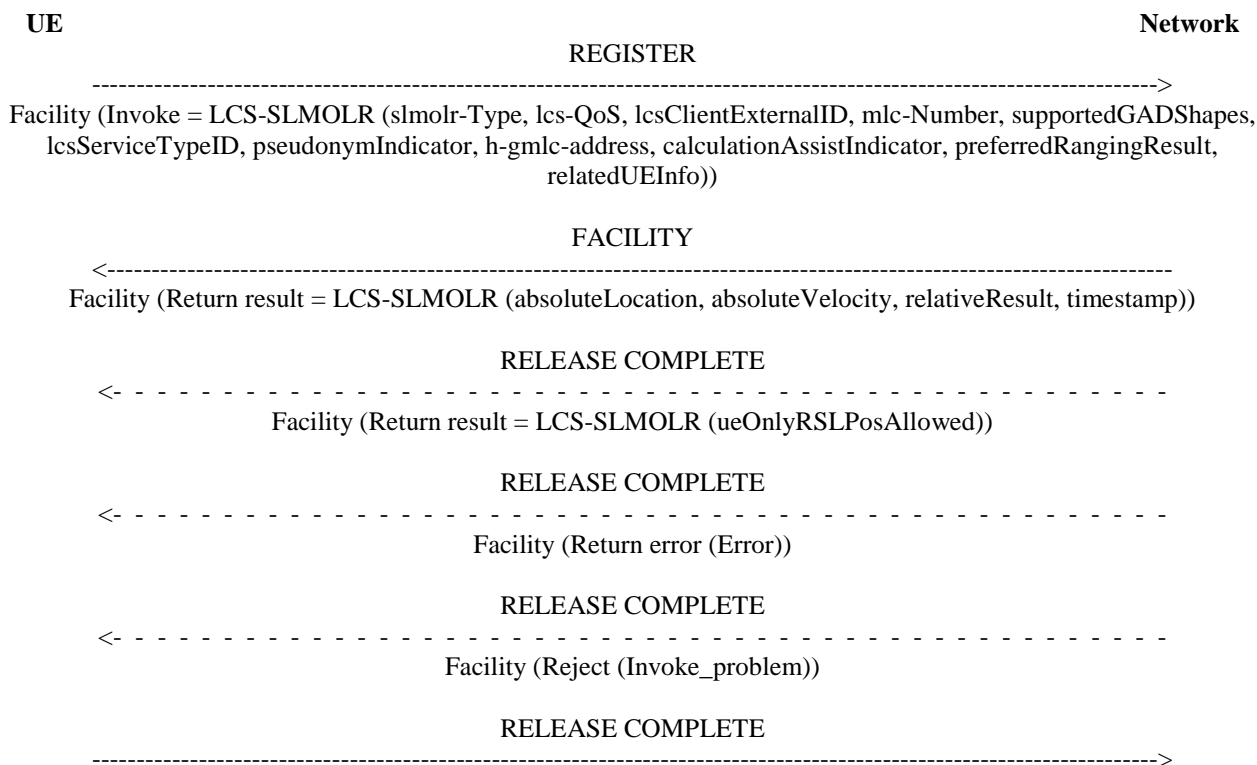
   d) may include the timestamp IE.

UE   **Network**

REGISTER

-->

Facility (Invoke = LCS-SLMOLR (slmolr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, pseudonymIndicator, h-gmlc-address, calculationAssistIndicator, preferredRangingResult, relatedUEInfo))

FACILITY

<---

Facility (Return result = LCS-SLMOLR (absoluteLocation, absoluteVelocity, relativeResult, timestamp))

RELEASE COMPLETE

<- -

Facility (Return result = LCS-SLMOLR (ueOnlyRSLPosAllowed))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

-->

Figure 5.2.2.9.2-1: Single sidelink mobile originated location request

UE **Network**

REGISTER

-->

Facility (Invoke = LCS-SLMOLR (slmolr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, pseudonymIndicator, h-gmlc-address, calculationAssistIndicator, preferredRangingResult, relatedUEInfo))

FACILITY

<--

Facility (Return result = LCS-SLMOLR (absoluteLocation, absoluteVelocity, relativeResult, timestamp))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

FACILITY

-->

Facility (Invoke = LCS-SLMOLR (slmolr-Type, lcs-QoS, lcsClientExternalID, mlc-Number, supportedGADShapes, lcsServiceTypeID, pseudonymIndicator, h-gmlc-address, calculationAssistIndicator, preferredRangingResult, relatedUEInfo))

