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| 3GPP  Postal address  3GPP support office address  650 Route des Lucioles - Sophia Antipolis  Valbonne - FRANCE  Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16  Internet  http://www.3gpp.org |
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# Foreword

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

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

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document specifies the Sidelink Positioning Protocol (SLPP) for the interface between UEs and between UE and LMF.

# 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 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

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

[4] ITU-T Recommendation X.691 (07/2002) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).

[5] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[6] 3GPP TS 38.211: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation".

[7] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[8] 3GPP TR 38.901: "Technical Specification Group Radio Access Network; Study on channel model for frequencies from 0.5 to 100 GHz".

[9] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[10] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[11] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[12] 3GPP TS 23.586: "Technical Specification Group Services and System Aspects; Architectural Enhancements to support Ranging based services and Sidelink Positioning".

[13] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[14] 3GPP TS 23.304: "Technical Specification Group Services and System Aspects; Proximity based Services (ProSe) in the 5G System (5GS)".

[15] 3GPP TS 38.321: "NR; Medium Access Control (MAC); Protocol specification".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 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 TR 21.905 [1].

**Field**: The individual contents of an information element are referred to as fields.

**Ranging**: Refers to the determination of the distance between two UEs or more UEs and/or the direction of one UE (i.e. Target UE) from another UE via PC5 interface.

**Ranging/Sidelink Positioning**: AS functionality enabling ranging-based services and sidelink positioning as specified in TS 23.586 [12].

**SL Anchor UE**: A UE, supporting positioning of target UE, e.g. by transmitting and/or receiving reference signals for positioning, providing positioning-related information, etc. over the Sidelink interface.

**SL Server UE:** A UE offering position method determination, assistance data distribution and/or location calculation functionalities for sidelink positioning and ranging based services. It interacts with other UEs over PC5 as necessary in order to determine a ranging/SL position method, distribute assistance data and calculate the location of the target UE. A Target UE or SL Anchor UE can act as SL Server UE if any of the functionalities is supported.

**SL Target UE**: A UE whose distance, direction and/or position is measured with the support from one or multiple SL Anchor UEs using Sidelink in the Ranging based service and Sidelink positioning.

**UE-only Operation**: Operation of Ranging/Sidelink Positioning in which the service request handling and result calculation are performed by UE.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

DFN Direct Frame Number

LMF Location Management Function

LOS Line-of-Sight

NLOS Non-Line-of-Sight

SL Sidelink

SL-AoA Sidelink Angle-of-Arrival

SLPP Sidelink Positioning Protocol

SL-PRS Sidelink Positioning Reference Signals

SL-PRS-RSRP Sidelink Positioning Reference Signals based Reference Signal Received Power

SL-PRS-RSRPP Sidelink Positioning Reference Signals based Reference Signal Received Path Power

SL-PRS-RSTD Sidelink Positioning Reference Signals based Reference Signal Time Difference

SL-PRS-RTOA Sidelink Positioning Reference Signals based Relative Time of Arrival

SL-RTT Sidelink Round Trip Time

SL-TDOA Sidelink Time Difference Of Arrival

SL-TOA Sidelink Time Of Arrival

UE User Equipment

# 4 Functionality of Protocol

## 4.1 General

### 4.1.1 SLPP Configuration

SLPP is used point-to-point between Endpoints, e.g. Location Server (SL Server UE or LMF) and target in order to obtain absolute position, relative position, or ranging information of target UE using sidelink measurements obtained by one or more reference sources.

Figure 4.1.1-1: Void

### 4.1.2 SLPP Sessions and Transactions

An SLPP session is used between UEs or a Location Server and a UE in order to obtain location related measurements based on NR PC5 radio signals, a location estimate or to transfer assistance data. A single SLPP session is used to support a single location request (e.g., for a single SL-MT-LR, or SL-MO-LR). Multiple SLPP sessions can be used between the same endpoints to support multiple location requests (as required by TS 23.273 [5]). For UE-only Operation, the instigator of an SLPP session which is the Endpoint who receives the LCS request, initiates an SLPP session by sending an SLPP message containing an assigned session ID (session identifier) to the other endpoint (s). All constituent messages within a session shall contain the same session ID. For LMF involved Operation, the session ID is assigned by target UE and contained in the SLPP messages used for communication between UEs. The session ID may be included in the SLPP message for the communication between a UE and the LMF.

Each SLPP session comprises one or more SLPP transactions, with each SLPP transaction performing a single operation (capability exchange, assistance data transfer, or location information transfer). The SLPP transactions are realized as SLPP procedures. The instigator of an SLPP session will always instigate the first SLPP transaction, but subsequent transactions may be instigated by either end. SLPP transactions within a session may occur serially or in parallel. SLPP transactions are indicated at the SLPP protocol level with a transaction ID in order to associate messages with one another (e.g., request and response).

Messages within a transaction are linked by a common transaction identifier.

### 4.1.3 SLPP Positioning Methods

This version of the specification defines SL-TDOA, SL-TOA, SL-AoA and SL-RTT positioning methods based on NR PC5 radio signals.

### 4.1.4 SLPP Messages

Each SLPP transaction involves the exchange of one or more SLPP messages between Endpoint A and Endpoint B. The general format of an SLPP message consists of a set of common fields followed by a body. The body (which may be empty) contains information specific to a particular message type. Each message type contains information specific to one or more positioning methods and/or information common to all positioning methods.

The common fields are as follows:

|  |  |
| --- | --- |
| Field | Role |
| *sessionID* | Identify messages belonging to the same session |
| *transactionID* | Identify messages belonging to the same transaction |
| *endTransaction* | Indicate when a transaction (e.g. one with periodic responses) has ended |
| *sequenceNumber* | Enable detection of a duplicate SLPP message at a receiver |
| *acknowledgement* | Enable an acknowledgement to be requested and/or returned for any SLPP message |

The following message types are defined:

- Request Capabilities;

- Provide Capabilities;

- Request Assistance Data;

- Provide Assistance Data;

- Request Location Information;

- Provide Location Information;

- Abort;

- Error.

## 4.2 Common SLPP Session Procedure

The purpose of this procedure is to support an SLPP session comprising a sequence of SLPP transactions. The procedure is described in Figure 4.2-1.



Figure 4.2-1 SLPP Session Procedure

1. Endpoint A, which is the Endpoint who receives the LCS request, initiates an SLPP session by sending an SLPP message containing an assigned session ID for an initial SLPP transaction *j* to the other endpoint B.

2. Endpoints A and B may exchange further messages to continue the transaction started in step 1.

3. Either endpoint may instigate further transactions by sending additional SLPP messages.

4. A session is terminated by a final transaction *N* in which SLPP messages will be exchanged between the two endpoints.

Within the same session, all constituent messages shall contain the same session ID and within each transaction, all constituent messages shall contain the same transaction ID. The last message sent in each transaction shall have the field *endTransaction* set to TRUE. Transactions that occur in parallel shall use different transaction IDs; transaction IDs for completed transactions may be reused at any time after the final message of the previous transaction with the same ID is known to have been received.

## 4.3 SLPP Transport

### 4.3.1 Transport Layer Requirements

SLPP requires reliable, in-sequence delivery of SLPP messages from the underlying transport layers. This clause describes the transport capabilities that are available within SLPP. A UE implementing SLPP shall support SLPP reliable transport (including all three of duplicate detection, acknowledgement, and retransmission).

### 4.3.2 SLPP Duplicate Detection

A sender shall include a sequence number in all SLPP messages sent for a particular location session. The sequence number shall be distinct for different SLPP messages sent by the same endpoint for the same endpoint in the same location session (e.g., may start at zero in the first SLPP message and increase monotonically in each succeeding SLPP message). Sequence numbers used in the messages transmitted from different endpoints or for different endpoints are independent (e.g., can be the same).

A receiver shall record the most recent received sequence number for each pair of endpoints of each location session. If a message is received carrying the same sequence number as that last received for the same pair of endpoints and the associated location session, it shall be discarded. Otherwise (i.e., if the sequence number is different or the sequence number is same but for different pair of endpoints), the message shall be processed.

Sending and receiving sequence numbers shall be deleted in a server when the associated location session is terminated and shall be deleted in the UE(s) when there has been no activity for a particular location session for 10 minutes.

### 4.3.3 SLPP Acknowledgement

#### 4.3.3.1 General

Each SLPP message may carry an acknowledgement request and/or an acknowledgement indicator. A SLPP message including an acknowledgement request (i.e., that include the field *ackRequested* set to TRUE) shall also include a sequence number. Upon reception of an SLPP message which includes the field *ackRequested* set to TRUE, a receiver returns an SLPP message with an acknowledgement response (i.e., that includes the field *ackIndicator* set to the same sequence number of the message being acknowledged). An acknowledgement response may contain no SLPP message body (in which case only the sequence number being acknowledged is significant); alternatively, the acknowledgement may be sent in an SLPP message along with an SLPP message body. An acknowledgement is returned for each received SLPP message that requested an acknowledgement including any duplicate(s). Once a sender receives an acknowledgement for an SLPP message, and provided any included sequence number is matching, it is permitted to send the next SLPP message. No message reordering is needed at the receiver since this stop-and-wait method of sending ensures that messages normally arrive in the correct order.

When an SLPP message is transported via a NAS SL-MO-LR request, the message does not request an acknowledgement.

#### 4.3.3.2 Procedure related to Acknowledgement

Figure 4.3.3.2-1 shows the procedure related to acknowledgement.



Figure 4.3.3.2-1: SLPP Acknowledgement procedure

1. Endpoint A sends an SLPP message *N* to Endpoint B which includes the field *ackRequested* set to TRUE and a sequence number.

2. If SLPP message *N* is received and Endpoint B is able to decode the *ackRequested* value and sequence number, Endpoint B shall return an acknowledgement for message *N*. The acknowledgement shall contain the field *ackIndicator* set to the same sequence number as that in message *N*.

3. When the acknowledgement for SLPP message *N* is received and provided the included the field *ackIndicator* matches the sequence number sent in message *N*, Endpoint A sends the next SLPP message *N+1* to Endpoint B when this message is available.

### 4.3.4 SLPP Retransmission

#### 4.3.4.1 General

This capability builds on the acknowledgement and duplicate detection capabilities. When an SLPP message which requires acknowledgement is sent and not acknowledged, it is resent by the sender following a timeout period up to three times. If still unacknowledged after that, the sender aborts all SLPP activity for this Endpoint. The timeout period is determined by the sender implementation but shall not be less than a minimum value of 250 ms.

#### 4.3.4.2 Procedure related to Retransmission

Figure 4.3.4.2-1 shows the procedure related to retransmission when combined with acknowledgement and duplicate detection.



Figure 4.3.4.2-1: SLPP Retransmission procedure

1. Endpoint A sends an SLPP message *N* to Endpoint B for a particular location session and includes a request for acknowledgement along with a sequence number.

2. If SLPP message *N* is received and Endpoint B is able to decode the *ackRequested* value and sequence number (regardless of whether the message body can be correctly decoded), Endpoint B shall return an acknowledgement for message *N*. If the acknowledgement is received by Endpoint A (such that the acknowledged message can be identified and sequence numbers are matching), Endpoint A skips steps 3 and 4.

3. If the acknowledgement in step 2 is not received after a timeout period, Endpoint A shall retransmit SLPP message *N* and shall include the same sequence number as in step 1.

4. If SLPP message *N* in step 3 is received and Endpoint B is able to decode the *ackRequested* value and sequence number (regardless of whether the message body can be correctly decoded and whether or not the message is considered a duplicate), Endpoint B shall return an acknowledgement. Steps 3 may be repeated one or more times if the acknowledgement in step 4 is not received after a timeout period by Endpoint A. If the acknowledgement in step 4 is still not received after sending three retransmissions, Endpoint A shall abort all procedures and activity associated with SLPP support for this Endpoint B.

5. Once an acknowledgement in step 2 or step 4 is received, Endpoint A sends the next SLPP message *N+1* for the location session to Endpoint B when this message is available.

# 5 SLPP Procedures

## 5.1 Procedures related to capability transfer

### 5.1.1 General

The purpose of the procedures that are grouped together in this clause is to enable the transfer of capabilities from Endpoint A to Endpoint B. Capabilities in this context refer to positioning and protocol capabilities related to SLPP and the positioning methods supported by SLPP.

### 5.1.2 Capability Transfer procedure

The Capability Transfer procedure is shown in Figure 5.1.2-1.



Figure 5.1.2-1: SLPP Capability Transfer procedure

1. Endpoint B sends a *RequestCapabilities* message to Endpoint A. Endpoint B may indicate the types of capability requested.

2. Endpoint A responds with a *ProvideCapabilities* message to Endpoint B. The capabilities shall correspond to the capability types specified in step 1. This message shall include the field *endTransaction* set to TRUE.

### 5.1.3 Capability Indication procedure

The Capability Indication procedure allows the Endpoint A to provide unsolicited capabilities to the Endpoint B and is shown in Figure 5.1.3-1.



Figure 5.1.3-1: SLPP Capability Indication procedure

1. Endpoint A sends a *ProvideCapabilities* message to Endpoint B. This message shall include the field *endTransaction* set to TRUE.

### 5.1.4 Transmission of SLPP Request Capabilities

When triggered to transmit a *RequestCapabilities* message, Endpoint B shall:

1> set the method specific *RequestCapabilities* PDUs in accordance with the information received from upper layers.

1> deliver the message to lower layers for transmission.

### 5.1.5 Reception of SLPP Request Capabilities

Upon receiving a *RequestCapabilities* message, Endpoint A shall generate a *ProvideCapabilities* message as a response.

Endpoint A shall:

1> for each positioning method for which a request for capabilities is included in the message:

2> if Endpoint A supports this positioning method:

3> include the capabilities of Endpoint A for that supported positioning method in the response message;

1> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;

1> set the field *transactionID* in the response message to the same value as the field *transactionID* in the received message;

1> deliver the response message to lower layers for transmission.

### 5.1.6 Transmission of SLPP Provide Capabilities

When triggered to transmit a *ProvideCapabilities* message, Endpoint A shall:

1> for each positioning method whose capabilities are to be indicated:

2> set the corresponding fields to include Endpoint A's capabilities;

1> deliver the response to lower layers for transmission.

## 5.2 Procedures related to Assistance Data Transfer

### 5.2.1 General

The purpose of the procedures that are grouped together in this clause is to enable Endpoint A to request assistance data from Endpoint B to assist in positioning, and to enable Endpoint B to transfer assistance data to Endpoint A without a request.

### 5.2.2 Assistance Data Transfer procedure

The Assistance Data Transfer procedure is shown in Figure 5.2.2-1.



Figure 5.2.2-1: SLPP Assistance data transfer procedure

1. Endpoint A sends a *RequestAssistanceData* message to Endpoint B.

2. Endpoint B responds with a *ProvideAssistanceData* message to Endpoint A containing assistance data. The transferred assistance data should match or be a subset of the assistance data requested in step 1. Endpoint B may also provide any not requested information that it considers useful to Endpoint A. If step 3 is not expected, this message shall set the field *endTransaction* to TRUE.

3. Endpoint B may transmit one or more additional *ProvideAssistanceData* messages to Endpoint A containing further assistance data. The transferred assistance data should match or be a subset of the assistance data requested in step 1. Endpoint B may also provide any not requested information that it considers useful to Endpoint A. The last message shall include the field *endTransaction* set to TRUE.

### 5.2.3 Assistance Data Delivery procedure

The Assistance Data Delivery procedure allows Endpoint B to provide unsolicited assistance data to Endpoint A and is shown in Figure 5.2.3-1.



Figure 5.2.3-1: SLPP Assistance data transfer procedure

1. Endpoint B sends a *ProvideAssistanceData* message to Endpoint A containing assistance data. If step 2 is not expected, this message shall set the field *endTransaction* to TRUE.

