# ETSI TS 138 351 V18.1.0 (2024-05)

**TECHNICAL SPECIFICATION**

**5G;
NR;
Sidelink Relay Adaptation Protocol (SRAP) Specification
(3GPP TS 38.351 version 18.1.0 Release 18)**

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# Contents

# Foreword

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

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where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

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

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

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

**shall**            indicates a mandatory requirement to do something

**shall not**        indicates an interdiction (prohibition) to do something

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

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

**should**           indicates a recommendation to do something

**should not**       indicates a recommendation not to do something

**may**              indicates permission to do something

**need not**         indicates permission not to do something

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

**can**              indicates that something is possible

**cannot**           indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

# 1 Scope

The present document provides description of the Sidelink Relay Adaptation Protocol (SRAP).

# 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 38.300: "NG Radio Access Network; Overall description".

[3]     3GPP TS 38.331: "NR Radio Resource Control (RRC); Protocol Specification".

[4]     3GPP TS 38.322: "NR Radio Link Control (RLC) protocol specification".

[5]     3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) 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].

**Egress RLC channel:** a RLC channel on which a packet is transmitted by a U2N Relay UE, a U2N Remote UE, a U2U Remote UE, a U2U Relay UE or a network node.

**Egress link**: a radio link on which a packet is transmitted by a U2N Relay UE, a U2N Remote UE, a U2U Remote UE, a U2U Relay UE or a network node.

**Ingress RLC channel:** a RLC channel on which a packet is received from a U2N Relay UE, a U2N Remote UE, a U2U Remote UE, a U2U Relay UE or a network node.

**Ingress link**: a radio link on which a packet is received from a U2N Relay UE, a U2N Remote UE, a U2U Remote UE, a U2U Relay UE or a network node.

**U2N Relay UE:** a UE that provides functionality to support connectivity to the network for U2N Remote UE(s).

**U2N Remote UE:** a UE that communicates with the network via a U2N Relay UE.

**U2U Relay UE**: a UE that provides functionality to support connectivity between two U2U Remote UEs.

**U2U Remote UE**: a UE that communicates with other UE(s) via a U2U Relay 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].

SRAP          Sidelink Relay Adaptation Protocol
U2N          UE-to-Network
U2U          UE-to-UE

# 4 General

## 4.1 Introduction

The objective is to describe the SRAP architecture and the SRAP entities from a functional point of view.

## 4.2 SRAP architecture

### 4.2.1 General

This clause describes a model of the SRAP, i.e., it does not specify or restrict implementations.

### 4.2.2 SRAP entities

Figure 4.2.2-1 represents one possible structure for the SRAP sublayer. The figure is based on the radio interface protocol architecture defined in TS 38.300 [2].
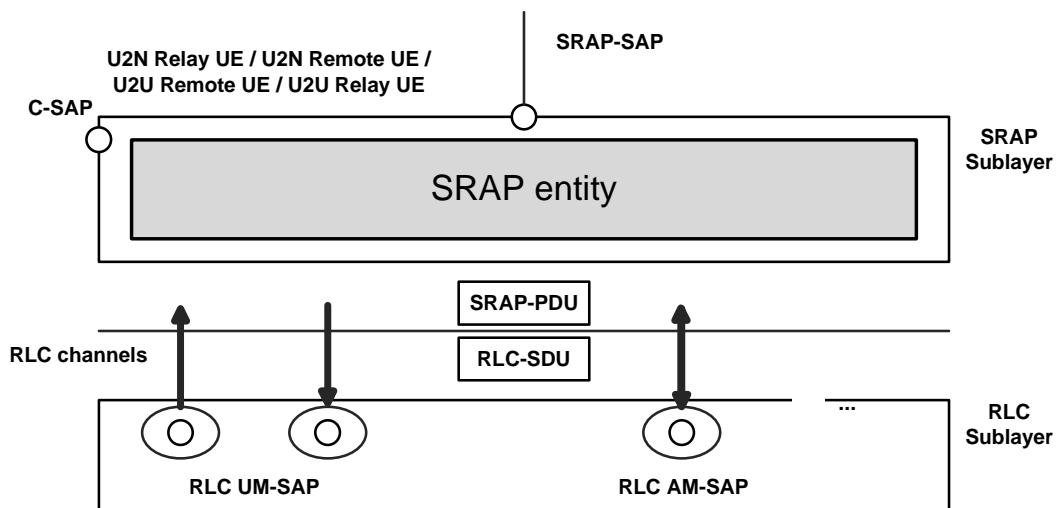