FACILITY

<--

Facility (Return result = LCS-SLMOLR (absoluteLocation, absoluteVelocity, relativeResult, timestamp))

RELEASE COMPLETE

<- -

Facility (Return result (ueOnlyRSLPosAllowed))

RELEASE COMPLETE

<- -

Facility (Return error (Error))

RELEASE COMPLETE

<- -

Facility (Reject (Invoke_problem))

RELEASE COMPLETE

-->

Figure 5.2.2.9.2-2: Multiple sidelink mobile originated location requests

NOTE: Only the following IEs defined in SL-MO-LR operations in 3GPP TS 24.080 [5] are used for NG-RAN LCS:

- slmolr-Type

- lcs-QoS

- lcsClientExternalID

- mlc-Number

- supportedGADShapes

- lcsServiceTypeID

- pseudonymIndicator

- h-gmlc-address

- calculationAssistIndicator

- preferredRangingResult

- relatedUEInfo

- absoluteLocation

- absoluteVelocity

- relativeResult

- ueOnlyRSLPosAllowed

- timestamp

5.2.2.10 UE initiated Sidelink Positioning Information Transport

The UE sends SLPP message and the associated Routing identifier in the UL NAS TRANSPORT message (refer to 3GPP TS 24.501 [3], 3GPP TS 23.586 [10], and 3GPP TS 23.273 [2] clause 6.20). Figure 5.2.2.10-1 illustrates an example of the NAS signalling transport for uplink SLPP messages.
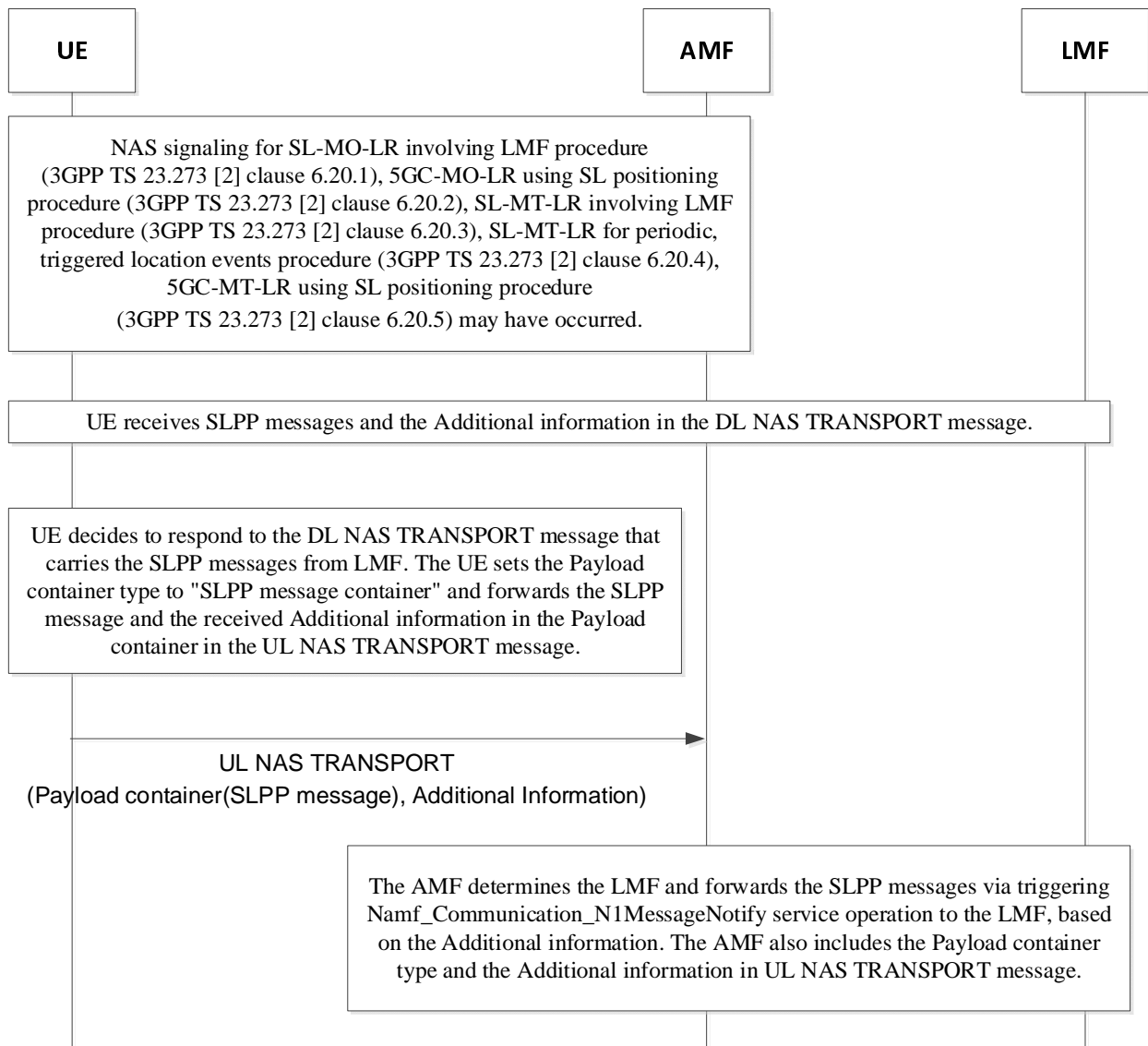
Figure 5.2.2.10-1: NAS signalling transport for uplink SLPP messages