2. Endpoint B may transmit one or more additional *ProvideAssistanceData* messages to Endpoint A containing additional assistance data. The last message shall include the field *endTransaction* set to TRUE.

### 5.2.4 Transmission of SLPP Request Assistance Data

When triggered to transmit a *RequestAssistanceData* message, Endpoint A shall:

1> set the method specific *RequestAssistanceData* PDUs in accordance with the information received from upper layers.

1> deliver the message to lower layers for transmission.

### 5.2.5 Reception of SLPP Request Assistance Data

Upon receiving a *RequestAssistanceData* message, Endpoint B shall generate a *ProvideAssistanceData* message as a response.

Endpoint B shall:

1> for each positioning method for which a request for assistance data is included in the message:

2> if Endpoint B supports this positioning method:

3> include the assistance data for that supported positioning method in the response message;

1> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;

1> set the field *transactionID* in the response message to the same value as the field *transactionID* in the received message;

1> deliver the response message to lower layers for transmission.

### 5.2.6 Reception of SLPP Provide Assistance Data

Upon receiving a *ProvideAssistanceData* message, Endpoint A shall:

1> for each positioning method contained in the message:

2> deliver the related assistance data to upper layers.

## 5.3 Procedures related to Location Information Transfer

### 5.3.1 General

The purpose of the procedures that are grouped together in this clause is to enable Endpoint B to request location measurement data and/or a location estimate from Endpoint A, and to enable Endpoint A to transfer location measurement data and/or a location estimate to Endpoint B without a request.

### 5.3.2 Location Information Transfer procedure

The Location Information Transfer procedure is shown in Figure 5.3.2-1.



Figure 5.3.2-1: SLPP Location Information transfer procedure

1. Endpoint B sends a *RequestLocationInformation* message to Endpoint A to request location information, indicating the type of location information requested and optionally the associated QoS.

2. Endpoint A sends a *ProvideLocationInformation* message to Endpoint B to transfer location information. The location information transferred should match or be a subset of the location information requested in step 1 unless Endpoint B explicitly allows additional location information. If step 3 is not expected, this message shall set the field *endTransaction* to TRUE.

3. If requested in step 1, Endpoint A sends additional *ProvideLocationInformation* messages to Endpoint B to transfer location information. The location information transferred should match or be a subset of the location information requested in step 1 unless Endpoint B explicitly allows additional location information. The last message shall include the field *endTransaction* set to TRUE.

### 5.3.3 Location Information Delivery procedure

The Location Information Delivery procedure allows Endpoint A to provide unsolicited location information to Endpoint B. The procedure is shown in Figure 5.3.3-1.



Figure 5.3.3-1: SLPP Location Information Delivery procedure

1. Endpoint A sends a *ProvideLocationInformation* message to Endpoint B to transfer location information. If step 2 is not expected, this message shall set the field *endTransaction* to TRUE.

2. Endpoint A may send one or more additional *ProvideLocationInformation* messages to Endpoint B containing additional location information data. The last message shall include the field *endTransaction* set to TRUE.

### 5.3.4 Transmission of Request Location Information

When triggered to transmit a *RequestLocationInformation* message, Endpoint B shall:

1> set the method specific *RequestLocationInformation* PDUs in accordance with the information received from upper layers.

1> deliver the message to lower layers for transmission.

### 5.3.5 Reception of Request Location Information

Upon receiving a *RequestLocationInformation* message, Endpoint A shall:

1> if the requested information is compatible with Endpoint A's capabilities and configuration:

2> include the requested information in a *ProvideLocationInformation* message;

2> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;

2> set the field *transactionID* in the response to the same value as the field *transactionID* in the received message;

2> deliver the *ProvideLocationInformation* message to lower layers for transmission.

1> else if one or more positioning methods are included that Endpoint A does not support:

2> continue to process the message as if it contained only information for the supported positioning methods;

2> handle the signaling content of the unsupported positioning methods by SLPP error detection as in 5.4.3.

### 5.3.6 Transmission of Provide Location Information

When triggered to transmit *ProvideLocationInformation* message, Endpoint A shall:

1> for each positioning method contained in the message:

2> set the corresponding fields to include the available location information;

1> deliver the response to lower layers for transmission.

## 5.4 Error Handling Procedures

### 5.4.1 General

This clause describes how a receiving endpoint behaves in cases when it receives erroneous or unexpected data or detects that certain data are missing.

### 5.4.2 Procedures related to Error Indication

Figure 5.4.2-1 shows the Error indication procedure.



Figure 5.4.2-1: SLPP Error Indication procedure

1. Endpoint A sends an SLPP message to Endpoint B.

2. Endpoint B determines that the SLPP message in step 1 contains an error. Endpoint B returns an *Error* message to Endpoint A indicating the error or errors and discards the message in step 1. If Endpoint B is able to determine that the erroneous SLPP message in step 1 is an SLPP Error or Abort Message, Endpoint B discards the message in step 1 without returning an *Error* message to Endpoint A.

### 5.4.3 SLPP Error Detection

Upon receiving any SLPP message, the receiving endpoint shall attempt to decode the message and verify the presence of any errors and:

1> if decoding errors are encountered:

2> if the receiver cannot determine that the received message is an SLPP *Error* or *Abort* message:

3> return an SLPP *Error* message to the sender and include the field *sessionID* (if PC5-U is used as transport layer) and the received *transactionID*, if they were decoded, and type of error;

3> discard the received message and stop the error detection procedure;

1> if the message is a duplicate of a previously received message:

2> discard the message and stop the error detection procedure;

1> if the field *transactionID* matches the field *transactionID* for a procedure that is still ongoing for the same session and the message type is invalid for the current state of the procedure:

2> abort the ongoing procedure;

2> return an SLPP *Error* message to the sender and include the field *sessionID* (if PC5-U is used as transport layer), the received field *transactionID* and type of error;

2> discard the message and stop the error detection procedure;

1> if the message type is an SLPP *RequestCapabilities* and some of the requested information is not supported:

2> return any information that can be provided in a normal response.

1> if the message type is an SLPP *RequestAssistanceData* or *RequestLocationInformation* and some or all of the requested information is not supported:

2> return any information that can be provided in a normal response, which includes indications on other information that is not supported.

### 5.4.4 Reception of an SLPP Error Message

Upon receiving an *Error* message, Endpoint A shall:

1> abort any ongoing procedure associated with the field *sessionID* and the field *transactionID* if included in the received message.

Endpoint A may:

1> restart the aborted procedure taking into consideration the returned error information.

## 5.5 Abort Procedure

### 5.5.1 General

The purpose of the abort procedure is to allow Endpoints to abort an ongoing procedure due to some unexpected event (e.g., cancellation of a location request by an LCS client). It can also be used to stop an ongoing procedure (e.g., periodic location reporting from an Endpoint).

### 5.5.2 Procedures related to Abort

Figure 5.5.2-1 shows the Abort procedure.



Figure 5.5.2-1: SLPP Abort procedure

1. A procedure P is ongoing between endpoints A and B.

2. Endpoint A determines that the procedure must be aborted and sends an *Abort* message to Endpoint B carrying the field *sessionID* (if PC5-U is used as transport layer) and the field *transactionID* for procedure P. Endpoint B aborts procedure P.

### 5.5.3 Reception of an SLPP Abort Message

Upon receiving an *Abort* message, Endpoint shall:

1> abort any ongoing procedure associated with the field *sessionID* and the field *transactionID* indicated in the message.

# 6 Protocol data units, formats and parameters (ASN.1)

## 6.1 General

The contents of each SLPP message is specified in clause 6.2 using ASN.1 to specify the message syntax and using tables when needed to provide further detailed information about the fields specified in the message syntax. The syntax of the information elements that are defined as stand-alone abstract types is further specified in a similar manner in clause 6.3.

The ASN.1 in this clause uses the same format and coding conventions as described in Annex A of TS 38.331 [2].

Transfer syntax for SLPP messages is derived from their ASN.1 definitions by use of Basic Packed Encoding Rules (BASIC-PER), Unaligned Variant, as specified in ITU-T Rec. X.691 [4]. The encoded SLPP message always contains a multiple of 8 bits.

Transfer syntax for SLPP IEs is derived from their ASN.1 definitions by use of Basic Packed Encoding Rules (BASIC-PER), Unaligned Variant, as specified in ITU-T Rec. X.691 [4]. The encoded SLPP IE always contains a multiple of 8 bits. This applies when a single SLPP IE is encoded as the basic production, i.e. for other purposes than encoding the SLPP IE within an SLPP message.

When specifying information elements which are to be represented by BIT STRINGs, if not otherwise specifically stated in the field description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the most significant bit (MSB);

- the last bit (rightmost bit) contains the least significant bit (LSB).

## 6.2 SLPP messages

### 6.2.1 General message structure

#### *– SLPP-PDU-Definitions*

This ASN.1 segment is the start of the SLPP PDU definitions.

-- ASN1START

-- TAG-SLPP-PDU-DEFINITIONS-START

SLPP-PDU-Definitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

CommonIEsRequestCapabilities,

CommonIEsProvideCapabilities,

CommonIEsRequestAssistanceData,

CommonIEsProvideAssistanceData,

CommonIEsRequestLocationInformation,

CommonIEsProvideLocationInformation

FROM

SLPP-PDU-CommonContents

CommonSL-PRS-MethodsIEsRequestCapabilities,

CommonSL-PRS-MethodsIEsProvideCapabilities,

CommonSL-PRS-MethodsIEsRequestAssistanceData,

CommonSL-PRS-MethodsIEsProvideAssistanceData,

CommonSL-PRS-MethodsIEsRequestLocationInformation,

CommonSL-PRS-MethodsIEsProvideLocationInformation

FROM

SLPP-PDU-CommonSL-PRS-MethodsContents

SL-AoA-RequestCapabilities,

SL-AoA-ProvideCapabilities,

SL-AoA-RequestAssistanceData,

SL-AoA-ProvideAssistanceData,

SL-AoA-RequestLocationInformation,

SL-AoA-ProvideLocationInformation

FROM

SLPP-PDU-SL-AoA-Contents

SL-RTT-RequestCapabilities,

SL-RTT-ProvideCapabilities,

SL-RTT-RequestAssistanceData,

SL-RTT-ProvideAssistanceData,

SL-RTT-RequestLocationInformation,

SL-RTT-ProvideLocationInformation

FROM

SLPP-PDU-SL-RTT-Contents

SL-TDOA-RequestCapabilities,

SL-TDOA-ProvideCapabilities,

SL-TDOA-RequestAssistanceData,

SL-TDOA-ProvideAssistanceData,

SL-TDOA-RequestLocationInformation,

SL-TDOA-ProvideLocationInformation

FROM

SLPP-PDU-SL-TDOA-Contents

SL-TOA-RequestCapabilities,

SL-TOA-ProvideCapabilities,

SL-TOA-RequestAssistanceData,

SL-TOA-ProvideAssistanceData,

SL-TOA-RequestLocationInformation,

SL-TOA-ProvideLocationInformation

FROM

SLPP-PDU-SL-TOA-Contents;

-- TAG-SLPP-PDU-DEFINITIONS-STOP

-- ASN1STOP

NOTE 1: An implementation needs to include only the supported "Method" PDUs. Not supported methods do not need to be included. For example, if SL-RTT is not supported by an implementation, the *SLPP-PDU-SL-RTT-Contents* PDU does not need to be included in the protocol.

NOTE 2: An implementation supporting SL-RTT, SL-AoA, SL-TDOA, or SL-TOA must also support the *SLPP-PDU-CommonSL-PRS-MethodsContents* PDU.

#### *– SLPP-Message*

The *SLPP-Message* provides the complete set of information for an invocation or response pertaining to an SLPP transaction.

-- ASN1START

-- TAG-SLPP-MESSAGE-START

SLPP-Message ::= SEQUENCE {

transactionID INTEGER (0..255) OPTIONAL,

endTransaction BOOLEAN,

sequenceNumber SequenceNumber OPTIONAL,

sessionID SessionID OPTIONAL,

acknowledgement Acknowledgement OPTIONAL,

slpp-MessageBody SLPP-MessageBody OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

SequenceNumber ::= INTEGER (0..255)

SessionID ::= OCTET STRING (SIZE (6))

Acknowledgement ::= SEQUENCE {

ackRequested BOOLEAN,

ackIndicator SequenceNumber OPTIONAL

}

-- TAG-SLPP-MESSAGE-STOP

-- ASN1STOP

|  |
| --- |
| *SLPP-Message* field descriptions |
| ***acknowledgement***  This field is included in an SLPP acknowledgement and in any SLPP message requesting an acknowledgement when SLPP operates over the control plane and is omitted otherwise.  - ***ackRequested***: This field indicates whether an SLPP acknowledgement is requested (TRUE) or not (FALSE). A value of TRUE may only be included when an *slpp-MessageBody* is included.  - ***ackIndicator***: This field indicates the sequence number of the message being acknowledged. |
| ***endTransaction***  This field indicates whether an SLPP message is the last message carrying an *slpp-MessageBody* in a transaction (TRUE) or not last (FALSE). |
| ***sequenceNumber***  This field may be included when an s*lpp-MessageBody* is included but shall be omitted otherwise. |
| ***sessionID***  This field indicates the session ID which is used to identify messages belonging to the same session. |
| ***slpp-MessageBody***  This field may be omitted in the case the message is sent only to acknowledge a previously received message. |
| ***transactionID***  This field is omitted if an s*lpp-MessageBody* is not present (i.e. in an SLPP message sent only to acknowledge a previously received message) or if it is not available to the transmitting endpoint (e.g., in an S*LPP-Error* message triggered by a message that could not be parsed). If present, this field shall be ignored at a receiver in an SLPP message for which the s*lpp-MessageBody* is not present. |

#### *– SLPP-MessageBody*

The *SLPP-MessageBody* identifies the type of an SLPP message and contains all SLPP information specifically associated with that type.

-- ASN1START

-- TAG-SLPP-MESSAGEBODY-START

SLPP-MessageBody ::= CHOICE {

c1 CHOICE {

requestCapabilities RequestCapabilities,

provideCapabilities ProvideCapabilities,

requestAssistanceData RequestAssistanceData,

provideAssistanceData ProvideAssistanceData,

requestLocationInformation RequestLocationInformation,

provideLocationInformation ProvideLocationInformation,

abort Abort,

error Error,

spare8 NULL, spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL, spare3 NULL, spare2 NULL, spare1 NULL

},

messageClassExtension SEQUENCE {}

}

-- TAG-SLPP-MESSAGEBODY-STOP

-- ASN1STOP

### 6.2.2 Message body information elements definitions

#### – *RequestCapabilities*

The *RequestCapabilities* message body in an SLPP message is used by Endpoint B to request Endpoint A capability information for SLPP and the supported individual positioning methods.

-- ASN1START

-- TAG-REQUESTCAPABILITIES-START

RequestCapabilities ::= SEQUENCE {

criticalExtensions CHOICE {

requestCapabilities RequestCapabilities-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RequestCapabilities-IEs ::= SEQUENCE {

commonIEsRequestCapabilities OCTET STRING OPTIONAL, -- Containing CommonIEsRequestCapabilities

commonSL-PRS-MethodsIEsRequestCapabilities OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestCapabilities

sl-AoA-RequestCapabilities OCTET STRING OPTIONAL, -- Containing SL-AoA-RequestCapabilities

sl-RTT-RequestCapabilities OCTET STRING OPTIONAL, -- Containing SL-RTT-RequestCapabilities

sl-TDOA-RequestCapabilities OCTET STRING OPTIONAL, -- Containing SL-TDOA-RequestCapabilities

sl-TOA-RequestCapabilities OCTET STRING OPTIONAL, -- Containing SL-TOA-RequestCapabilities

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-REQUESTCAPABILITIES-STOP

-- ASN1STOP

#### – *ProvideCapabilities*

The *ProvideCapabilities* message body in an SLPP message indicates the SLPP capabilities of Endpoint A to Endpoint B.