**Figure 4.2.2-1: SRAP structure overview**

On the U2N Relay UE, the SRAP sublayer contains one SRAP entity at Uu interface and a separate collocated SRAP entity at the PC5 interface. On the U2N Remote UE, the SRAP sublayer contains only one SRAP entity at the PC5 interface. On the U2U Relay UE and U2U Remote UE, the SRAP sublayer contains only one SRAP entity at the PC5 interface.

Each SRAP entity has a transmitting part and a receiving part. Across the PC5 interface in the U2N case, the transmitting part of the SRAP entity at the U2N Remote UE has a corresponding receiving part of an SRAP entity at the U2N Relay UE, and vice versa. Across the Uu interface, the transmitting part of the SRAP entity at the U2N Relay UE has a corresponding receiving part of an SRAP entity at the gNB, and vice versa.

Across the PC5 interface in the U2U case, the transmitting part of the SRAP entity at the U2U Remote UE has a corresponding receiving part of an SRAP entity at the U2U Relay UE, and vice versa.

Figure 4.2.2-2 and Figure 4.2.2-3 represents the functional view of the SRAP entity in U2N Relay case for the SRAP sublayer at PC5 interface and at Uu interface respectively. Figure 4.2.2-4 represents the functional view of the SRAP entity in U2U Relay case for the SRAP sublayer at PC5 interface.



**Figure 4.2.2-2: Example of functional view of SRAP sublayer at PC5 interface in U2N Relay case**

**Figure 4.2.2-3: Example of functional view of SRAP sublayer at Uu interface**

In the example of Figure 4.2.2-2 and Figure 4.2.2-3, at relay UE:

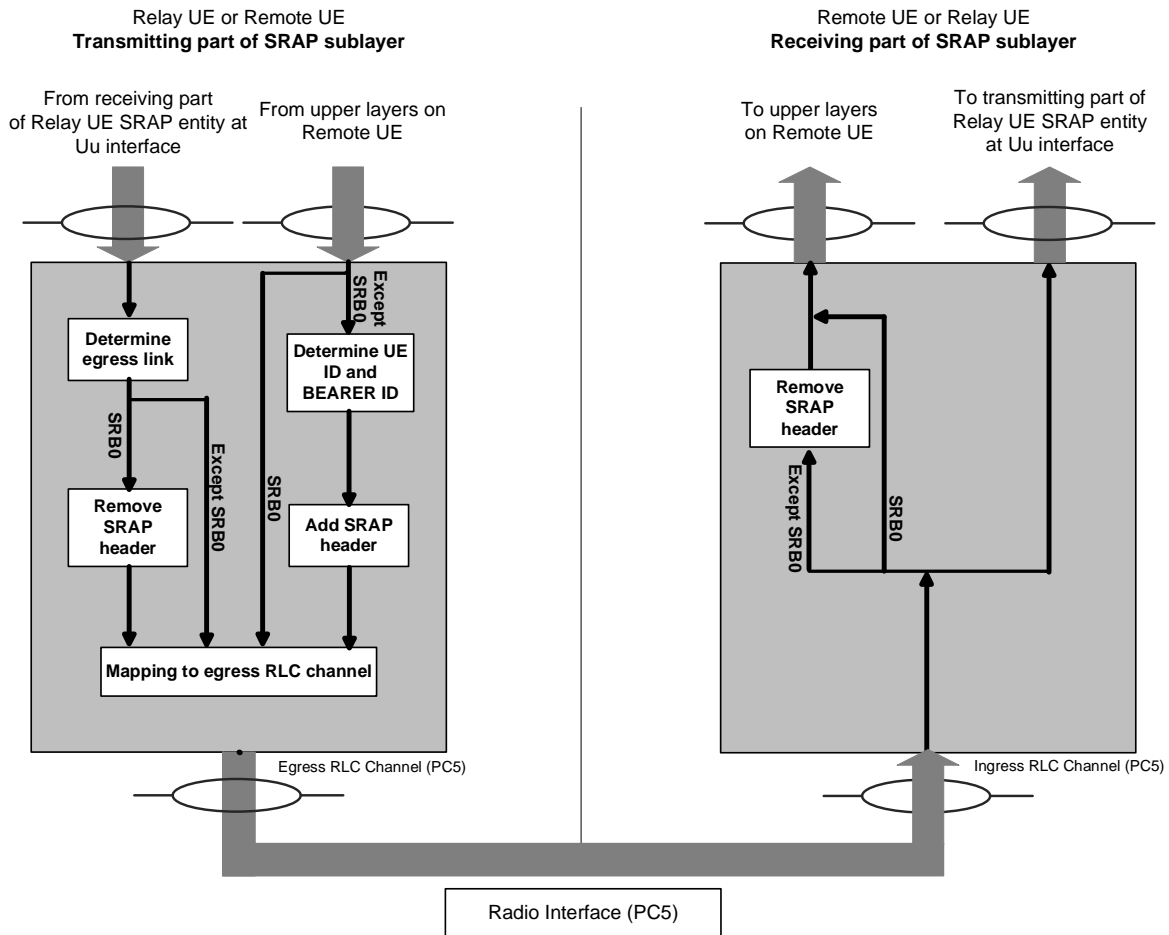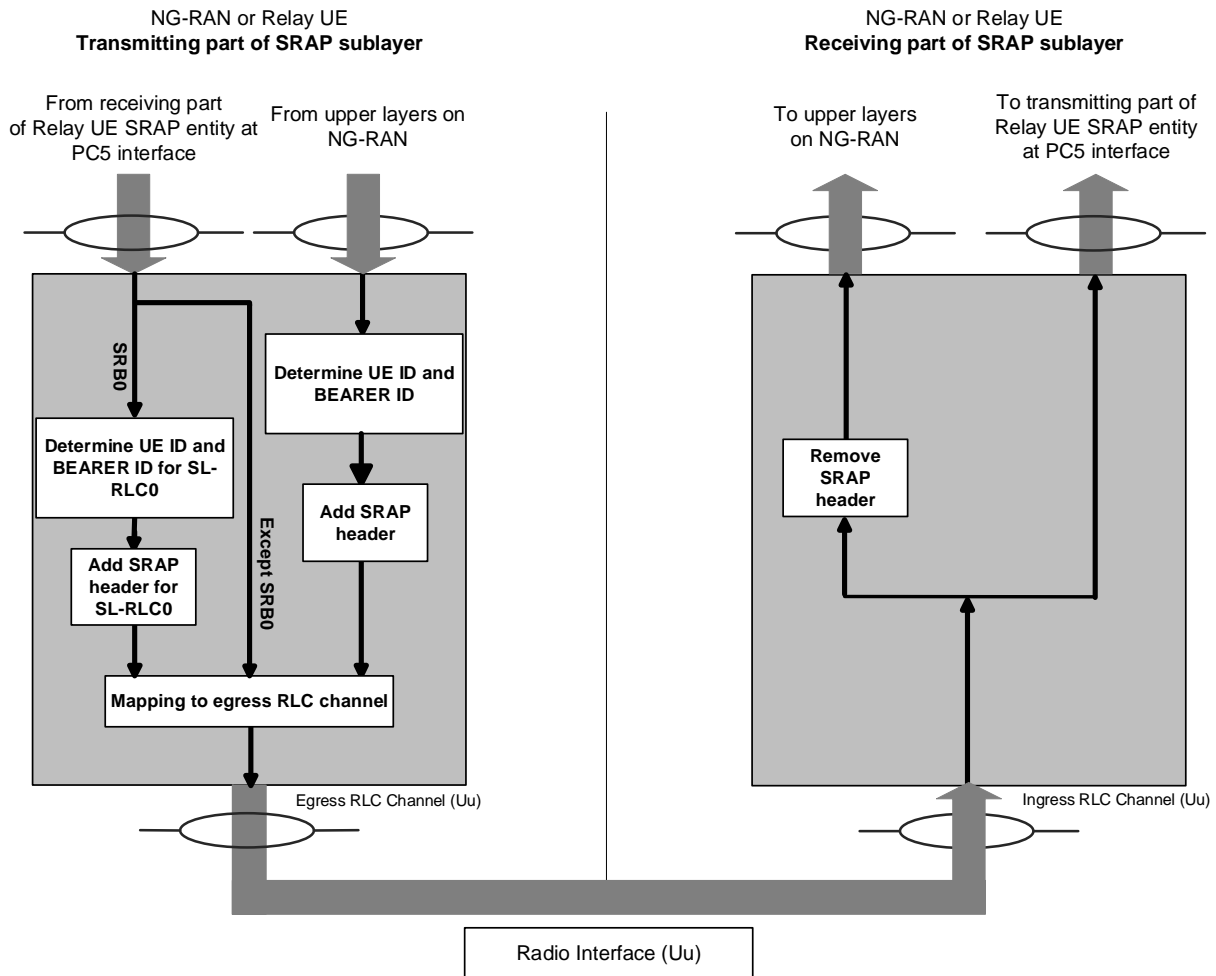- For data packet not corresponding to SRB0, the receiving part on the SRAP entity of Uu interface delivers SRAP Data PDUs to the transmitting part on the collocated SRAP entity of PC5 interface, and the receiving part on the SRAP entity of PC5 interface delivers SRAP Data PDUs to the transmitting part on the collocated SRAP entity of Uu interface. As an alternative, the receiving part may deliver SRAP SDUs to the transmitting part on the collocated SRAP entity. When passing SRAP SDUs, the receiving part removes the SRAP header and the transmitting part of the relay UE adds the SRAP header with the same SRAP header content as carried on the SRAP Data PDU header prior to removal. Passing SRAP SDUs in this manner is therefore functionally equivalent to passing SRAP Data PDUs, in implementation. The following specification therefore refers to the passing of SRAP data packets.