5.2.2.11 UE initiated RSPP supplementary information transport

5.2.2.11.1 General

The UE initiated RSPP supplementary information transport procedure enables the target UE to transfer the RSPP supplementary information to the LMF for capability exchange, assistance data exchange or location information exchange as decribed in clause 6.20.1, clause 6.20.2, clause 6.20.3, clause 6.20.4 or clause 6.20.5 of 3GPP TS 23.273 [2].

The LCS message carrying the ULRSPPTransport invoke component is transferred from the initiating UE to the LMF via the serving AMF in a UL NAS TRANSPORT message. An acknowledgement message from the LMF is returned to the LMF via the serving AMF and is transferred to the initiating UE in a DL NAS TRANSPORT message.

5.2.2.11.2 Normal operation

In order to initate the UE initiated RSPP supplementary information transport procedure, the initiating UE shall send a REGISTER message to the LMF containing the ULRSPPTransport invoke component as defined in 3GPP TS 24.080 [5].

In the ULRSPPTransport invoke component included in the REGISTER message, the UE shall include rangingSLPPList IE. In the rangingSLPPList, the UE:

    a)   may include the embedded SLPP message as defined in 3GPP TS 38.355 [4a] for the initiating UE; and

    b)   shall include the embedded SLPP message(s) as defined in 3GPP TS 38.355 [4a] for the related SL reference UE(s) or the related located UE(s) with the associated application layer ID(s).

    NOTE: The SLPP message(s) sent by the initiating UE include the SLPP message(s) to provide capability, to request assistance data or to provide location information as defined in 3GPP TS 38.355 [4a].

The LMF shall then return a RELEASE COMPLETE message containing an ULRSPPTransport return result component (see Figure 5.2.2.11.2-1) if the LMF accepts the ULRSPPTransport invoke component.

If the LMF does not accept the ULRSPPTransport invoke component, it shall return an error indication by sending a RELEASE COMPLETE message containing a return error component. Error values are specified in 3GPP TS 24.080 [5].

During the UE initiated RSPP supplementary information transport operation, the UE shall run a timer T. This timer is started when the operation is sent, and stopped when a response is received from the network. If this timer expires the UE shall assume that the operation has failed. The UE may terminate the dialogue by sending a RELEASE COMPLETE message, and informs the user of the failure.