-- ASN1START

-- TAG-PROVIDECAPABILITIES-START

ProvideCapabilities ::= SEQUENCE {

criticalExtensions CHOICE {

provideCapabilities ProvideCapabilities-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

ProvideCapabilities-IEs ::= SEQUENCE {

commonIEsProvideCapabilities OCTET STRING OPTIONAL, -- Containing CommonIEsProvideCapabilities

commonSL-PRS-MethodsIEsProvideCapabilities OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideCapabilities

sl-AoA-ProvideCapabilities OCTET STRING OPTIONAL, -- Containing SL-AoA-ProvideCapabilities

sl-RTT-ProvideCapabilities OCTET STRING OPTIONAL, -- Containing SL-RTT-ProvideCapabilities

sl-TDOA-ProvideCapabilities OCTET STRING OPTIONAL, -- Containing SL-TDOA-ProvideCapabilities

sl-TOA-ProvideCapabilities OCTET STRING OPTIONAL, -- Containing SL-TOA-ProvideCapabilities

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-PROVIDECAPABILITIES-STOP

-- ASN1STOP

#### – *RequestAssistanceData*

The *RequestAssistanceData* message body in an SLPP message is used by the Endpoint A to request assistance data from Endpoint B.

-- ASN1START

-- TAG-REQUESTASSISTANCEDATA-START

RequestAssistanceData ::= SEQUENCE {

criticalExtensions CHOICE {

requestAssistanceData RequestAssistanceData-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RequestAssistanceData-IEs ::= SEQUENCE {

commonIEsRequestAssistanceData OCTET STRING OPTIONAL, -- Containing CommonIEsRequestAssistanceData

commonSL-PRS-MethodsIEsRequestAssistanceData OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestAssistanceData

sl-AoA-RequestAssistanceData OCTET STRING OPTIONAL, -- Containing SL-AOA-RequestAssistanceData

sl-RTT-RequestAssistanceData OCTET STRING OPTIONAL, -- Containing SL-RTT-RequestAssistanceData

sl-TDOA-RequestAssistanceData OCTET STRING OPTIONAL, -- Containing SL-TDOA-RequestAssistanceData

sl-TOA-RequestAssistanceData OCTET STRING OPTIONAL, -- Containing SL-TOA-RequestAssistanceData

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

#### – *ProvideAssistanceData*

The *ProvideAssistanceData* message body in an SLPP message is used by Endpoint B to provide assistance data to Endpoint A either in response to a request from Endpoint A or in an unsolicited manner. Upon receiving an SLPP message *ProvideAsssistanceData*, the UE releases the value received in previous SLPP message *ProvideAsssistanceData* if any.

-- ASN1START

-- TAG-PROVIDEASSISTANCEDATA-START

ProvideAssistanceData ::= SEQUENCE {

criticalExtensions CHOICE {

provideAssistanceData ProvideAssistanceData-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

ProvideAssistanceData-IEs ::= SEQUENCE {

commonIEsProvideAssistanceData OCTET STRING OPTIONAL, -- Containing CommonIEsProvideAssistanceData

commonSL-PRS-MethodsIEsProvideAssistanceData OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideAssistanceData

sl-AoA-ProvideAssistanceData OCTET STRING OPTIONAL, -- Containing SL-AoA-ProvideAssistanceData

sl-RTT-ProvideAssistanceData OCTET STRING OPTIONAL, -- Containing SL-RTT-ProvideAssistanceData

sl-TDOA-ProvideAssistanceData OCTET STRING OPTIONAL, -- Containing SL-TDOA-ProvideAssistanceData

sl-TOA-ProvideAssistanceData OCTET STRING OPTIONAL, -- Containing SL-TOA-ProvideAssistanceData

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-PROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

#### – *RequestLocationInformation*

The *RequestLocationInformation* message body in an SLPP message is used by Endpoint B to request positioning measurements or a position estimate from Endpoint A.

-- ASN1START

-- TAG-REQUESTLOCATIONINFORMATION-START

RequestLocationInformation ::= SEQUENCE {

criticalExtensions CHOICE {

requestLocationInformation RequestLocationInformation-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RequestLocationInformation-IEs ::= SEQUENCE {

commonIEsRequestLocationInformation OCTET STRING OPTIONAL, -- Containing CommonIEsRequestLocationInformation

commonSL-PRS-MethodsIEsRequestLocationInformation OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestLocationInformation

sl-AoA-RequestLocationInformation OCTET STRING OPTIONAL, -- Containing SL-AoA-RequestLocationInformation

sl-RTT-RequestLocationInformation OCTET STRING OPTIONAL, -- Containing SL-RTT-RequestLocationInformation

sl-TDOA-RequestLocationInformation OCTET STRING OPTIONAL, -- Containing SL-TDOA-RequestLocationInformation

sl-TOA-RequestLocationInformation OCTET STRING OPTIONAL, -- Containing SL-TOA-RequestLocationInformation

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-REQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

#### – *ProvideLocationInformation*

The *ProvideLocationInformation* message body in an SLPP message is used by Endpoint A to provide positioning measurements or position estimates to Endpoint B.

-- ASN1START

-- TAG-PROVIDELOCATIONINFORMATION-START

ProvideLocationInformation ::= SEQUENCE {

criticalExtensions CHOICE {

provideLocationInformation ProvideLocationInformation-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

ProvideLocationInformation-IEs ::= SEQUENCE {

commonIEsProvideLocationInformation OCTET STRING OPTIONAL, -- Containing CommonIEsProvideLocationInformation

commonSL-PRS-MethodsIEsProvideLocationInformation OCTET STRING OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideLocationInformation

sl-AoA-ProvideLocationInformation OCTET STRING OPTIONAL, -- Containing SL-AoA-ProvideLocationInformation

sl-RTT-ProvideLocationInformation OCTET STRING OPTIONAL, -- Containing SL-RTT-ProvideLocationInformation

sl-TDOA-ProvideLocationInformation OCTET STRING OPTIONAL, -- Containing SL-TDOA-ProvideLocationInformation

sl-TOA-ProvideLocationInformation OCTET STRING OPTIONAL, -- Containing SL-TOA-ProvideLocationInformation

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-PROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

#### *– Abort*

The *Abort* message body in an SLPP message carries a request to abort an ongoing SLPP procedure.

-- ASN1START

-- TAG-ABORT-START

Abort ::= SEQUENCE {

criticalExtensions CHOICE {

abort Abort-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

Abort-IEs ::= SEQUENCE {

commonIEsAbort CommonIEsAbort OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-ABORT-STOP

-- ASN1STOP

#### *– Error*

The *Error* message body in an SLPP message carries information concerning an SLPP message that was received with errors.

-- ASN1START

-- TAG-ERROR-START

Error ::= CHOICE {

criticalExtensions CHOICE {

error Error-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

Error-IEs ::= SEQUENCE {

commonIEsError CommonIEsError OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-ERROR-STOP

-- ASN1STOP

## 6.3 SLPP information elements

### 6.3.1 Common information elements

#### *– ARFCN-ValueNR*

The *ARFCN-ValueNR* is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) NR global frequency raster, as defined in TS 38.101-2 [10] and TS 38.101-1 [11].

-- ASN1START

-- TAG-ARFCN-VALUENR-START

ARFCN-ValueNR ::= INTEGER (0..3279165)

-- TAG-ARFCN-VALUENR-STOP

-- ASN1STOP

#### *– CommonIEsAbort*

The *CommonIEsAbort* carries common IEs for an Abort SLPP message Type.

-- ASN1START

-- TAG-COMMONIESABORT-START

CommonIEsAbort ::= SEQUENCE {

abortCause ENUMERATED { undefined, stopPeriodicReporting }

}

-- TAG-COMMONIESABORT-STOP

-- ASN1STOP

|  |
| --- |
| *CommonIEsAbort* field descriptions |
| ***abortCause***  This field defines the request to abort an ongoing procedure. The abort cause '*stopPeriodicReporting*' is used by an endpoint to stop any ongoing location reporting configured as *periodicalReporting* in the *CommonIEsRequestLocationInformation*. |

#### – *CommonIEsError*

The *CommonIEsError* carries common IEs for an Error SLPP message Type.

-- ASN1START

-- TAG-COMMONIESERROR-START

CommonIEsError ::= SEQUENCE {

errorCause ENUMERATED { undefined, slppMessageHeaderError, slppMessageBodyError, incorrectDataValue }

}

-- TAG-COMMONIESERROR-STOP

-- ASN1STOP

|  |
| --- |
| *CommonIEsError* field descriptions |
| ***errorCause***  This field defines the cause for an error. '*slppMessageHeaderError*' and '*slppMessageBodyError*' are used if a receiver is able to detect a coding error in the SLPP header (i.e., in the common fields) or SLPP message body respectively. '*incorrectDataValue*' is used if a receiver receives an incorrect data value. |

#### *– GNSS-ID-Bitmap*

The IE *GNSS-ID-Bitmap* is used to indicate several GNSSs using a bit map.

-- ASN1START

-- TAG-GNSS-ID-BITMAP-START

--

-- GNSS-ID-Bitmap ::= BIT STRING { gps (0), sbas (1), qzss (2), galileo (3), glonass (4), bds (5), navic (6) } (SIZE (1..16))

--

-- TAG-GNSS-ID-BITMAP-STOP

-- ASN1STOP

#### – *LCS-GCS-Translation*

The IE *LCS-GCS-Translation* provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8].

-- ASN1START

-- TAG-LCS-GCS-TRANSLATION-START

LCS-GCS-Translation ::= SEQUENCE {

alpha INTEGER (0..3599),

beta INTEGER (0..3599),

gamma INTEGER (0..3599)

}

-- TAG-LCS-GCS-TRANSLATION-STOP

-- ASN1STOP

|  |
| --- |
| *LCS-GCS-Translation* field descriptions |
| ***alpha***  This field specifies the bearing angle α for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degree; range 0 to 359 degrees. |
| ***beta***  This field specifies the downtilt angle β for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degrees; range 0 to 359 degrees. |
| ***gamma***  This field specifies the slant angle γ for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degree; range 0 to 359 degrees. |

#### – *LOS-NLOS-Indicator*

The IE *LOS-NLOS-Indicator* provides information on the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver.

-- ASN1START

-- TAG-LOS-NLOS-INDICATOR-START

LOS-NLOS-Indicator ::= SEQUENCE {

indicator CHOICE {

soft INTEGER (0..10),

hard BOOLEAN

}

}

-- TAG-LOS-NLOS-INDICATOR-STOP

-- ASN1STOP

|  |
| --- |
| *LOS-NLOS-Indicator* field descriptions |
| ***indicator***  This field provides information on the likelihood of a Line-of-Sight propagation path from the source to the receiver with a value of 1 corresponding to LoS and a value of 0 corresponding to NLoS.  - ***soft***: Integer value '0' indicates likelihood 0, integer value '10' indicates likelihood 1. Scale factor 0.1; range 0 to 1.  - ***hard***: FALSE indicates likelihood '0', TRUE indicates likelihood '1'. |

#### *– NCGI*

The *NCGI* specifies the NR Cell Global Identifier (NCGI) which is used to identify NR cells globally (TS 38.331 [2]).

-- ASN1START

-- TAG-NCGI-START

NCGI ::= SEQUENCE {

mcc SEQUENCE (SIZE (3)) OF INTEGER (0..9),

mnc SEQUENCE (SIZE (2..3)) OF INTEGER (0..9),

nr-CellIdentity BIT STRING (SIZE (36))

}

-- TAG-NCGI-STOP

-- ASN1STOP

#### *– NR-PhysCellID*

The *NR-PhysCellID* specifies the NR physical cell identifier (TS 38.331 [2]).

-- ASN1START

-- TAG-NR-PHYSCELLID-START

NR-PhysCellID ::= INTEGER (0..1007)

-- TAG-NR-PHYSCELLID-STOP

-- ASN1STOP

#### – *PositioningModes*

The IE *PositioningModes* is used to indicate several positioning modes using a bit map.

-- ASN1START

-- TAG-POSITIONINGMODES-START

PositioningModes ::= BIT STRING { sl-TargetUE-Based (0), sl-TargetUE-Assisted (1) } (SIZE (1..8))

-- TAG-POSITIONINGMODES-STOP

-- ASN1STOP

|  |
| --- |
| *PositioningModes* field descriptions |
| ***posModes***  This field specifies the positioning mode(s). This is represented by a bit string, with a one value at the bit position means the particular positioning mode is addressed; a zero value means not addressed. |

#### – *SL-RTD-Info*

The IE *SL-RTD-Info* provides time synchronization information of SL Anchor UEs.

-- ASN1START

-- TAG-SL-RTD-INFO-START

SL-RTD-Info ::= SEQUENCE ( SIZE (1.. maxNrOfUEs)) OF RTD-InfoListPerAnchorUE

RTD-InfoListPerAnchorUE ::= SEQUENCE {

applicationLayerID OCTET STRING,

referenceRTD-Info ReferenceRTD-Info,

rtd-BetweenAnchorUEs CHOICE {

subframeOffset INTEGER (0..1966079),

sl-OffsetDFN INTEGER (0..1000)

},

rtd-Quality SL-TimingQuality,

syncSourceType ENUMERATED { gnss, gNB-eNB, ue}

}

ReferenceRTD-Info ::= SEQUENCE {

syncSourceType ENUMERATED { gnss, gNB-eNB, ue},

applicationLayerID OCTET STRING OPTIONAL,

nrCell-Identify SEQUENCE {

nr-PhysCellID NR-PhysCellID OPTIONAL,

nr-ARFCN ARFCN-ValueNR OPTIONAL,

nr-CellGlobalID NCGI OPTIONAL

} OPTIONAL

}

-- TAG-SL-RTD-INFO-STOP

-- ASN1STOP

|  |
| --- |
| *SL-RTD-Info* field descriptions |
| ***nrCell-Identify***  This field provides NR cell identity information. The field is present only if the synchronization source of a SL Anchor UE is gNB/eNB. |
| ***referenceRTD-Info***  This field defines the reference RTD and comprises the following sub-fields:  - ***syncSourceType***: This field specifies the synchronization source type.  - ***applicationLayerID***: This field provides the application layer ID of the reference UE if the *syncSourceType* is set to UE. |
| ***rtdBetweenAnchorUEs***  This field specifies the RTD between SL Anchor UEs:  - ***subframeOffset***: This field specifies the subframe boundary offset at the TRP antenna location between the reference UE and this neighbour UE in time units  where Hz and  (TS 38.211 [6]). The offset is counted from the beginning of a subframe #0 of the reference UE to the beginning of the closest subsequent subframe of this neighbour UE. Scale factor 1 Tc.  - ***sl-OffsetDFN***: This field indicates the timing offset for the UE to determine DFN timing when GNSS is used for timing reference. Value 1 corresponds to 0.001 milliseconds, value 2 corresponds to 0.002 milliseconds, and so on. |
| ***rtd-Quality***  This field specifies the quality of the RTD. |

#### – *SL-TimeStamp*

The IE *SL-TimeStamp* defines the UE measurement associated time stamp.

-- ASN1START

-- TAG-SL-TIMESTAMP-START

SL-TimeStamp ::= CHOICE {

dfn-Time SEQUENCE {

syncSourceType ENUMERATED { gnss, ue} OPTIONAL,

applicationLayerID OCTET STRING OPTIONAL,

dfn INTEGER (0.. 1023),

nr-Slot CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..19),

scs60 INTEGER (0..39),

scs120 INTEGER (0..79)

}

},

sfn-Time SEQUENCE {

nr-PhysCellID NR-PhysCellID OPTIONAL,

nr-ARFCN ARFCN-ValueNR OPTIONAL,

nr-CellGlobalID NCGI OPTIONAL,

nr-SFN INTEGER (0..1023),

nr-Slot CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..19),

scs60 INTEGER (0..39),

scs120 INTEGER (0..79)

}

}

}

-- TAG-SL-TIMESTAMP-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TimeStamp* field descriptions |
| ***dfn-Time***  This field provides the DFN based time stamp. |
| ***sfn-Time***  This field provides the SFN based time stamp. If this field is present, at least one of *nr-PhysCellID*, *nr-ARFCN*, or *nr-CellGlobalID* shall be present. |

#### – *SL-TimingQuality*

The IE *SL-TimingQuality* defines the quality of a timing value (e.g., of a TOA measurement).