- For UL data packet corresponding to SRB0, the receiving part on the SRAP entity of PC5 interface delivers SRAP SDUs to the transmitting part on the collocated SRAP entity of Uu interface, and the transmitting part on the SRAP entity of Uu interface adds the SRAP header in accordance with clause 5.3.3.

- For DL data packet corresponding to SRB0, the receiving part on the SRAP entity of Uu interface delivers SRAP Data PDUs to the transmitting part on the collocated SRAP entity of PC5 interface, and the transmitting part on the SRAP entity of PC5 interface removes the SRAP header in accordance with clause 5.2.2. As an alternative for handling DL data packet corresponding to SRB0 not shown in Figure 4.2.2-2 or Figure 4.2.2-3, the receiving part on the SRAP entity of Uu interface removes the SRAP header and delivers SRAP SDUs to the transmitting part on the collocated SRAP entity of PC5 interface.
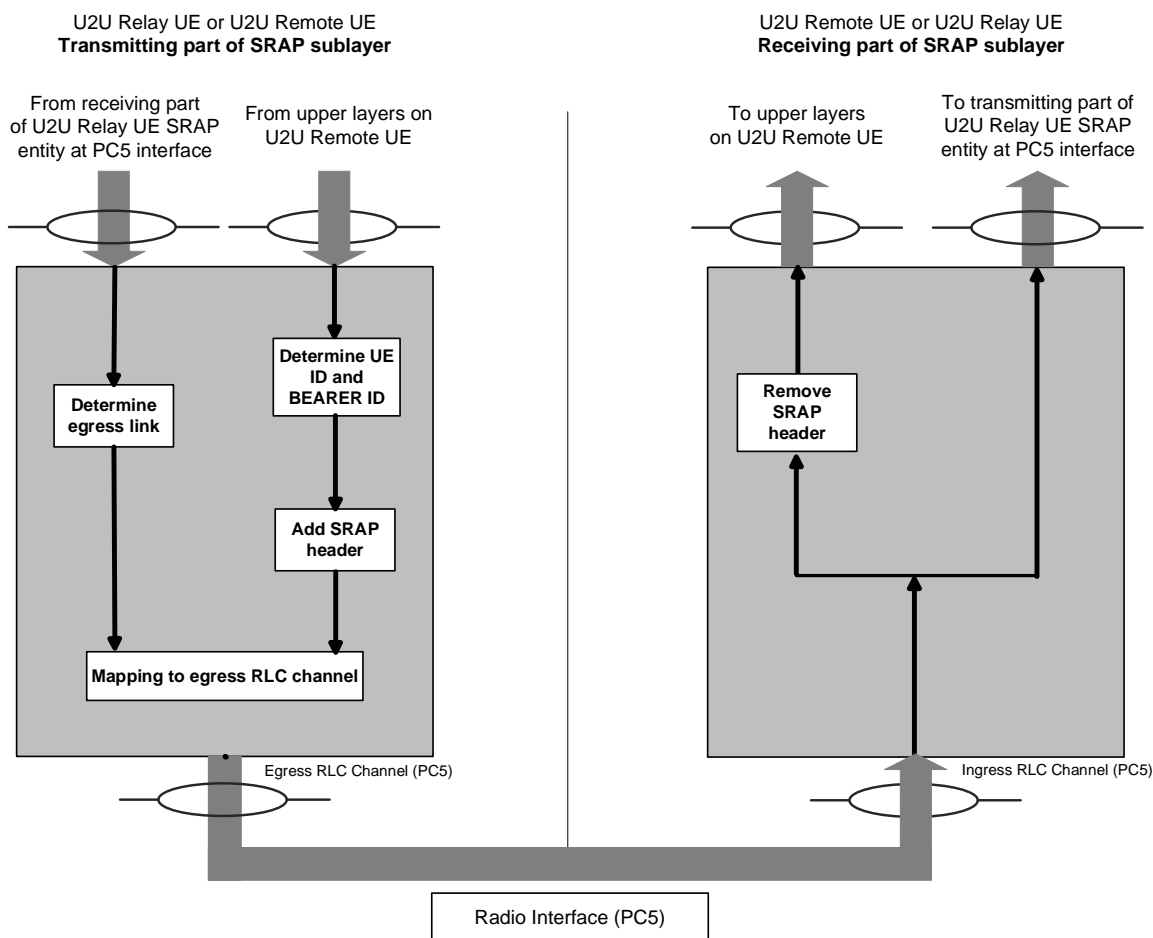
**Figure 4.2.2-4: Example of functional view of SRAP sublayer at PC5 interface in U2U Relay case**

In the example of Figure 4.2.2-4, at U2U relay UE:

- For U2U data packet, the receiving part on the SRAP entity of PC5 interface between the U2U Relay UE and the U2U Remote UE delivers U2U SRAP Data PDUs to the transmitting part on the SRAP entity of PC5 interface between the U2U Relay UE and the peer U2U Remote UE. As an alternative, the receiving part may deliver SRAP SDUs to the transmitting part on the SRAP entity. When passing SRAP SDUs, the receiving part removes the SRAP header and the transmitting part of the relay UE adds the SRAP header with the same SRAP header content as carried on the U2U SRAP Data PDU header prior to removal. Passing SRAP SDUs in this manner is therefore functionally equivalent to passing U2U SRAP Data PDUs, in implementation. The following specification therefore refers to the passing of SRAP data packets.

# 4.3 Services

## 4.3.1 Services provided to upper layers

The following services are provided by the SRAP sublayer to upper layers:

- Data transfer.

## 4.3.2 Services expected from lower layers

An SRAP sublayer expects the following services from lower layers per RLC entity (for a detailed description see TS 38.322 [4]):

- Acknowledged data transfer service;

- Unacknowledged data transfer service.

## 4.4 Functions

The SRAP sublayer supports the following functions:

- Data transfer;

- Determination of UE ID field and BEARER ID field for data packets;

- Determination of egress link;

- Determination of egress RLC channel.

## 4.5 Configurations

The configuration of the SRAP entity for U2N Remote UE includes:

- Mapping from a radio bearer identified by BEARER ID field to egress PC5 Relay RLC channel via RRC;

- The local identity via RRC.

The configuration of the SRAP entity for U2N Relay UE includes:

- The local identity for each U2N Remote UE via RRC;

- Mapping from a radio bearer identified by UE ID field and BEARER ID field to egress Uu Relay RLC channel for each U2N Remote UE via RRC;

- Mapping from a radio bearer identified by UE ID field and BEARER ID field to egress PC5 Relay RLC channel for each U2N Remote UE via RRC.