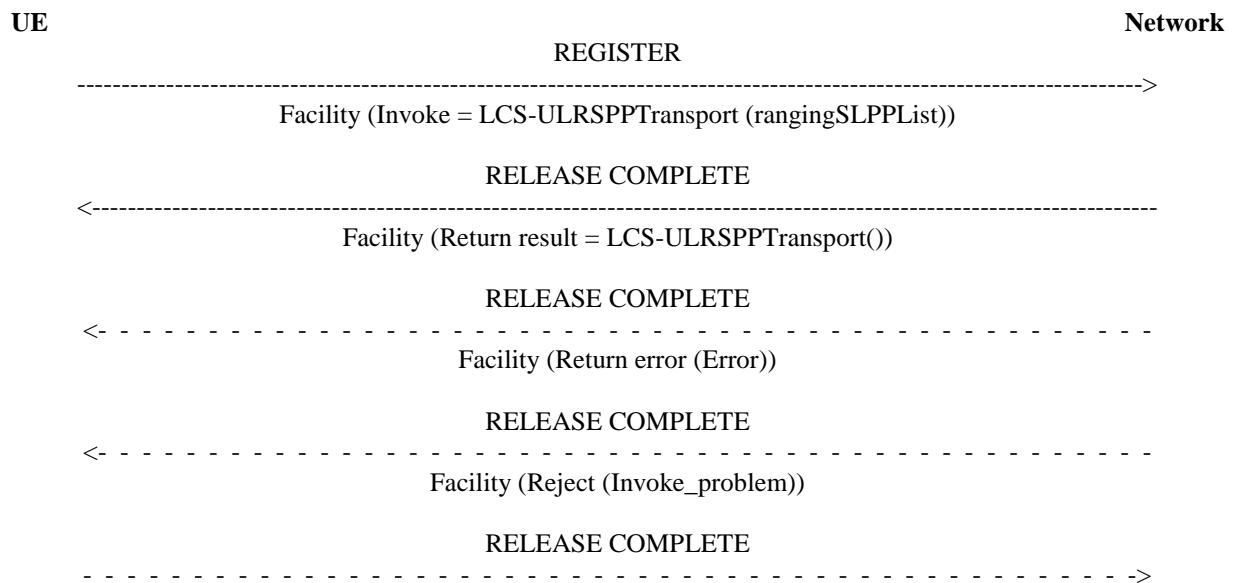Figure 5.2.2.11.2.1 illustrates the signalling for normal operation between the UE and the network.

UE   **Network**
                                                    REGISTER
-->
                        Facility (Invoke = LCS-ULRSPPTransport (rangingSLPPList))

                                              RELEASE COMPLETE
    <--
                            Facility (Return result = LCS-ULRSPPTransport())

                                              RELEASE COMPLETE
    <- -
                                  Facility (Return error (Error))

                                              RELEASE COMPLETE
    <- -
                                  Facility (Reject (Invoke_problem))

                                              RELEASE COMPLETE
- ->

Figure 5.2.2.11.2-1: UE initiated RSPP supplementary information transport

NOTE 1: Only the following IEs defined in ULRSPPTransport operations in 3GPP TS 24.080 [5] are used for ranging and sidelink positioning:

-    rangingSLPPList

NOTE 2: The rangingSLPPList IE is added to ULRSPPTransport to allow for passing multiple SLPP messages for the UE connecting with the LMF and/or the other related UE. Its ASN.1 description is given in 3GPP TS 24.080 [5].

5.3   LCS message and coding

5.3.1   Messages for Location services operations

The LCS message format and information elements coding for the MO-LR, LocationNotification, EventReport, PeriodicTriggeredInvoke, CancelDeferredLocation and LocationPrivacySetting operations (clause 5.2) are defined in 3GPP TS 24.080 [5] for the following messages:

-    Register message;

-    Facility message; and

-    Release Complete message.

5.3.2   Messages for LTE Positioning Protocol (LPP)

5.3.2.1   Downlink Positioning Information Transport using LPP messages

The AMF shall set the Payload container type to "LPP message container" in the DL NAS TRANSPORT message.

The AMF includes a Routing identifier in the Additional information IE of the DL NAS TRANSPORT message which identifies the LMF and the positioning session between the AMF and LMF when a positioning session is being used.

The Routing identifier is the Correlation ID, which is defined in 3GPP TS 29.572 [6], so that the AMF can map the Routing identifier to the LMF and the Correlation identifier when the AMF receives a UL NAS TRANSPORT message including the responding LPP message.

5.3.2.2 Uplink Positioning Information Transport using LPP messages

The UE shall set the Payload container type to "LPP message container" in the UL NAS TRANSPORT message.

The UE includes a Routing identifier received in the Additional information IE of the DL NAS TRANSPORT message in the Additional information IE of the UL NAS TRANSPORT message. This association of the Routing Identifier is provided at the LPP level: the UL NAS TRANSPORT message carries an LPP message that is a response to or instigated by the LPP message in the DL NAS TRANSPORT message. The Routing identifier is the Correlation ID, which is defined in 3GPP TS 29.572 [6], so that the AMF can map the Routing identifier to the Correlation identifier when the AMF receives the UL NAS TRANSPORT message.

5.3.3 Messages for SideLink Positioning Protocol (SLPP)

5.3.3.1 Downlink Positioning Information Transport using SLPP messages

The AMF shall set the Payload container type to "SLPP message container" in the DL NAS TRANSPORT message.

The AMF includes a routing identifier in the Additional information IE of the DL NAS TRANSPORT message which identifies the LMF and the positioning session between the AMF and LMF when a positioning session is being used.