-- ASN1START

-- TAG-SL-TIMINGQUALITY-START

SL-TimingQuality ::= SEQUENCE {

timingQualityValue INTEGER (0..31),

timingQualityResolution ENUMERATED {mdot1, m1, m10, m30}

}

-- TAG-SL-TIMINGQUALITY-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TimingQuality* field descriptions |
| ***timingQualityValue***  This field provides an estimate of uncertainty of the timing value for which the IE *SL-TimingQuality* is provided in units of metres. |
| ***timingQualityResolution***  This field provides the resolution used in the *timingQualityValue* field. Enumerated values mdot1, m1, m10, m30 correspond to 0.1, 1, 10, 30 metres, respectively. |

### 6.3.2 UE capability information elements

*– ScheduledLocationTimeSupportPerMode*

The IE *ScheduledLocationTimeSupportPerMode* is used by the endpoint to indicate the time bases supported for scheduled location requests for each positioning mode indicated by *PositioningModes*.

-- ASN1START

-- TAG-SCHEDULEDLOCATIONTIMESUPPORTPERMODE-START

ScheduledLocationTimeSupportPerMode ::= SEQUENCE {

utcTime PositioningModes OPTIONAL,

gnssTime SEQUENCE {

posModes PositioningModes

-- gnss-TimeIDs GNSS-ID-Bitmap

} OPTIONAL,

nrTime PositioningModes OPTIONAL,

relativeTime PositioningModes OPTIONAL

}

-- TAG-SCHEDULEDLOCATIONTIMESUPPORTPERMODE-STOP

-- ASN1STOP

### 6.3.3 Positioning Method information elements

## 6.4 Multiplicity and type constraint values

#### *– Multiplicity and type constraint definitions*

-- ASN1START

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxNrOfUEs INTEGER ::= 256 -- Max number of Tx UEs or Rx UEs

nrMaxBands INTEGER ::= 1024 -- Maximum number of supported bands in UE capability

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP

-- ASN1STOP

#### *– End of SLPP-PDU-Definitions*

-- ASN1START

END

-- ASN1STOP

## 6.5 SLPP PDU Common Contents

#### *– SLPP-PDU-CommonContents*

This ASN.1 segment is the start of the SLPP PDU Common Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-COMMONCONTENTS-START

SLPP-PDU-CommonContents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

ARFCN-ValueNR,

NCGI,

NR-PhysCellID

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-COMMON-CONTENTS-STOP

-- ASN1STOP

#### *– CommonIEsRequestCapabilities*

-- ASN1START

-- TAG-COMMONIESREQUESTCAPABILITIES-START

CommonIEsRequestCapabilities ::= SEQUENCE {

}

-- TAG-COMMONIESREQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– CommonIEsProvideCapabilities*

-- ASN1START

-- TAG-COMMONIESPROVIDECAPABILITIES-START

CommonIEsProvideCapabilities ::= SEQUENCE {

}

-- TAG-COMMONIESPROVIDECAPABILITIES-STOP

-- ASN1STOP

#### *– CommonIEsRequestAssistanceData*

-- ASN1START

-- TAG-COMMONIESREQUESTASSISTANCEDATA-START

CommonIEsRequestAssistanceData ::= SEQUENCE {

}

-- TAG-COMMONIESREQUESTASSISTANCEDATA-STOP

-- ASN1STOP

#### *– CommonIEsProvideAssistanceData*

-- ASN1START

-- TAG-COMMONIESPROVIDEASSISTANCEDATA-START

CommonIEsProvideAssistanceData ::= SEQUENCE {

}

-- TAG-COMMONIESPROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

#### *– CommonIEsRequestLocationInformation*

The *CommonIEsRequestLocationInformation* carries common IEs for a Request Location Information SLPP message Type.

-- ASN1START

-- TAG-COMMONIESREQUESTLOCATIONINFORMATION-START

CommonIEsRequestLocationInformation ::= SEQUENCE {

locationInformationType LocationInformationType,

periodicalReporting PeriodicalReportingCriteria OPTIONAL,

additionalInformation AdditionalInformation OPTIONAL,

qos QoS OPTIONAL,

environment Environment OPTIONAL,

scheduledLocationTime ScheduledLocationTime OPTIONAL,

...

}

LocationInformationType ::= ENUMERATED { locationEstimateRequired, locationMeasurementsRequired, locationEstimatePreferred,

locationMeasurementsPreferred, rangeEstimateRequired, rangeMeasurementsRequired,

rangeEstimatePreferred, rangeMeasurementsPreferred, directionEstimateRequired,

directionMeasurementsRequired, directionEstimatePreferred, directionMeasurementsPreferred,

rangeDirectionEstimateRequired, rangeDirectionMeasurementsRequired,

rangeDirectionEstimatePreferred, rangeDirectionMeasurementsPreferred,

relativeLocationEstimateRequired, relativeLocationMeasurementsRequired,

relativeLocationEstimatePreferred, relativeLocationMeasurementsPreferred, spare12, spare11,

spare10, spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 }

PeriodicalReportingCriteria ::= SEQUENCE {

reportingAmount ENUMERATED { ra2, ra4, ra8, ra16, ra32, ra64, ra-Infinity },

reportingInterval ENUMERATED { ri1, ri2, ri4, ri8, ri10, ri16, ri20, ri32, ri64}

}

AdditionalInformation ::= ENUMERATED { onlyReturnInformationRequested, mayReturnAdditionalInformation}

QoS ::= SEQUENCE {

horizontalAccuracy HorizontalAccuracy OPTIONAL,

verticalCoordinateRequest BOOLEAN,

verticalAccuracy VerticalAccuracy OPTIONAL,

rangeAccuracy RangeAccuracy OPTIONAL,

azimuthAccuracy AzimuthAccuracy OPTIONAL,

elevationAccuracy ElevationAccuracy OPTIONAL,

responseTime ResponseTime OPTIONAL,

velocityRequest BOOLEAN

}

HorizontalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..255),

confidence INTEGER(0..100)

}

VerticalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..255),

confidence INTEGER(0..100)

}

RangeAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100)

}

AzimuthAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100)

}

ElevationAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100)

}

ResponseTime ::= SEQUENCE {

time INTEGER (1..128),

tenMilliSeconds ENUMERATED { true} OPTIONAL

}

Environment ::= ENUMERATED { badArea, notBadArea, mixedArea}

ScheduledLocationTime ::= SEQUENCE {

utc-Time UTCTime OPTIONAL,

gnss-Time SEQUENCE {

gnss-TOD-Msec INTEGER (0..3599999),

gnss-TimeID GNSS-ID

} OPTIONAL,

nr-Time SEQUENCE {

nr-PhysCellID NR-PhysCellID,

nr-ARFCN ARFCN-ValueNR,

nr-CellGlobalID NCGI OPTIONAL,

nr-SFN INTEGER (0..1023),

nr-Slot CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..19),

scs60 INTEGER (0..39),

scs120 INTEGER (0..79)

} OPTIONAL

} OPTIONAL,

relativeTime INTEGER (1..1024) OPTIONAL

}

GNSS-ID ::= ENUMERATED{ gps, sbas, qzss, galileo, glonass, bds, navic, spare1}

-- TAG-COMMONIESREQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *CommonIEsRequestLocationInformation* field descriptions |
| ***additionalInformation***  This field indicates whether the UE is allowed to return additional information to that requested. If this field indicates '*onlyReturnInformationRequested'* then the UE shall not return any additional information. If this field indicates '*mayReturnAdditionalInformation'* then the UE may return additional information. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include SL-AoA measurements if SL-TDOA measurements were requested but not SL-AoA measurements). |
| ***environment***  This field provides the UE with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:  - badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban).  - notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural).  - mixedArea: environment that is mixed or not defined.  If this field is absent, a default value of 'mixedArea' applies. |
| ***locationInformationType***  This field indicates whether an endpoint requires a location estimate or measurements. For '*locationEstimateRequired*', '*rangeEstimateRequired*' or '*relativeLocationEstimateRequired*', the UE shall return a location or range estimate if possible, or indicate a location error if not possible. For '*locationMeasurementsRequired*', '*rangeMeasurementsRequired*' or '*relativeLocationMeasurementsRequired*', the UE shall return measurements if possible, or indicate a location error if not possible. For '*locationEstimatePreferred*', '*rangeEstimatePreferred*' or '*relativeLocationEstimatePreferred*', the UE shall return a location or range estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '*locationMeasurementsPreferred*,'*rangeMeasurementsPreferred*' or '*relativeLocationMeasurementsPreferred*', the UE shall return location or range measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible. |
| ***periodicalReporting***  This field indicates that periodic reporting is requested and comprises the following subfields:  - ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the UE should continue periodic reporting until an SLPP *Abort* message is received.  - ***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a *reportingInterval* expires before a UE is able to obtain new measurements or obtain a new location estimate. |
| ***qos***  This field indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the endpoint from the measurements provided by the UE assuming that the measurements are the only sources of error. This field comprises the following subfields:  - ***horizontalAccuracy*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracy*' corresponds to the encoded uncertainty as defined in TS 23.032 [7] and '*confidence*' corresponds to confidence as defined in TS 23.032 [7].  - ***verticalCoordinateRequest*** indicates whether a vertical coordinate is required (TRUE) or not (FALSE)  - ***verticalAccuracy*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracy*' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [7] and '*confidence*' corresponds to confidence as defined in TS 23.032 [7].  - ***responseTime***  - ***time*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*.  - ***tenMilliSeconds*** indicates the unit of the *time* field corresponds to a resolution of 0.01 seconds. If this field is absent, the unit/resolution is 1 second.  - ***velocityRequest*** indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE).  All QoS requirements shall be obtained by the UE to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable. |
| ***scheduledLocationTime***  This field indicates that the UE is requested to obtain location measurements or location estimate valid at the *scheduledLocationTime* *T* and comprises the following subfields:  - ***utc-Time*** provides *T* in UTC in the form of YYMMDDhhmmssZ.  - ***gnss-Time*** provides *T* in GNSS system time of the GNSS indicated by *gnss-TimeID*.  - ***gnss-TOD-msec*** specifies the GNSS TOD in 1-milli-second resolution rounded down to the nearest millisecond unit.  - ***nr-Time*** provides *T* in NR network time.  - ***nr-PhysCellID***, ***nr-ARFCN*** , ***nr-CellGlobalID*** identifies the reference cell (NR) that is used for the network time.  - ***nr-SFN*** specifies the system frame number in NR.  - ***nr-Slot*** specifies the slot number in NR for the indicated subcarrier spacing (SCS). The total NR network time is given by *nr-SFN* + *nr-Slot*.  - ***relativeTime*** provides *T* in seconds from current time, where current time is defined as the time the *CommonIEsRequestLocationInformation* was received.  NOTE 1: A location estimate returned to an LCS Client, AF or UE for a scheduled location time can be treated by the LCS Client, AF or UE as an estimate of the location of the UE at the scheduled location time (see TS 23.273 [5]).  NOTE 2: If this field is present, at least one of *utc-Time*, *gnss-Time*, *nr-Time,* or *relativeTime* shall be present. |

#### *– CommonIEsProvideLocationInformation*

The *CommonIEsProvideLocationInformation* carries common IEs for a Provide Location Information SLPP message Type.

-- ASN1START

-- TAG-COMMONIESPROVIDELOCATIONINFORMATION-START

CommonIEsProvideLocationInformation ::= SEQUENCE {

locationEstimate LocationCoordinates OPTIONAL, -- locationTargetUe-sl-pos

rangeAndOrDirection RangeAndOrDirection OPTIONAL,

velocityEstimate Velocity OPTIONAL,

relativeLocationEstimate RelativeLocationCoordinates OPTIONAL,

locationError LocationError OPTIONAL,

...

}

LocationCoordinates ::= CHOICE {

ellipsoidPoint EllipsoidPoint,

ellipsoidPointWithUncertaintyCircle EllipsoidPointWithUncertaintyCircle,

ellipsoidPointWithUncertaintyEllipse EllipsoidPointWithUncertaintyEllipse,

polygon Polygon,

ellipsoidPointWithAltitude EllipsoidPointWithAltitude,

ellipsoidPointWithAltitudeAndUncertaintyEllipsoid EllipsoidPointWithAltitudeAndUncertaintyEllipsoid,

ellipsoidArc EllipsoidArc

}

RelativeLocationCoordinates ::= CHOICE {

relative2D-LocationWithUncertaintyEllipse Relative2D-LocationWithUncertaintyEllipse,

relative3D-LocationWithUncertaintyEllipsoid Relative3D-LocationWithUncertaintyEllipsoid,

...

}

Relative2D-LocationWithUncertaintyEllipse ::= SEQUENCE {

x INTEGER (-134217728..134217727), -- 27 bit field

y INTEGER (-134217728..134217727), -- 27 bit field

uncertaintySemiMajor INTEGER (0..127),

uncertaintySemiMinor INTEGER (0..127),

orientationMajorAxis INTEGER (0..179),

confidence INTEGER (0..100)

}

Relative3D-LocationWithUncertaintyEllipsoid ::= SEQUENCE {

x INTEGER (-134217728..134217727), -- 27 bit field

y INTEGER (-134217728..134217727), -- 27 bit field

z INTEGER (-16777216..16777215), -- 24 bit field

uncertaintySemiMajor INTEGER (0..127),

uncertaintySemiMinor INTEGER (0..127),

orientationMajorAxis INTEGER (0..179),

uncertaintyAltitude INTEGER (0..127),

confidence INTEGER (0..100)

}

Velocity ::= CHOICE {

horizontalVelocity HorizontalVelocity,

horizontalWithVerticalVelocity HorizontalWithVerticalVelocity,

horizontalVelocityWithUncertainty HorizontalVelocityWithUncertainty,

horizontalWithVerticalVelocityAndUncertainty HorizontalWithVerticalVelocityAndUncertainty

}

LocationError ::= SEQUENCE {

locationfailurecause LocationFailureCause

}

LocationFailureCause ::= ENUMERATED { undefined, requestedMethodNotSupported, positionMethodFailure, periodicLocationMeasurementsNotAvailable}

EllipsoidPoint ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607) -- 24 bit field

}

EllipsoidPointWithUncertaintyCircle ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607), -- 24 bit field

uncertainty INTEGER (0..127)

}

EllipsoidPointWithUncertaintyEllipse ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607), -- 24 bit field

uncertaintySemiMajor INTEGER (0..127),

uncertaintySemiMinor INTEGER (0..127),

orientationMajorAxis INTEGER (0..179),

confidence INTEGER (0..100)

}

EllipsoidPointWithAltitude ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607), -- 24 bit field

altitudeDirection ENUMERATED {height, depth},

altitude INTEGER (0..32767) -- 15 bit field

}

EllipsoidPointWithAltitudeAndUncertaintyEllipsoid ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607), -- 24 bit field

altitudeDirection ENUMERATED {height, depth},

altitude INTEGER (0..32767), -- 15 bit field

uncertaintySemiMajor INTEGER (0..127),

uncertaintySemiMinor INTEGER (0..127),

orientationMajorAxis INTEGER (0..179),

uncertaintyAltitude INTEGER (0..127),

confidence INTEGER (0..100)

}

EllipsoidArc ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607), -- 24 bit field

innerRadius INTEGER (0..65535), -- 16 bit field,

uncertaintyRadius INTEGER (0..127),

offsetAngle INTEGER (0..179),

includedAngle INTEGER (0..179),

confidence INTEGER (0..100)