The configuration of the SRAP entity for U2U Remote UE includes:

- Mapping from a sidelink radio bearer identified by BEARER ID field to egress PC5 Relay RLC channel for each U2U Remote UE pair;

- The local identities.

The configuration of the SRAP entity for U2U Relay UE includes:

- Mapping from a sidelink radio bearer identified by BEARER ID field to egress PC5 Relay RLC channel for each U2U Remote UE pair and each direction of data transfer.

# 5 Procedures

## 5.1 SRAP entity handling

### 5.1.1 SRAP entity establishment

When upper layers request establishment of an SRAP entity, UE shall:

- Establish an SRAP entity;

- Follow the procedures in clause 5.

### 5.1.2 SRAP entity release

When upper layers request release of an SRAP entity, UE shall:

- Release the SRAP entity and the related SRAP configurations.

# 5.2 DL Data transfer

## 5.2.1 Receiving operation of U2N Relay UE

Upon receiving an SRAP Data PDU from lower layer, the receiving part of the SRAP entity on the Uu interface of U2N Relay UE shall:

- Deliver the SRAP data packet to the transmitting part of the collocated SRAP entity on the PC5 interface.

## 5.2.2 Transmitting operation of U2N Relay UE

### 5.2.2.0 General

The transmitting part of the SRAP entity on the PC5 interface of U2N Relay UE receives SRAP data packets from the receiving part of the SRAP entity on the Uu interface of the same U2N Relay UE, and construct SRAP Data PDUs as needed (see clause 4.2.2).

When the transmitting part of the SRAP entity on the PC5 interface has an SRAP Data PDU to transmit, the transmitting part of the SRAP entity on the PC5 interface shall:

- Determine the egress link in accordance with clause 5.2.2.1;

- Determine the egress RLC channel in accordance with clause 5.2.2.2;

- If the SRAP Data PDU is for SRB0 (the BEARER ID field is 0, and the bearer is identified as SRB based on *sl-RemoteUE-RB-Identity* associated with the entry containing the *sl-EgressRLC-ChannelUu* which matches the LCID of the Uu Relay RLC Channel from which the SRAP Data PDU is received):

    - Remove the SRAP header from the SRAP Data PDU;

- Submit this SRAP Data PDU to the determined egress RLC channel of the determined egress link.

### 5.2.2.1 Egress link determination

For a SRAP Data PDU to be transmitted, SRAP entity shall:

- If there is an entry in *sl-RemoteUE-ToAddModList*, whose *sl-LocalIdentity* included in *sl-SRAP-ConfigRelay* matches the UE ID field in SRAP Data PDU:

    - Determine the egress link on PC5 interface corresponding to *sl-L2IdentityRemote* configured for the concerned *sl-LocalIdentity* as specified in TS 38.331 [3].

### 5.2.2.2 Egress RLC channel determination

For a SRAP Data PDU to be transmitted, the SRAP entity shall:

- If the SRAP Data PDU is for SRB0 (the BEARER ID field is 0 and the bearer is identified as SRB based on *sl-RemoteUE-RB-Identity* associated with the entry containing the *sl-EgressRLC-ChannelUu* which matches the LCID of the Uu Relay RLC Channel from which the SRAP Data PDU is received):

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to *logicalChannelIdentity* for SL-RLC0 as specified in TS 38.331 [3].

- Else if there is an entry in *sl-RemoteUE-ToAddModList*, whose *sl-LocalIdentity* included in *sl-SRAP-ConfigRelay* matches the UE ID field in SRAP Data PDU, which includes an *sl-RemoteUE-RB-Identity* that matches the SRB identity or DRB identity of the SRAP Data PDU determined by the BEARER ID field (For the BEARER ID shared by both SRB and DRB, SRB and DRB are differentiated based on *sl-RemoteUE-RB-Identity* associated with the entry containing the *sl-EgressRLC-ChannelUu* which matches the LCID of the Uu Relay

RLC Channel from which the SRAP Data PDU is received, and for DRB, the DRB identity is BEARER ID plus 1):

- If the SRAP Data PDU is for SRB1 but the corresponding *sl-EgressRLC-ChannelPC5* is absent in *sl-SRAP-ConfigRelay*:

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to *logicalChannelIdentity* for SL-RLC1 as specified in TS 38.331 [3].