The routing identifier is the correlation ID, which is defined in 3GPP TS 29.572 [6], so that the AMF can map the routing identifier to the LMF and the correlation identifier when the AMF receives a UL NAS TRANSPORT message including the responding SLPP message.

5.3.3.2 Uplink Positioning Information Transport using SLPP messages

The UE shall set the Payload container type to "SLPP message container" in the UL NAS TRANSPORT message.

The UE includes a routing identifier received in the Additional information IE of the DL NAS TRANSPORT message in the Additional information IE of the UL NAS TRANSPORT message. This association of the routing identifier is provided at the SLPP level: the UL NAS TRANSPORT message carries an SLPP message that is a response to or instigated by the SLPP message in the DL NAS TRANSPORT message. The routing identifier is the correlation ID, which is defined in 3GPP TS 29.572 [6], so that the AMF can map the routing identifier to the correlation identifier when the AMF receives the UL NAS TRANSPORT message.

Annex A (informative):
Change history

Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
						Change history	
2019-08	CT1#119					Draft skeleton provided by the rapporteur	0.0.0
2019-10	CT1#120					Includes the following contribution agreed by CT1 at CT1#120:C1-196563	0.1.0
2019-11	CT1#121					Includes the following contributions agreed by CT1 at CT1#121:C1-198290, C1-198720	0.2.0
2019-12	CT#86	CP-193155				Presentation for information to TSG CT	1.0.0
2020-03	CT#87e	CP-200287				Implementation of pCRs CP-200102 and 103 approved by TSG CT. Presentation for approval to TSG CT.	2.0.0
2020-03	CT#87e					Version 16.0.0 created after approval	16.0.0
2020-03	CT#87e					Editorial corrections	16.0.1
2020-06	CT#88e	CP-201098	0001		B	Adding Location Privacy Setting operation	16.1.0
2020-09	CT#89e	CP-202148	0002	3	B	UE initiated Event Reporting Procedure for Low Power Event Reporting	16.2.0
2020-09	CT#89e	CP-202148	0003		F	Additional function of MO-LR procedure	16.2.0
2021-12	CT#84e	CP-213031	0004	1	F	TS reference update and multiplePositioningProtocolPDUs limit clarification	17.0.0
2022-03	CT#95e	CP-220243	0006	1	B	AMF LCS functionality for satellite access	17.1.0
2022-03	CT#95e	CP-220243	0008	1	F	Clarification on multiplePositioningProtocolPDUs IE	17.1.0
2022-03	CT#95e	CP-220243	0009	4	F	Clarification on the LMF ID	17.1.0
2022-03	CT#95e	CP-220243	0010	1	F	Clarification on Routing information	17.1.0
2022-06	CT#96	CP-221207	0011	1	F	The Location Service partially applicable for SNPN	17.2.0
2022-06	CT#96	CP-221207	0012	1	B	Additional of Scheduled Location Time	17.2.0
2022-06	CT#96	CP-221207	0013	1	F	Handling of Scheduled Location Time by UE	17.2.0
2022-12	CT#98e	CP-223115	0014	1	F	Correction on country verification for satellite access	17.3.0
2023-03	CT#99	CP-230210	0015	3	B	Signalling support to enable a periodic or triggered 5GC-MT-LR event reporting over user plane connection	18.0.0
2023-03	CT#99	CP-230285	0016		F	Several corrections on the reference to 23.273	18.0.0
2023-03	CT#99	CP-230210	0017	2	B	NAS protocol supports LCS PRU messages	18.0.0
2023-03	CT#99	CP-230210	0018	1	B	Enhance the Triggered Location for UE power saving purpose	18.0.0
2023-06	CT#100	CP-231207	0019	2	B	New procedures for PRU UE	18.1.0
2023-06	CT#100	CP-231207	0030	-	F	Correction to the IE's name and the correlation NOTE	18.1.0
2023-06	CT#100	CP-231207	0025	2.0	B	Enhancement for location service continuity from 5GS to EPS	18.1.0
2023-06	CT#100	CP-231207	0027	2	B	Restriction on NR satellite access for PRU UE	18.1.0
2023-06	CT#100	CP-231207	0031	1	B	Enhancement of the event report allowed area	18.1.0