}

RangeAndOrDirection ::= SEQUENCE {

range Range OPTIONAL,

azimuth Azimuth OPTIONAL,

elevation Elevation OPTIONAL

}

Range ::= SEQUENCE {

rangeResult INTEGER (0..1048575),

uncertainty INTEGER (0..255),

confidence INTEGER (0..100) OPTIONAL

}

Azimuth ::= SEQUENCE {

azimuthResult INTEGER (0..3599),

uncertainty INTEGER (0..127),

confidence INTEGER (0..100) OPTIONAL

}

Elevation ::= SEQUENCE {

elevationResult INTEGER (0..1800),

uncertainty INTEGER (0..63),

confidence INTEGER (0..100) OPTIONAL

}

HorizontalVelocity ::= SEQUENCE {

bearing INTEGER(0..359),

horizontalSpeed INTEGER(0..2047)

}

HorizontalWithVerticalVelocity ::= SEQUENCE {

bearing INTEGER(0..359),

horizontalSpeed INTEGER(0..2047),

verticalDirection ENUMERATED{upward, downward},

verticalSpeed INTEGER(0..255)

}

HorizontalVelocityWithUncertainty ::= SEQUENCE {

bearing INTEGER(0..359),

horizontalSpeed INTEGER(0..2047),

uncertaintySpeed INTEGER(0..255)

}

HorizontalWithVerticalVelocityAndUncertainty ::= SEQUENCE {

bearing INTEGER(0..359),

horizontalSpeed INTEGER(0..2047),

verticalDirection ENUMERATED{upward, downward},

verticalSpeed INTEGER(0..255),

horizontalUncertaintySpeed INTEGER(0..255),

verticalUncertaintySpeed INTEGER(0..255)

}

Polygon ::= SEQUENCE (SIZE (3..15)) OF PolygonPoints

PolygonPoints ::= SEQUENCE {

latitudeSign ENUMERATED {north, south},

degreesLatitude INTEGER (0..8388607), -- 23 bit field

degreesLongitude INTEGER (-8388608..8388607) -- 24 bit field

}

-- TAG-COMMONIESPROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *CommonIEsProvideLocationInformation* field descriptions |
| ***azimuthResult***  This field provides an azimuth result which provides a direction to point B from point A in a horizontal plane through point A and as measured clockwise from North. Scale factor 0.1 degree; range 0 to 360 degrees. |
| ***elevationResult***  This field provides an elevation angle which is measured relative to zenith (elevation 0 deg points to Zenith, 90 deg to the Horizontal Plane and 180 deg to the Nadir. Scale factor 0.1 degree; range 0 to 180 degrees). |
| ***locationError***  This field shall be included if and only if a location estimate and measurements are not included in the SLPP PDU. The field includes information concerning the reason for the lack of location information. The *LocationFailureCause* '*periodicLocationMeasurementsNotAvailable*' shall be used by the UE if periodic location reporting was requested, but no measurements or location estimate are available when *the reportingInterval* expired. |
| ***locationEstimate***  This field provides a location estimate using one of the geographic shapes defined in TS 23.032 [7]. Coding of the values of the various fields internal to each geographic shape follow the rules in TS 23.032 [7]. The conditions for including this field are defined for the *locationInformationType* field in a Request Location Information message. |
| ***rangeResult***  This field provides the range result between two points in units of mill-meters, as defined in TS 23.032 [7] for the "Range and Direction". |
| ***velocityEstimate***  This field provides a velocity estimate using one of the velocity shapes defined in TS 23.032 [7]. Coding of the values of the various fields internal to each velocity shape follow the rules in TS 23.032 [7]. |
| ***x, y, z***  This field provides the value (in the unit of mill-meters) on x-axis, y-axis and z-axis of the relative location in the local cartesian system, as defined in TS 23.032 [7]. The origin of the cartesian system is the reference location of the relative positioning. |

#### *– End of SLPP-PDU-CommonContents*

-- ASN1START

END

-- ASN1STOP

## 6.6 SLPP PDU Common SL-PRS Methods Contents

#### *– SLPP-PDU-CommonSL-PRS-MethodsContents*

This ASN.1 segment is the start of the SLPP PDU Common SL-PRS Methods Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-COMMONSL-PRS-METHODSCONTENTS-START

SLPP-PDU-CommonSL-PRS-MethodsContents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

EllipsoidPoint,

EllipsoidPointWithUncertaintyEllipse,

EllipsoidPointWithAltitude,

EllipsoidPointWithAltitudeAndUncertaintyEllipsoid

FROM

SLPP-PDU-CommonContents

SL-TimeStamp,

maxNrOfUEs,

nrMaxBands

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-COMMONSL-PRS-METHODSCONTENTS-STOP

-- ASN1STOP

#### *– CommonSL-PRS-MethodsIEsRequestCapabilities*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESREQUESTCAPABILITIES-START

CommonSL-PRS-MethodsIEsRequestCapabilities ::= SEQUENCE {

}

-- TAG-COMMONSL-PRS-METHODSIESREQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– CommonSL-PRS-MethodsIEsProvideCapabilities*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESPROVIDECAPABILITIES-START

CommonSL-PRS-MethodsIEsProvideCapabilities ::= SEQUENCE {

sl-PRS-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-PRS-CapabilityPerBand,

...

}

SL-PRS-CapabilityPerBand ::= SEQUENCE {

freqBandIndicatorNR INTEGER (1..1024),

--R1 41-1-19 ARP location provision for sidelink as assistance data

sl-PositioningARP-LocationProvision ENUMERATED {supported} OPTIONAL,

--R1 41-1-19a Report of Rx ARP-ID with SL positioning measurements

sl-PositioningMeasReportWithRxARP-ID ENUMERATED {supported} OPTIONAL,

--R1 41-1-19b Report of Tx ARP-ID to LMF or another UE for the transmitted SL PRS

sl-PRS-ReportTxARP-ID ENUMERATED {supported} OPTIONAL,

--R1 41-1-2 Receiving SL-PRS in a shared resource pool

sl-PRS-RxInSharedResourcePool ENUMERATED {supported} OPTIONAL,

--R1 41-1-3 Receiving SL-PRS in a dedicated resource pool

sl-PRS-RxInDedicatedResourcePool ENUMERATED {supported} OPTIONAL,

--R1 41-1-4a Transmitting SL-PRS in a shared resource pool

sl-PRS-TxInSharedResourcePool ENUMERATED {supported} OPTIONAL,

--R1 41-1-4b Transmitting SL-PRS mode 1 in a dedicated resource pool

sl-PRS-TxScheme1InDedicatedResourcePool ENUMERATED {supported} OPTIONAL,

--R1 41-1-4c Transmitting SL-PRS mode 2 in a dedicated resource pool

sl-PRS-TxScheme2InDedicatedResourcePool ENUMERATED {supported} OPTIONAL,

--R1 41-1-7e SL PRS measurement for SL PRS-RSRP

sl-PRS-RSRP-Meas ENUMERATED {supported} OPTIONAL,

--R1 41-1-7f SL PRS measurement for SL PRS-RSRPP

sl-PRS-RSRPP-Meas ENUMERATED {supported} OPTIONAL,

--R1 41-1-11 TDM-based multiplexing of SL-PRS reception from different UEs in the same slot in dedicated resource pool

sl-PRS-TDM-Multiplexing ENUMERATED {supported} OPTIONAL,

--R1 41-1-12 Comb-based multiplexing for SL-PRS reception from different UEs in the same slot in dedicated resource pool

sl-PRS-RxCombMultiplexing ENUMERATED {supported} OPTIONAL,

--R1 41-1-13 Reporting the additional paths for SL positioning

sl-PRS-AdditionalPathsReport ENUMERATED {n1,n2,n4,n6,n8} OPTIONAL,

--R1 41-1-14 LoS/NLoS indicator for SL positioning per measurement

sl-PRS-LOS-NLOS-Indication ENUMERATED {hard, hard-soft} OPTIONAL,

...

}

-- TAG-COMMONSL-PRS-METHODSIESPROVIDECAPABILITIES-STOP

-- ASN1STOP

|  |
| --- |
| *CommonSL-PRS-MethodsIEsProvideCapabilities* field descriptions |
| ***sl-PositioningARP-LocationProvision***  Indicates whether UE supports of ARP location provision for sidelink as assistance data. |
| ***sl-PositioningMeasReportWithARP-ID***  Indicates whether UE supports providing Rx ARP-ID with SL positioning measurements. |
| ***sl-PRS-AdditionalPathsReport***  Indicates whether UE supports RSRPP reporting for additional paths.  The value indicates the maximum number of additional detected path timing reporting for K additional paths for SL positioning.  UE supporting this feature shall also support at least one of *sl-PRS-RSTD-Meas*, *sl-RTOA-Meas*, *sl-PRS-RxTxTimeDiffWithoutTxTimeStamp*, *sl-PRS-RxTxTimeDiffWithTxTimeStamp*, *sl-PRS-RSRPP-Meas*, or *sl-AoA-Meas*. |
| ***sl-PRS-LOS-NLOS-Indication***  Indicates whether UE supports LoS/NLoS indicator for SL positioning per measurement.  The value indicates whether the indicator is hard value or hard+soft value.  UE supporting this feature shall also support at least one of *sl-PRS-RSTD-Meas*, *sl-RTOA-Meas*, *sl-PRS-RxTxTimeDiffWithoutTxTimeStamp*, *sl-PRS-RxTxTimeDiffWithTxTimeStamp*, or *sl-AoA-Meas*. |
| ***sl-PRS-ReportTxARP-ID***  Indicates whether UE supports providing Tx ARP-ID for the transmitted SL PRS. |
| ***sl-PRS-RSRP-Meas***  Indicates whether UE supports SL PRS measurement for SL PRS-RSRP, and is comprised of the following functional components:  - Support SL PRS-RSRP measurement based on SL-PRS;  - Support SL PRS-RSRP measurement reporting.  UE supporting this feature shall also support FG41-1-1. |
| ***sl-PRS-RSRPP-Meas***  Indicates whether UE supports SL PRS measurement for SL PRS-RSRPP, and is comprised of the following functional components:  - Support SL PRS-RSRPP measurement based on SL-PRS;  - Support SL PRS-RSRPP measurement reporting.  UE supporting this feature shall also support FG41-1-1. |
| ***sl-PRS-RxCombMultiplexing***  Indicates whether UE supports comb-based multiplexing for SL-PRS reception from different UEs in the same slot in dedicated resource pool.  UE supporting this feature shall also support *sl-PRS-RxInDedicatedResourcePool*. |
| ***sl-PRS-RxInDedicatedResourcePool***  Indicates whether UE supports receiving SL-PRS in dedicated resource pool and receiving SCI format 1B. |
| ***sl-PRS-RxInSharedResourcePool***  Indicates whether UE supports receiving SL-PRS in shared resource pool and receiving SCI format 2D. |
| ***sl-PRS-TDM-Multiplexing***  Indicates whether UE supports TDM-based multiplexing of SL-PRS reception from different UEs in the same slot in dedicated resource pool.  UE supporting this feature shall also support*sl-PRS-RxInDedicatedResourcePool*. |
| ***sl-PRS-TxInSharedResourcePool***  Indicates whether UE supports transmitting SL-PRS in a shared resource pool, and is comprised of the following functional components:  - Support transmitting SL-PRS in shared resource pool;  - Support transmitting SCI format 2D;  - Support downlink pathloss based open loop power control.  The supported resource allocation modes are the same as for communication and signaled in *sl-TransmissionMode1-r16* and *sl-TransmissionMode2-r16* defined in TS 38.331 [2]*.*  UE supporting this feature shall also support *sl-TransmissionMode1-r16* or *sl-TransmissionMode2-r16*, and *sl-PRS-RxInSharedResourcePool* defined in TS 38.331 [2]. |
| ***sl-PRS-TxScheme1InDedicatedResourcePool***  Indicates whether UE supports transmitting SL-PRS scheme 1 in a dedicated resource pool, and is comprised of the following functional components:  - Support transmitting SL-PRS and PSCCH within a slot without PSSCH in dedicated resource pool;  - Support transmitting SL-PRS according to the mapping rule between PSCCH and SL-PRS;  - Support transmitting SCI format 1B;  - Support receiving DCI format 3\_2;  - Support downlink pathloss based open loop power control of SL-PRS (NOTE 1).  UE supporting this feature shall also support *sl-PRS-RxInDedicatedResourcePool*.  NOTE 1: It is not required to be supported in a band indicated with only the PC5 interface in TS 38.101-1 [11] Table 5.2E.1-1. |
| ***sl-PRS-TxScheme2InDedicatedResourcePool***  Indicates whether UE supports transmitting SL-PRS scheme 2 in a dedicated resource pool, and is comprised of the following functional components:  - Support transmitting SL-PRS and PSCCH within a slot without PSSCH in dedicated resource pool;  - Support transmitting SL-PRS according to the mapping rule between PSCCH and SL-PRS;  - Support transmitting SCI format 1B.  UE supporting this feature shall also support at least one of *sl-PRS-TxRandomSelection* or FG41-1-10. |

#### *– CommonSL-PRS-MethodsIEsRequestAssistanceData*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESREQUESTASSISTANCEDATA-START

CommonSL-PRS-MethodsIEsRequestAssistanceData ::= SEQUENCE {

applicationLayerID OCTET STRING,

sl-PRS-AssistanceDataInfoReq BIT STRING { sl-PRS-SequenceID-Req (0),

anchorUE-LocationInfoReq (1),

arp-LocationInfoReq (2)

} (SIZE (1..8)) OPTIONAL,

...

}

-- TAG-COMMONSL-PRS-METHODSIESREQUESTASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *CommonSL-PRS-MethodsIEsRequestAssistanceData* field descriptions |
| ***applicationLayerID***  This field indicates the application layer ID of the UE which is requesting the assistance data. |
| ***sl-PRS-AssistanceDataInfoReq***  This field indicates the SL PRS Assistance Data requested.  - bit 0 indicates whether the field *sl-PRS-SequenceID-Req* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not;  - bit 1 indicates whether the field *anchorUE-LocationInformation* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not;  - bit 2 indicates whether the field *arp-LocationInfo* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not; |

#### *– CommonSL-PRS-MethodsIEsProvideAssistanceData*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESPROVIDEASSISTANCEDDATA-START

CommonSL-PRS-MethodsIEsProvideAssistanceData ::= SEQUENCE {

sl-PRS-AssistanceDataInfo SEQUENCE (SIZE (1..maxNrOfUEs)) OF SL-PRS-AssistanceData OPTIONAL,

...

}

SL-PRS-AssistanceData ::= SEQUENCE {

applicationLayerID OCTET STRING,

sl-PRS-SequenceID INTEGER(0..4095) OPTIONAL, -- SL PRS sequence ID for transmitting SL-PRS

anchorUE-LocationInformation AnchorLocationCoordinates OPTIONAL,

arp-LocationInfo ARP-LocationInfo OPTIONAL,

sl-PRS-TxInfo SL-PRS-TxInfo OPTIONAL,

...

}

AnchorLocationCoordinates ::= CHOICE {

ellipsoidPoint EllipsoidPoint,

ellipsoidPointWithUncertaintyEllipse EllipsoidPointWithUncertaintyEllipse,

ellipsoidPointWithAltitude EllipsoidPointWithAltitude,

ellipsoidPointWithAltitudeAndUncertaintyEllipsoid EllipsoidPointWithAltitudeAndUncertaintyEllipsoid

}

ARP-LocationInfo ::= SEQUENCE {

referencePoint ReferencePoint OPTIONAL,

arp-LocationInfoList SEQUENCE (SIZE (1..4)) OF ARP-LocationInfoElement

}

ReferencePoint ::= CHOICE {

location2D EllipsoidPointWithUncertaintyEllipse,

location3D EllipsoidPointWithAltitudeAndUncertaintyEllipsoid

}

ARP-LocationInfoElement ::= SEQUENCE {

sl-PRS-ARP-ID INTEGER (1..4),

arp-LocationInfo RelativeLocation

}

RelativeLocation ::= SEQUENCE {

milliArcSecondUnits ENUMERATED { mas0-03, mas0-3, mas3, mas30},

heightUnits ENUMERATED { mm, cm, m},

deltaLatitude DeltaLatitude,

deltaLongitude DeltaLongitude,

deltaHeight DeltaHeight,

locationUNC LocationUncertainty OPTIONAL

}

DeltaLatitude ::= SEQUENCE {

deltaLatitude INTEGER (-1024..1023),

coarseDeltaLatitude INTEGER (0..4095) OPTIONAL

}

DeltaLongitude ::= SEQUENCE {

deltaLongitude INTEGER (-1024..1023),

coarseDeltaLongitude INTEGER (0..4095) OPTIONAL

}

DeltaHeight ::= SEQUENCE {

deltaHeight INTEGER (-1024..1023),

coarseDeltaHeight INTEGER (0..4095) OPTIONAL

}

LocationUncertainty ::= SEQUENCE {

horizontalUncertainty INTEGER (0..255),

horizontalConfidence INTEGER (0..100),

verticalUncertainty INTEGER (0..255),

verticalConfidence INTEGER (0..100)

}

SL-PRS-TxInfo ::= SEQUENCE {

sl-PRS-Priority INTEGER (1..8) OPTIONAL,

sl-PRS-DelayBudget INTEGER (0..1023) OPTIONAL,

sl-PRS-BW INTEGER (10..275) OPTIONAL

}

-- TAG-COMMONSL-PRS-METHODSIESPROVIDEASSISTANCEDDATA-STOP

-- ASN1STOP

|  |
| --- |
| *CommonSL-PRS-MethodsIEsProvideAssistanceData* field descriptions |
| ***anchorUE-LocationInformation***  This field provides the location coordinates of a SL Anchor UE identified by *applicationLayerID*. |
| ***arp-LocationInfo***  This field provides the location coordinates of the ARPs of the UE identified by *applicationLayerID*. |
| ***applicationLayerID***  This field provides the application layer ID as defined in TS 23.287 [9] for which the *SL-PRS-AssistanceData* is applicable. |
| ***referencePoint***  This field provides the reference point used to define the location of ARPs provided in the *arp-LocationInfoList*. If this field is absent, the reference point is the same as in the previous entry of the *sl-PRS-AssistanceDataInfo* list. |
| ***sl-PRS-ARP-ID***  This field provides the ARP ID of an ARP. The ARP ID is used to uniquely identify an ARP associated with the UE identified by *applicationLayerID*. |
| ***sl-PRS-BW***  This field provides the number of PRBs corresponding to the bandwidth of SL-PRS transmission which is used in *UEAssistanceInformation* message as defined in TS 38.331 [2].and the SL-PRS resource request MAC CE as defined in TS 38.321 [15]. |
| ***sl-PRS-DelayBudget***  This field provides the SL-PRS delay budget which is used in *UEAssistanceInformation* message as defined in TS 38.331 [2] and the resource selection as defined in TS 38.321 [15]. |
| ***sl-PRS-Priority***  This field provides the priority of SL-PRS which is used in *UEAssistanceInformation* message as defined in TS 38.331 [2] and the resource selection as defined in TS 38.321 [15]. Value 1 is the highest priority whereas value 8 is the lowest priority. |
| ***sl-PRS-SequenceID***  This field specifies the sequence ID used to initialize cinit value used in pseudo random generator for generation of SL PRS sequence for transmission on a given SL PRS Resource, as specified in TS 38.211 [6] for a UE identified by *applicationLayerID*. If an UE does not receive a sequence ID via this SLPP message, the sequence ID is based on the 12 LSB bits CRC of PSCCH associated with the SL PRS. |

#### *– CommonSL-PRS-MethodsIEsRequestLocationInformation*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESREQUESTLOCATIONINFORMATION-START

CommonSL-PRS-MethodsIEsRequestLocationInformation ::= SEQUENCE {

sl-POS-ARP-ID-Tx-Req ENUMERATED { true } OPTIONAL,

...

}

-- TAG-COMMONSL-PRS-METHODSIESREQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

#### *– Common-SL-PRS-MethodsIEsProvideLocationInformation*

-- ASN1START

-- TAG-COMMONSL-PRS-METHODSIESPROVIDELOCATIONINFORMATION-START

CommonSL-PRS-MethodsIEsProvideLocationInformation ::= SEQUENCE {

sl-POS-ARP-ID-Tx SL-POS-ARP-ID-Tx-InfoList OPTIONAL,

...

}

SL-POS-ARP-ID-Tx-InfoList ::= SEQUENCE (SIZE (1..4)) OF SL-POS-ARP-ID-Tx-Info

SL-POS-ARP-ID-Tx-Info ::= SEQUENCE {

sl-POS-ARP-ID INTEGER (1..4),

sl-PRS-ResourceIdList-Tx SEQUENCE (SIZE(1..16)) OF SL-PRS-ResourceId-Tx

}

SL-PRS-ResourceId-Tx ::= SEQUENCE {

sl-PRS-ResourceId INTEGER (0..16) OPTIONAL,

tx-TimeStamp SL-TimeStamp

}

-- TAG-COMMONSL-PRS-METHODSIESPROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

#### *– End of SLPP-PDU-CommonSL-PRS-MethodsContents*

-- ASN1START

END

-- ASN1STOP

## 6.7 SLPP PDU SL-AoA Contents

#### *– SLPP-PDU-SL-AoA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-AoA Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-SL-AOA-CONTENTS-START

SLPP-PDU-SL-AoA-Contents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

LCS-GCS-Translation,

LOS-NLOS-Indicator,

PositioningModes,

SL-TimeStamp,

SL-TimingQuality,

maxNrOfUEs,

ScheduledLocationTimeSupportPerMode,

nrMaxBands

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-A0A-CONTENTS-STOP

-- ASN1STOP

#### *– SL-AoA-RequestCapabilities*

-- ASN1START

-- TAG-SL-AOA-REQUESTCAPABILITIES-START

SL-AoA-RequestCapabilities ::= SEQUENCE {

}

-- TAG-SL-AOA-REQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– SL-AoA-ProvideCapabilities*

The IE *SL-AoA-ProvideCapabilities* is used to indicate the support of SL-AoA and to provide SL-AoA positioning capabilities.

-- ASN1START

-- TAG-SL-AOA-PROVIDECAPABILITIES-START

SL-AoA-ProvideCapabilities ::= SEQUENCE {

applicationLayerID OCTET STRING,

positioningModes PositioningModes,

tenMsUnitResponseTime PositioningModes OPTIONAL,

periodicalReporting PositioningModes OPTIONAL,

scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,

sl-AoA-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-AoA-CapabilityPerBand,

...

}

SL-AoA-CapabilityPerBand ::= SEQUENCE {

--R1 41-1-7g SL PRS measurement for SL AoA

sl-AoA-Meas BIT STRING { gcs (0), lcsWithTranslation (1), lcsWithoutTranslation (2) } (SIZE (1..8)) OPTIONAL,

...

}

-- TAG-SL-AOA-PROVIDECAPABILITIES-STOP

-- ASN1STOP

|  |
| --- |
| *SL-AoA-ProvideCapabilities* field descriptions |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***positioningModes***  This field specifies the SL-AoA mode(s) supported by the UE. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests. |
| ***sl-AoA-Meas***  Indicates whether UE supports SL PRS measurement for SL-AoA, and is comprised of the following functional components:  - Support SL AoA measurement based on SL-PRS;  - Support SL AoA measurement reporting types.  The value indicates the supported SL AoA measurement reporting types. The left most bit in the bitmap corresponds to GCS, the next bit in the bitmap corresponds to LCS with translation, the right most bit in the bitmap corresponds to LCS without translation. A bit in the bitmap is set to 1 if the corresponding type is supported by the UE.  UE supporting this feature shall also support FG41-1-1. |
| ***tenMsUnitResponseTime***  This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonIEsRequestLocationInformation*. |

#### *– SL-AoA-RequestAssistanceData*

-- ASN1START

-- TAG-SL-AOA-REQUESTASSISTANCEDATA-START

SL-AoA-RequestAssistanceData ::= SEQUENCE {

expectedSL-ZenithAoA-AndUncertainty ENUMERATED { true} OPTIONAL,

...

}

-- TAG-SL-AOA-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

#### *– SL-AoA-ProvideAssistanceData*

-- ASN1START

-- TAG-SL-AOA-PROVIDEASSISTANCEDATA-START

SL-AoA-ProvideAssistanceData ::= SEQUENCE {

sl-AoA-AssistanceDataInfo SEQUENCE (SIZE (1..maxNrOfUEs)) OF SL-AoA-AssistanceData OPTIONAL,

...

}

SL-AoA-AssistanceData ::= SEQUENCE {

applicationLayerID OCTET STRING,

expectedSL-AzimuthAoA-AndUncertainty INTEGER(0..3599), -- expected-SL-AoA-and-Uncertainty

expectedSL-ZenithAoA-AndUncertainty INTEGER(0..1800) OPTIONAL, -- expected-SL-AoA-and-Uncertainty

...

}

-- TAG-SL-AoA-PROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *SL-AoA-ProvideAssistanceData* field descriptions |
| ***expectedSL-AzimuthAoA-AndUncertainty***  This field provides expected SL-AzimuthAoA and uncertainty range to a measuring UE. |
| ***expectedSL-ZenithAoA-AndUncertainty***  This field provides expected SL-ZenithAoA and uncertainty range to a measuring UE. |
| ***applicationLayerID***  This field provides an application layer ID as defined in TS 23.287 [9] which is used to identify a UE. |

#### *– SL-AoA-RequestLocationInformation*

-- ASN1START

-- TAG-SL-AOA-REQUESTLOCATIONINFORMATION-START

SL-AoA-RequestLocationInformation ::= SEQUENCE {

measurementReportingType ENUMERATED { gcs, lcsWithTranslation, lcsWithoutTranslation } OPTIONAL,

sl-ARP-InfoRequest ENUMERATED { true } OPTIONAL,

sl-AzimuthAoA-Request ENUMERATED { true } OPTIONAL,

sl-ZenithAoA-Request ENUMERATED { true } OPTIONAL,

sl-LOS-NLOS-IndicatorRequest ENUMERATED { true } OPTIONAL,

sl-PRS-RSRP-Request ENUMERATED { true } OPTIONAL,

sl-RSRPP-Request ENUMERATED { true } OPTIONAL,

sl-AdditionalPathsRequest ENUMERATED { true } OPTIONAL,

...

}

-- TAG-SL-AOA-REQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-AoA-RequestLocationInformation* field descriptions |
| ***sl-AdditionalPathsRequest***  This field, if present, indicates that the UE is requested to provide *sl-AoA-AdditionalPathList*. |
| ***sl-ARP-InfoRequest***  This field, if present, indicates that the UE is requested to provide *sl-POS-ARP-ID-Rx*. |
| ***sl-RSRPP-Request***  This field, if present, indicates that the UE is requested to provide *sl-RSRPP*. |
| ***sl-LOS-NLOS-IndicatorRequest***  This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator. |
| ***sl-PRS-RSRP-Request***  This field, if present, indicates that the UE is requested to provide *sl-PRS-RSRP-Result*. |

#### *– SL-AoA-ProvideLocationInformation*

-- ASN1START

-- TAG-SL-AOA-PROVIDELOCATIONINFORMATION-START

SL-AoA-ProvideLocationInformation ::= SEQUENCE {

sl-AoA-SignalMeasurementInformation SL-AoA-SignalMeasurementInformation OPTIONAL,

...

}

SL-AoA-SignalMeasurementInformation ::= SEQUENCE {

sl-AoA-MeasList SEQUENCE (SIZE(1.. maxNrOfUEs)) OF SL-AoA-MeasElement,

...

}

SL-AoA-MeasElement ::= SEQUENCE {

applicationLayerID OCTET STRING,

sl-LCS-GCS-Translation LCS-GCS-Translation OPTIONAL, -- sl-LCS-to-GCS-translation

los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator

sl-AngleQuality MeasurementAngleQuality OPTIONAL, -- sl-AngleQuality

sl-AoA-AdditionalPathList SL-AoA-AdditionalPathList OPTIONAL,

sl-AzimuthAoA-Result INTEGER (0..3599) OPTIONAL, -- sl-PRS-AoA

sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-Rx

sl-PRS-ResourceId INTEGER (0..16) OPTIONAL, -- sl-PRS-ResourceId

sl-PRS-RSRP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRP

sl-PRS-RSRPP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRPP

sl-TimeStamp SL-TimeStamp OPTIONAL, -- sl-Timestamp

sl-ZenithAoA-Result INTEGER (0..1799) OPTIONAL, -- sl-PRS-AoA

...

}

SL-AoA-AdditionalPathList ::= SEQUENCE (SIZE(1..2)) OF SL-AoA-AdditionalPath

SL-AoA-AdditionalPath ::= SEQUENCE {

sl-AngleQuality MeasurementAngleQuality OPTIONAL, -- sl-AngleQuality

sl-AzimuthAoA-AdditionalPathResult INTEGER (0..3599) OPTIONAL, -- additionalPath-SL-PRS-AoA

sl-AzimuthAoA-LCS-GCS-Translation LCS-GCS-Translation OPTIONAL, -- sl-LCS-to-GCS-translation

sl-ZenithAoA-AdditionalPathResult INTEGER (0..1799) OPTIONAL, -- additionalPath-SL-PRS-AoA

sl-ZenithAoA-LCS-GCS-Translation LCS-GCS-Translation OPTIONAL, -- sl-LCS-to-GCS-translation

sl-PRS-AdditionalPathRSRPP-Result INTEGER (0..126) OPTIONAL, -- additionalPath-SL-PRS-RSRPP

...

}

MeasurementAngleQuality ::= SEQUENCE {

azimuthQuality INTEGER (0..255),

zenithQuality INTEGER (0..255) OPTIONAL

}

-- TAG-SL-AOA-PROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-AoA-ProvideLocationInformation* field descriptions |
| ***los-NLOS-Indicator***  This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference). |
| ***sl-AngleQuality***  This field specifies the angle quality for measurement results reported. Scale factor 0.1 degree. |
| ***sl-AoA-AdditionalPathList***  This field specifies the sidelink PRS measurements based on additional path of arrival. |
| ***sl-AzimuthAoA-Result***  This field specifies the first path result of SL-AzimuthAoA. |
| ***sl-AzimuthAoA-LCS-GCS-Translation***  This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8]. |
| ***sl-POS-ARP-ID-Rx***  This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE. |
| ***sl-PRS-ResourceId***  This field specifies the PRS resource ID used for SL positioning measurements. |
| ***sl-PRS-RSRP-Result***  This field specifies the sidelink PRS reference signal received power (RSRP) measurement. |
| ***sl-PRS-RSRPP-Result***  This field specifies the SL-RSRPP measurement based on first path of arrival. |
| ***sl-TimeStamp***  This field specifies the time instance at which the SL-PRS RSRP (if included) measurement is performed. |
| ***sl-ZenithAoA-Result***  This field specifies the first path result of SL-ZenithAoA. |
| ***sl-ZenithAoA-LCS-GCS-Translation***  This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8]. |

#### *– End of SLPP-PDU-SL-AoA-Contents*

-- ASN1START

END

-- ASN1STOP

## 6.8 SLPP PDU SL-RTT Contents

#### *– SLPP-PDU-SL-RTT-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-RTT Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-SL-RTT-CONTENTS-START

SLPP-PDU-SL-RTT-Contents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

LOS-NLOS-Indicator,

PositioningModes,

SL-TimeStamp,

SL-TimingQuality,

maxNrOfUEs,

ScheduledLocationTimeSupportPerMode,

nrMaxBands

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-RTT-CONTENTS-STOP

-- ASN1STOP

#### *– SL-RTT-RequestCapabilities*

-- ASN1START

-- TAG-SL-RTT-REQUESTCAPABILITIES-START

SL-RTT-RequestCapabilities ::= SEQUENCE {

}

-- TAG-SL-RTT-REQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– SL-RTT-ProvideCapabilities*

The IE SL-RTT-ProvideCapabilities is used to indicate the support of SL-RTT and to provide SL-RTT positioning capabilities.