2023-06	CT#100	CP-231207	0028	3	B	Definition of PRU UE	18.1.0
2023-06	CT#100	CP-231207	0026	4	F	Edit misaligned note	18.1.0
2023-06	CT#100	CP-231207	0032	2	B	Addition of EPC-(H)GMLC address in LCS-PeriodicTriggered	18.1.0
2023-09	CT#101	CP-232201	0034	-	F	Update the defination of UE operating as PRU	18.2.0
2023-09	CT#101	CP-232201	0041	1	F	Update the terminology of PRU UE into UE operating as PRU	18.2.0
2023-09	CT#101	CP-232201	0039	1	F	Add reporting indication to Supplementary Services Periodic or Triggered Location	18.2.0
2023-09	CT#101	CP-232201	0040	2	B	Add reporting indication to UE initiated Event Reporting Procedure	18.2.0
2023-12	CT#102	CP-233143	0046	-	D	Editorial correction for MO-LR	18.3.0
2023-12	CT#102	CP-233128	0049	-	B	PRU ON/OFF state	18.3.0
2023-12	CT#102	CP-233128	0051	1	F	Addition of parameters in PRU procedure	18.3.0
2023-12	CT#102	CP-233128	0052	-	F	Solve EN in PRU disassociation procedure	18.3.0
2023-12	CT#102	CP-233182	0044	1	B	Additional of the SL-MO-LR procedure	18.3.0
2023-12	CT#102	CP-233128	0056	-	F	Correction to reference	18.3.0
2023-12	CT#102	CP-233128	0054	1	F	Payload container information IE related to PRU	18.3.0
2023-12	CT#102	CP-233182	0047	3	B	NAS transport for RSPP	18.3.0
2023-12	CT#102	CP-233182	0055	1	B	SLPP introduction	18.3.0
2024-03	CT#103	CP-240087	0058	-	D	Typo corrections	18.4.0
2024-03	CT#103	CP-240120	0064	-	F	Correction to NAS signalling transport for downlink SLPP messages	18.4.0
2024-03	CT#103	CP-240120	0059	1	B	SL-MO-LR response in case of network congestion	18.4.0
2024-03	CT#103	CP-240087	0065	1	D	Miscellaneous corrections	18.4.0
2024-03	CT#103	CP-240087	0066	1	F	Update the positioning information transport procedure for PRU	18.4.0
2024-03	CT#103	CP-240087	0068	2	F	Clarifications for reporting indication	18.4.0
2024-03	CT#103	CP-240120	0069	1	B	Procedure for Ranging/SL Positioning service exposure through 5GC network via control plane	18.4.0
2024-03	CT#103	CP-240120	0071	2	B	UL Supplementary service message between LMF and UE for Ranging_SL	18.4.0
2024-03	CT#103	CP-240120	0070	2	B	DL Supplementary service message between LMF and UE for Ranging_SL	18.4.0
2024-03	CT#103	CP-240120	0043	6	B	Mobile Terminated Location Request for Ranging_SL	18.4.0
2024-06	CT#104	CP-241154	0075	-	F	Clarification on the parameters for the UP and cumulative event reporting	18.5.0
2024-06	CT#104	CP-241154	0076	-	F	Clarification on PRU capability	18.5.0
2024-06	CT#104	CP-241192	0073	1	F	Removal of ranging SL positioning service exposure through 5GC network via control plane	18.5.0
2024-06	CT#104	CP-241192	0077	1	F	Update of rangingResult IE	18.5.0
2024-06	CT#104	CP-241153	0081	-	F	Revise the PRU disassociation procedure	18.5.0
2024-06	CT#104	CP-241192	0079	1	F	Update overview clause to capture ranging operations	18.5.0

2024-06	CT#104	CP-241192	0080	1	F	Notification for privacy check on UE for RangingSl	18.5.0
2024-06	CT#104					Editorial	18.5.1
2024-09	CT#105	CP-242193	0083	-	F	Correction to LCS message used in SL-MT-LR procedure	18.6.0
2024-09	CT#105	CP-242206	0087	1	F	Clarification on the positioning IEs	18.6.0
2024-09	CT#105	CP-242193	0084	1	F	Corrections to RSPP supplementary information transport procedure	18.6.0
2024-09	CT#105	CP-242193	0086	1	F	Correct the foramt of the NOTE for the Ranging IEs	18.6.0
2024-12	CT#106	CP-243195	0091	-	F	Information elements in SL-MT-LR response	18.7.0
2024-12	CT#106	CP-243206	0098	1	F	Correction to missing message RELEASE COMPLETE for network initiated location service operations.	18.7.0
2024-12	CT#106	CP-243206	0100	3	F	Correction to missing RELEASE COMPLETE for UE initiated location service operations.	18.7.0

History

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