-- ASN1START

-- TAG-SL-RTT-PROVIDECAPABILITIES-START

SL-RTT-ProvideCapabilities ::= SEQUENCE {

applicationLayerID OCTET STRING,

positioningModes PositioningModes,

tenMsUnitResponseTime PositioningModes OPTIONAL,

periodicalReporting PositioningModes OPTIONAL,

scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,

sl-RTT-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-RTT-CapabilityPerBand,

...

}

SL-RTT-CapabilityPerBand ::= SEQUENCE {

--R1 41-1-7c SL PRS measurement for UE Rx–Tx time difference without Tx time stamp

sl-PRS-RxTxTimeDiffWithoutTxTimeStamp ENUMERATED {n1,n2,n3,n4} OPTIONAL,

--R1 41-1-7d SL PRS measurement for UE Rx–Tx time difference with Tx time stamp

sl-PRS-RxTxTimeDiffWithTxTimeStamp SEQUENCE {

numOfMeasForSameSL-PRS ENUMERATED {n1,n2,n3,n4},

maxMeasReportingForDiffSL-PRS ENUMERATED {n1,n2,n3,n4}

} OPTIONAL,

...

}

-- TAG-SL-RTT-PROVIDECAPABILITIES-STOP

-- ASN1STOP

|  |
| --- |
| *SL-RTT-ProvideCapabilities* field descriptions |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***positioningModes***  This field specifies the SL-RTT mode(s) supported by the UE. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests. |
| ***sl-PRS-RxTxTimeDiffWithoutTxTimeStamp***  Indicates whether UE supports SL PRS measurement for UE Rx–Tx time difference without Tx time stamp, and is comprised of the following functional components:  - Support UE Rx–Tx time difference measurement based on SL PRS;  - Support UE Rx–Tx time difference measurement reporting without Tx time stamp.  The value indicates the supported maximum number of Rx-Tx measurement reporting for different SL-PRS reception for the same pair of UEs.  UE supporting this feature shall also support FG41-1-1, and at least one of *sl-PRS-TxInSharedResourcePool*, *sl-PRS-TxScheme1InDedicatedResourcePool* or *sl-PRS-TxScheme2InDedicatedResourcePool*. |
| ***sl-PRS-RxTxTimeDiffWithTxTimeStamp***  Indicates whether UE supports SL PRS measurement for UE Rx–Tx time difference with Tx time stamp, and is comprised of the following functional components:  - Support UE Rx–Tx time difference measurement based on SL PRS;  - Support UE Rx–Tx time difference measurement reporting with Tx time stamp;  This field comprises the following sub-fields:  - *numOfMeasForSameSL-PRS*: indicates the reported number of Rx-Tx measurements for the same SL-PRS transmission (or reception) and different SL-PRS reception (or transmission) for the same pair of UEs;  - *maxMeasReportingForDiffSL-PRS*: indicates the supported maximum number of Rx-Tx measurement reporting for different SL-PRS reception for the same pair of UEs.  UE supporting this feature shall also support FG41-1-1, and at least one of *sl-PRS-TxInSharedResourcePool*, *sl-PRS-TxScheme1InDedicatedResourcePool* or *sl-PRS-TxScheme2InDedicatedResourcePool*. |
| ***tenMsUnitResponseTime***  This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonIEsRequestLocationInformation*. |

#### *– SL-RTT-RequestAssistanceData*

-- ASN1START

-- TAG-SL-RTT-REQUESTASSISTANCEDATA-START

SL-RTT-RequestAssistanceData ::= SEQUENCE {

}

-- TAG-SL-RTT-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

#### *– SL-RTT-ProvideAssistanceData*

-- ASN1START

-- TAG-SL-RTT-PROVIDEASSISTANCEDATA-START

SL-RTT-ProvideAssistanceData ::= SEQUENCE {

}

-- TAG-SL-RTT-PROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

#### *– SL-RTT-RequestLocationInformation*

-- ASN1START

-- TAG-SL-RTT-REQUESTLOCATIONINFORMATION-START

SL-RTT-RequestLocationInformation ::= SEQUENCE {

sl-ARP-InfoRequest ENUMERATED { true } OPTIONAL,

sl-LOS-NLOS-IndicatorRequest ENUMERATED { true } OPTIONAL,

sl-PRS-RSRP-Request ENUMERATED { true } OPTIONAL,

sl-RSRPP-Request ENUMERATED { true } OPTIONAL,

sl-AdditionalPathsRequest ENUMERATED { true } OPTIONAL,

tx-TimeInfoRequest ENUMERATED { true } OPTIONAL,

multipleSL-PRS-RxTxTimeDiffRequest SEQUENCE {

diffSL-PRS-Receptions ENUMERATED { n2, n3, n4 } OPTIONAL,

diffSL-PRS-Transmissions ENUMERATED { n2, n3, n4 } OPTIONAL

} OPTIONAL,

associatedSL-PRS-TxTimeStampRequest ENUMERATED { true } OPTIONAL,

...

}

-- TAG-SL-RTT-REQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-RTT-RequestLocationInformation* field descriptions |
| ***associatedSL-PRS-TxTimeStampRequest***  This field, if present, indicates that the UE is requested to provide the associated SL PRS transmission time stamp. |
| ***multipleSL-PRS-RxTxTimeDiffRequest***  This field, if present, indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission (resp. reception) and up to N different SL PRS receptions (resp. transmissions) for the same pair of UE(s). Fields are as follows:  - ***diffSL-PRS-Receptions*** indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission and up to N different SL PRS receptions.  - ***diffSL-PRS-Transmissions*** indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission and up to N different SL PRS transmissions. |
| ***sl-AdditionalPathsRequest***  This field, if present, indicates that the UE is requested to provide *sl-RTT-AdditionalPathList*. |
| ***sl-ARP-InfoRequest***  This field, if present, indicates that the UE is requested to provide *sl-POS-ARP-ID-Rx*. |
| ***sl-RSRPP-Request***  This field, if present, indicates that the UE is requested to provide *sl-RSRPP*. |
| ***sl-LOS-NLOS-IndicatorRequest***  This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator. |
| ***sl-PRS-RSRP-Request***  This field, if present, indicates that the UE is requested to provide *sl-PRS-RSRP-Result*. |

#### *– SL-RTT-ProvideLocationInformation*

-- ASN1START

-- TAG-SL-RTT-PROVIDELOCATIONINFORMATION-START

SL-RTT-ProvideLocationInformation ::= SEQUENCE {

sl-RTT-SignalMeasurementInformation SL-RTT-SignalMeasurementInformation OPTIONAL,

...

}

SL-RTT-SignalMeasurementInformation ::= SEQUENCE {

sl-RTT-MeasList SEQUENCE (SIZE(1..maxNrOfUEs)) OF SL-RTT-MeasElement,

...

}

SL-RTT-MeasElement ::= SEQUENCE {

applicationLayerID OCTET STRING,

los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator

sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-Rx

sl-PRS-RxTxTimeDiffMeasResult SL-PRS-RxTxTimeDiffMeasResult,

...

}

SL-PRS-RxTxTimeDiffMeasResult ::= CHOICE {

single-SL-PRS-RxTxTimeDiff SL-PRS-RxTxTimeDiffResult,

multiple-SL-PRS-RxTxTimeDiff SEQUENCE {

sameSL-PRS-TxAndDiffSL-PRS-Rx SEQUENCE (SIZE (2..4)) OF SL-PRS-RxTxTimeDiffResult OPTIONAL,

sameSL-PRS-RxAndDiffSL-PRS-Tx SEQUENCE (SIZE (2..4)) OF SL-PRS-RxTxTimeDiffResult OPTIONAL

},

...

}

SL-PRS-RxTxTimeDiffResult ::= SEQUENCE {

sl-PRS-ResourceId INTEGER (0..16) OPTIONAL, -- sl-PRS-ResourceId

sl-PRS-RxTxTimeDiffResult CHOICE {

k0 INTEGER (0..1970049),

k1 INTEGER (0..985025),

k2 INTEGER (0..492513),

k3 INTEGER (0..246257),

k4 INTEGER (0..123129),

k5 INTEGER (0..61565)

} OPTIONAL, -- sl-PRS-RxTxTimeDiff

sl-PRS-RSRP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRP

sl-PRS-RSRPP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRPP

sl-RTT-AdditionalPathList SL-RTT-AdditionalPathList OPTIONAL,

sl-TimeStamp SL-TimeStamp OPTIONAL, -- sl-Timestamp

sl-TimingQuality SL-TimingQuality OPTIONAL, -- sl-TimingQuality

tx-TimeInfo SL-TimeStamp OPTIONAL, -- tx-Time-Info

...

}

SL-RTT-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-RTT-AdditionalPath

SL-RTT-AdditionalPath ::= SEQUENCE {

sl-PRS-RxTxTimeDiffAdditionalPathResult CHOICE {

k0 INTEGER (0..8191),

k1 INTEGER (0..4095),

k2 INTEGER (0..2047),

k3 INTEGER (0..1023),

k4 INTEGER (0..511),

k5 INTEGER (0..255)

} OPTIONAL, -- additionalPath-SL-PRS-Rx-Tx-TimeDiff

sl-PRS-AdditionalPathRSRPP-Result INTEGER (0..126) OPTIONAL, -- additionalPath-SL-PRS-RSRPP

tx-TimeInfo SL-TimeStamp OPTIONAL, -- tx-Time-Info

...

}

-- TAG-SL-RTT-PROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-RTT-ProvideLocationInformation* field descriptions |
| ***los-NLOS-Indicator***  This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference). |
| ***sl-POS-ARP-ID-Rx***  This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE. |
| ***sl-PRS-ResourceId***  This field specifies the PRS resourde ID used for SL positioning measurements. |
| ***sl-PRS-RxTxTimeDiffResult***  This field specifies SL Rx-Tx time difference measurement based on first path of arrival. The mapping of the field is defined in TS 38.133 [13]. |
| ***sl-PRS-RSRP-Result***  This field specifies the sidelink PRS reference signal received power (RSRP) measurement. |
| ***sl-PRS-RSRPP-Result***  This field specifies the SL-RSRPP measurement based on first path of arrival. |
| ***sl-RTT-AdditionalPathList***  This field specifies the sidelink PRS measurements based on additional path of arrival. |
| ***sl-TimeStamp***  This field specifies the time instance at which the SL Rx-Tx time difference and SL-PRS RSRP (if included) measurement is performed. |

#### *– End of SLPP-PDU-SL-RTT-Contents*

-- ASN1START

END

-- ASN1STOP

## 6.9 SLPP PDU SL-TDOA Contents

#### *– SLPP-PDU-**SL-TDOA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-TDOA Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-SL-TDOA-CONTENTS-START

SLPP-PDU-SL-TDOA-Contents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

LOS-NLOS-Indicator,

PositioningModes,

SL-RTD-Info,

SL-TimeStamp,

SL-TimingQuality,

maxNrOfUEs,

ScheduledLocationTimeSupportPerMode,

nrMaxBands

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-TDOA-CONTENTS-STOP

-- ASN1STOP

#### *– SL-TDOA-RequestCapabilities*

-- ASN1START

-- TAG-SL-TDOA-REQUESTCAPABILITIES-START

SL-TDOA-RequestCapabilities ::= SEQUENCE {

}

-- TAG-SL-TDOA-REQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– SL-TDOA-ProvideCapabilities*

The IE *SL-TDOA-ProvideCapabilities* is used to indicate the support of SL-TDOA and to provide SL-TDOA positioning capabilities.

-- ASN1START

-- TAG-SL-TDOA-PROVIDECAPABILITIES-START

SL-TDOA-ProvideCapabilities ::= SEQUENCE {

applicationLayerID OCTET STRING,

positioningModes PositioningModes,

tenMsUnitResponseTime PositioningModes OPTIONAL,

periodicalReporting PositioningModes OPTIONAL,

scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,

sl-TDOA-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-TDOA-CapabilityPerBand,

...

}

SL-TDOA-CapabilityPerBand ::= SEQUENCE {

--R1 41-1-7a SL PRS measurement for SL-RSTD

sl-PRS-RSTD-Meas ENUMERATED {n1,n2,n3,n4} OPTIONAL,

...

}

-- TAG-SL-TDOA-PROVIDECAPABILITIES-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TDOA-ProvideCapabilities* field descriptions |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***positioningModes***  This field specifies the SL-TDOA mode(s) supported by the UE. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests. |
| ***sl-PRS-RSTD-Meas***  Indicates whether UE supports SL PRS measurement for SL-RSTD, and is comprised of the following functional components:  - Support SL RSTD measurement based on SL-PRS;  - Support SL RSTD measurement reporting;  The value indicates the supported maximum number of SL RSTD measurement reporting for different SL-PRS reception for the same pair of UEs.  UE supporting this feature shall also support FG41-1-1. |
| ***tenMsUnitResponseTime***  This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonIEsRequestLocationInformation*. |

#### *– SL-TDOA-RequestAssistanceData*

-- ASN1START

-- TAG-SL-TDOA-REQUESTASSISTANCEDATA-START

SL-TDOA-RequestAssistanceData ::= SEQUENCE {

sl-RTD-InfoRequest ENUMERATED { true} OPTIONAL,

...

}

-- TAG-SL-TDOA-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TDOA-RequestAssistanceData* field descriptions |
| ***sl-RTD-InfoRequest***  This field indicates the SL RTD information requested. |

#### *– SL-TDOA-ProvideAssistanceData*

-- ASN1START

-- TAG-SL-TDOA-PROVIDEASSISTANCEDATA-START

SL-TDOA-ProvideAssistanceData ::= SEQUENCE {

sl-PositionCalculationAssistanceTDOA SL-PositionCalculationAssistanceTDOA OPTIONAL,

...

}

SL-PositionCalculationAssistanceTDOA ::= SEQUENCE {

sl-RTD-Info SL-RTD-Info OPTIONAL,

...

}

-- TAG-SL-TDOA-PROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TDOA-ProvideAssistanceData* field descriptions |
| ***sl-RTD-Info***  This field provides synchronization information of SL Anchor UEs. |

#### *– SL-TDOA-RequestLocationInformation*

-- ASN1START

-- TAG-SL-TDOA-REQUESTLOCATIONINFORMATION-START

SL-TDOA-RequestLocationInformation ::= SEQUENCE {

sl-ARP-InfoRequest ENUMERATED { true } OPTIONAL,

sl-LOS-NLOS-IndicatorRequest ENUMERATED { true } OPTIONAL,

sl-PRS-RSRP-Request ENUMERATED { true } OPTIONAL,

sl-RSRPP-Request ENUMERATED { true } OPTIONAL,

sl-AdditionalPathsRequest ENUMERATED { true } OPTIONAL,

...

}

-- TAG-SL-TDOA-REQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TDOA-RequestLocationInformation* field descriptions |
| ***sl-ARP-InfoRequest***  This field, if present, indicates that the UE is requested to provide *sl-POS-ARP-ID-Rx*. |
| ***sl-LOS-NLOS-IndicatorRequest***  This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator. |
| ***sl-PRS-RSRP-Request***  This field, if present, indicates that the UE is requested to provide *sl-PRS-RSRP-Result*. |
| ***sl-RSRPP-Request***  This field, if present, indicates that the UE is requested to provide *sl-RSRPP*. |
| ***sl-AdditionalPathsRequest***  This field, if present, indicates that the UE is requested to provide *sl-TDOA-AdditionalPathList*. |

#### *– SL-TDOA-ProvideLocationInformation*

-- ASN1START

-- TAG-SL-TDOA-PROVIDELOCATIONINFORMATION-START

SL-TDOA-ProvideLocationInformation ::= SEQUENCE {

sl-RSTD-ReferenceUE-Info SEQUENCE {

applicationLayerID OCTET STRING

} OPTIONAL,

sl-TDOA-SignalMeasurementInformation SL-TDOA-SignalMeasurementInformation OPTIONAL,

...

}

SL-TDOA-SignalMeasurementInformation ::= SEQUENCE {

sl-TDOA-MeasList SEQUENCE (SIZE(1..maxNrOfUEs)) OF SL-TDOA-MeasElement,

...

}

SL-TDOA-MeasElement ::= SEQUENCE {

applicationLayerID OCTET STRING,

los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator

sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-Rx

sl-PRS-ResourceId INTEGER (0..16) OPTIONAL, -- sl-PRS-ResourceId

sl-PRS-RSRP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRP

sl-PRS-RSRPP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRPP

sl-RSTD-Result  CHOICE {

k0 INTEGER (0..1970049),

k1 INTEGER (0..985025),

k2 INTEGER (0..492513),

k3 INTEGER (0..246257),

k4 INTEGER (0..123129),

k5 INTEGER (0..61565)

} OPTIONAL, -- sl-PRS-RSTD

sl-TDOA-AdditionalPathList SL-TDOA-AdditionalPathList OPTIONAL,

sl-TimeStamp SL-TimeStamp OPTIONAL, -- sl-Timestamp

sl-TimingQuality SL-TimingQuality OPTIONAL, -- sl-TimingQuality

...

}

SL-TDOA-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-TDOA-AdditionalPath

SL-TDOA-AdditionalPath ::= SEQUENCE {

sl-RSTD-AdditionalPathResult CHOICE {

k0 INTEGER (0..1970049),

k1 INTEGER (0..985025),

k2 INTEGER (0..492513),

k3 INTEGER (0..246257),

k4 INTEGER (0..123129),

k5 INTEGER (0..61565)

} OPTIONAL, -- additionalPath-SL-PRS-RSTD

sl-PRS-AdditionalPathRSRPP-Result INTEGER (0..126) OPTIONAL, -- additionalPath-SL-PRS-RSRPP

...

}

-- TAG-SL-TDOA-PROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TDOA-ProvideLocationInformation* field descriptions |
| ***los-NLOS-Indicator***  This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference). |
| ***sl-POS-ARP-ID-Rx***  This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE. |
| ***sl-PRS-ResourceId***  This field specifies the PRS resourde ID used for SL positioning measurements. |
| ***sl-PRS-RSRP-Result***  This field specifies the sidelink PRS reference signal received power (RSRP) measurement. |
| ***sl-PRS-hRSRPP-Result***  This field specifies the SL-RSRPP measurement based on first path of arrival. |
| ***sl-TDOA-AdditionalPathList***  This field specifies the sidelink PRS measurements based on additional path of arrival. |
| ***sl-RSTD-Result***  This field specifies the SL-RSTD measurement based on first path of arrival. |
| ***sl-RSTD-ReferenceUE-Info***  This field indicates reference UE information for SL-PRS based RSTD measurement report. |
| ***sl-TimeStamp***  This field specifies the time instance at which the SL RSTD and SL-PRS RSRP (if included) measurement is performed. |

#### *– End of SLPP-PDU-SL-TDOA-Contents*

-- ASN1START

END

-- ASN1STOP

## 6.10 SLPP PDU SL-TOA Contents

#### *– SLPP-PDU-SL-TOA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-TOA Contents definitions.

-- ASN1START

-- TAG-SLPP-PDU-SL-TOA-CONTENTS-START

SLPP-PDU-SL-TOA-Contents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

LOS-NLOS-Indicator,

PositioningModes,

SL-RTD-Info,

SL-TimeStamp,

SL-TimingQuality,

maxNrOfUEs,

ScheduledLocationTimeSupportPerMode,

nrMaxBands

FROM

SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-TOA-CONTENTS-STOP

-- ASN1STOP

#### *– SL-TOA-RequestCapabilities*

-- ASN1START

-- TAG-SL-TOA-REQUESTCAPABILITIES-START

SL-TOA-RequestCapabilities ::= SEQUENCE {

}

-- TAG-SL-TOA-REQUESTCAPABILITIES-STOP

-- ASN1STOP

#### *– SL-TOA-ProvideCapabilities*

The IE *SL-TOA-ProvideCapabilities* is used to indicate the support of SL-TOA and to provide SL-TOA positioning capabilities.

-- ASN1START

-- TAG-SL-TOA-PROVIDECAPABILITIES-START

SL-TOA-ProvideCapabilities ::= SEQUENCE {

applicationLayerID OCTET STRING,

positioningModes PositioningModes,

tenMsUnitResponseTime PositioningModes OPTIONAL,

periodicalReporting PositioningModes OPTIONAL,

scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,

sl-TOA-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-TOA-CapabilityPerBand,

...

}

SL-TOA-CapabilityPerBand ::= SEQUENCE {

--R1 41-1-7b SL PRS measurement for SL RTOA

sl-RTOA-Meas ENUMERATED {n1,n2,n3,n4} OPTIONAL,

...

}

-- TAG-SL-TOA-PROVIDECAPABILITIES-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TOA-ProvideCapabilities* field descriptions |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***positioningModes***  This field specifies the SL-TOA mode(s) supported by the UE. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformationss* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests. |
| ***sl-RTOA-Meas***  Indicates whether UE supports SL PRS measurement for SL-RTOA, and is comprised of the following functional components:  - Support SL RTOA measurement based on SL-PRS;  - Support SL RTOA measurement reporting.  The value indicates the supported maximum number of SL RTOA measurement reporting for different SL-PRS reception for the same pair of UEs.  UE supporting this feature shall also support FG41-1-1. |
| ***tenMsUnitResponseTime***  This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonIEsRequestLocationInformation*. |

#### *– SL-TOA-RequestAssistanceData*

-- ASN1START

-- TAG-SL-TOA-REQUESTASSISTANCEDATA-START

SL-TOA-RequestAssistanceData ::= SEQUENCE {

sl-RTD-InfoRequest ENUMERATED { true} OPTIONAL,

...

}

-- TAG-SL-TOA-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TOA-RequestAssistanceData* field descriptions |
| ***sl-RTD-InfoRequest***  This field indicates the SL RTD information requested. |

#### *– SL-TOA-ProvideAssistanceData*

-- ASN1START

-- TAG-SL-TOA-PROVIDEASSISTANCEDATA-START

SL-TOA-ProvideAssistanceData ::= SEQUENCE {

sl-PositionCalculationAssistanceTOA SL-PositionCalculationAssistanceTOA OPTIONAL,

...

}

SL-PositionCalculationAssistanceTOA ::= SEQUENCE {

sl-RTD-Info SL-RTD-Info OPTIONAL,

...

}

-- TAG-SL-TOA-PROVIDEASSISTANCEDATA-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TOA-ProvideAssistanceData* field descriptions |
| ***sl-RTD-Info***  This field provides synchronization information of SL Anchor UEs. |

#### *– SL-TOA-RequestLocationInformation*

-- ASN1START

-- TAG-SL-TOA-REQUESTLOCATIONINFORMATION-START

SL-TOA-RequestLocationInformation ::= SEQUENCE {

sl-ARP-InfoRequest ENUMERATED { true } OPTIONAL,

sl-LOS-NLOS-IndicatorRequest ENUMERATED { true } OPTIONAL,

sl-PRS-RSRP-Request ENUMERATED { true } OPTIONAL,

sl-RSRPP-Request ENUMERATED { true } OPTIONAL,

sl-AdditionalPathsRequest ENUMERATED { true } OPTIONAL,

...

}

-- TAG-SL-TOA-REQUESTLOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TOA-RequestLocationInformation* field descriptions |
| ***sl-AdditionalPathsRequest***  This field, if present, indicates that the UE is requested to provide *sl-TOA-AdditionalPathList*. |
| ***sl-ARP-InfoRequest***  This field, if present, indicates that the UE is requested to provide *sl-POS-ARP-ID-Rx*. |
| ***sl-RSRPP-Request***  This field, if present, indicates that the UE is requested to provide *sl-RSRPP*. |
| ***sl-LOS-NLOS-IndicatorRequest***  This field, if present, indicates that the UE is requested to provide the estimated *LOS-NLOS-Indicator*. |
| ***sl-PRS-RSRP-Request***  This field, if present, indicates that the UE is requested to provide *sl-PRS-RSRP-Result*. |

#### *– SL-TOA-ProvideLocationInformation*

-- ASN1START

-- TAG-SL-TOA-PROVIDELOCATIONINFORMATION-START

SL-TOA-ProvideLocationInformation ::= SEQUENCE {

sl-TOA-SignalMeasurementInformation SL-TOA-SignalMeasurementInformation OPTIONAL,

...

}

SL-TOA-SignalMeasurementInformation ::= SEQUENCE {

sl-TOA-MeasList SL-TOA-MeasElement,

...

}

SL-TOA-MeasElement ::= SEQUENCE {

applicationLayerID OCTET STRING,

los-NLOS-Indicator LOS-NLOS-Indicator OPTIONAL, -- sl-losNlosIndicator

sl-RTOA-Result CHOICE {

k0 INTEGER (0..1970049),

k1 INTEGER (0..985025),

k2 INTEGER (0..492513),

k3 INTEGER (0..246257),

k4 INTEGER (0..123129),

k5 INTEGER (0..61565)

} OPTIONAL, -- sl-PRS-RTOA

sl-POS-ARP-ID-Rx INTEGER (1..4) OPTIONAL, -- sl-pos-arpID-Rx

sl-PRS-ResourceId INTEGER (0..16) OPTIONAL, -- sl-PRS-ResourceId

sl-PRS-RSRP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRP

sl-PRS-RSRPP-Result INTEGER (0..126) OPTIONAL, -- sl-PRS-RSRPP

sl-TOA-AdditionalPathList SL-TOA-AdditionalPathList OPTIONAL,

sl-TimeStamp SL-TimeStamp OPTIONAL, -- sl-Timestamp

sl-TimingQuality SL-TimingQuality OPTIONAL, -- sl-TimingQuality

...

}

SL-TOA-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-TOA-AdditionalPath

SL-TOA-AdditionalPath ::= SEQUENCE {

sl-RTOA-AdditionalPathResult CHOICE {

k0 INTEGER (0..16351),

k1 INTEGER (0..8176),

k2 INTEGER (0..4088),

k3 INTEGER (0..2044),

k4 INTEGER (0..1022),

k5 INTEGER (0..511)

} OPTIONAL, -- additionalPath-SL-PRS-RTOA

sl-PRS-AdditionalPathRSRPP-Result INTEGER (0..126) OPTIONAL, -- additionalPath-SL-PRS-RSRPP

...

}

-- TAG-SL-TOA-PROVIDELOCATIONINFORMATION-STOP

-- ASN1STOP

|  |
| --- |
| *SL-TOA-ProvideLocationInformation* field descriptions |
| ***los-NLOS-Indicator***  This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference). |
| ***sl-TOA-AdditionalPathList***  This field specifies the sidelink PRS measurements based on additional path of arrival. |
| ***sl-POS-ARP-ID-Rx***  This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE. |
| ***sl-PRS-ResourceId***  This field specifies the PRS resourde ID used for SL positioning measurements. |
| ***sl-PRS-RSRP-Result***  This field specifies the sidelink PRS reference signal received power (RSRP) measurement. |
| ***sl-PRS-RSRPP-Result***  This field specifies the SL-RSRPP measurement based on first path of arrival. |
| ***sl-RTOA-Result***  This field specifies the SL-RTOA measurement based on first path of arrival. |
| ***sl-TimeStamp***  This field specifies the time instance at which the SL RTOA and SL-PRS RSRP (if included) measurement is performed. |

#### *– End of SLPP-PDU-SL-TOA-Contents*

-- ASN1START

END

-- ASN1STOP

## 6.11 Information elements related to Discovery Message

This clause specifies information elements that are transferred in Discovery Message for ranging and sidelink positioning, as specified in TS 23.304 [14].

#### *– NR-DiscoveryMessageMetaDataContents*

This ASN.1 segment is the start of the *NR-DiscoveryMessageMetaDataContents* definitions.

-- ASN1START

-- TAG-NR-DISCOVERYMESSAGEMETADATACONTENTS-START

NR-DiscoveryMessageMetaDataContents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- TAG-NR-DISCOVERYMESSAGEMETADATACONTENTS-STOP

-- ASN1STOP

#### *– RSPP-Metadata*

The IE *RSPP-Metadata* includes the UE information included in Discovery Message for ranging and sidelink positioning.

-- ASN1START

-- TAG-RSPP-METADATA-START

RSPP-Metadata ::= SEQUENCE {

ue-RoleList BIT STRING { sl-anchorUE(0), sl-ServerUE(1), sl-TargetUE(2) } (SIZE (1..8)),

knownLocationAvailable ENUMERATED {true} OPTIONAL

}

-- TAG-RSPP-METADATA-STOP

-- ASN1STOP

|  |
| --- |
| *RSPP-Metadata* field descriptions |
| ***ue-RoleList***  This field indicates the UE role associate with the discovery message. This is represented by a bit string, with a one value at the bit position means the particular UE role associate with the discovery message.  In the case of solicitation message, this bit string is interpreted as:  - bit 0 indicates whether the UE role as a SL Anchor UE is requested or not;  - bit 1 indicates whether the UE role as a SL Server UE is requested or not;  - bit 2 indicates whether the UE supports UE role as a SL Target UE or not;  Otherwise, the bit string is interpreted as:  - bit 0 indicates whether the UE supports UE role as a SL Anchor UE or not;  - bit 1 indicates whether the UE supports UE role as a SL Server UE or not;  - bit 2 indicates whether the UE supports UE role as a SL Target UE or not; |
| ***knownLocationAvailable***  This field indicates whether the location of a SL Anchor UE is known or is able to be known, e.g., via Uu based positioning. The field can only be present if the bit 0 of *ue-RoleList* is set. |

#### *– End of NR-DiscoveryMessageMetaDataContents*

-- ASN1START

END

-- ASN1STOP

Annex A (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Change history | | | | | | | |
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 04/2023 | RAN2#121bis-e | R2-2302739 |  |  |  |  | 0.0.1 |
| 04/2023 | RAN2#121bis-e | R2-2304306 |  |  |  |  | 0.0.2 |
| 05/2023 | RAN2#122 | R2-2305439 |  |  |  |  | 0.0.3 |
| 08/2023 | RAN2#123 | R2-2307663 |  |  |  |  | 0.0.4 |
| 09/2023 | RAN2#123 | R2-2309183 |  |  |  | Endorsed by RAN2 in email discussion [Post123][415] | 0.0.5 |
| 09/2023 | RP-101 | RP-232009 |  |  |  | To be presented to RAN for information | 1.0.0 |
| 10/2023 | RAN2#123bis | R2-2310222 |  |  |  | Not endorsed in RAN2#123bis | 1.1.0 |
| 11/2023 | RAN2#124 | R2-2312021 |  |  |  |  | 1.2.0 |
| 11/2023 | RAN2#124 | R2-2313630 |  |  |  | Agreed by RAN2 in email discussion [Post124][419] | 1.3.0 |
| 12/2023 | RP-102 | RP-233391 |  |  |  | To be presented to RAN for Approval | 2.0.0 |
| 12/2023 | RP-102 |  |  |  |  | Promoted to Rel-18 after approval | 18.0.0 |
| 03/2024 | RP-103 | RP-240696 | 0001 | 1 | F | Miscellaneous corrections to SLPP specification | 18.1.0 |
|  | RP-103 | RP-240696 | 0002 | - | B | CR 38.355 for SLPP capability | 18.1.0 |