- Else:

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to *sl-EgressRLC-ChannelPC5* configured for the concerned *sl-LocalIdentity* and concerned *sl-RemoteUE-RB-Identity* as specified in TS 38.331 [3].

## 5.2.3 Receiving operation of U2N Remote UE

Upon receiving an SRAP Data PDU from lower layer, the receiving part of the SRAP entity shall:

- If the SRAP Data PDU is not for SRB0 (not received from SL-RLC0 as specified in TS 38.331 [3]):

    - If the SRAP Data PDU is received from SL-RLC1 as specified in TS 38.331 [3]:

        - Remove the SRAP header of this SRAP Data PDU and deliver the SRAP SDU to PDCP entity of SRB1 by ignoring the UE ID field and BEARER ID field of this SRAP Data PDU;

    - Else:

        - Remove the SRAP header of this SRAP Data PDU and deliver the SRAP SDU to upper layer entity corresponding to the BEARER ID field of this SRAP Data PDU (For the BEARER ID shared by both SRB and DRB, SRB and DRB are differentiated based on *sl-RemoteUE-RB-Identity* associated with the entry containing the *sl-EgressRLC-ChannelPC5* which matches LCID of the PC5 Relay RLC Channel from which the SRAP Data PDU is received, and for DRB, the DRB identity is BEARER ID plus 1);

- Else:

    - Deliver the SRAP SDU (i.e., same as SRAP PDU for SRB0) to upper layer, i.e., RRC layer entity (TS 38.331 [3]).

## 5.3 UL Data transfer

### 5.3.1 Transmitting operation of U2N Remote UE

The transmitting part of the SRAP entity on the PC5 interface of U2N Remote UE can receive SRAP SDU from upper layer and constructs SRAP Data PDU.

Upon receiving an SRAP SDU from upper layer, the transmitting part of the SRAP entity on the PC5 interface shall:

- If the SRAP SDU is not for SRB0:

    - Determine the UE ID field and BEARER ID field in accordance with clause 5.3.1.1;

    - Construct an SRAP Data PDU with SRAP header, where the UE ID field and BEARER ID field are set to the determined values, in accordance with clause 6.2.2;

- Else:

    - Construct an SRAP Data PDU without SRAP header in accordance with clause 6.2.2.

- Determine the egress RLC channel in accordance with clause 5.3.1.2;

- Submit this SRAP Data PDU to the determined egress RLC channel.

### 5.3.1.1 UE ID field and BEARER ID field determination

For an SRAP SDU received from upper layer, the SRAP entity shall:

- Determine the UE ID field corresponding to *sl-LocalIdentity*, configured as specified in TS 38.331 [3];

- Determine the BEARER ID field corresponding to SRB identity for SRB (i.e., set the BEARER ID field to *srb-Identity*), or corresponding to DRB identity minus 1 for DRB (i.e., set the BEARER ID field to *drb-Identity* minus 1), from which the SRAP SDU is received, configured as specified in TS 38.331 [3].

### 5.3.1.2 Egress RLC channel determination

For a SRAP Data PDU to be transmitted, the SRAP entity shall:

- If the SRAP Data PDU is for SRB0:

  - Determine the egress PC5 Relay RLC channel in the link with U2N Relay UE corresponding to *logicalChannelIdentity* for SL-RLC0 as specified in TS 38.331 [3].

- Else if the SRAP Data PDU is for SRB1 and if there is not an entry in *sl-MappingToAddModList*, whose *sl-RemoteUE-RB-Identity* matches the SRB identity of the SRAP Data PDU, or if there is an entry in *sl-MappingToAddModList* without the corresponding *sl-EgressRLC-ChannelPC5*:

  - Determine the egress PC5 Relay RLC channel in the link with U2N Relay UE corresponding to *logicalChannelIdentity* for SL-RLC1 as specified in TS 38.331 [3].

- Else if there is an entry in *sl-MappingToAddModList*, whose *sl-RemoteUE-RB-Identity* matches the SRB identity or DRB identity of the SRAP Data PDU:

  - Determine the egress PC5 Relay RLC channel of the link with U2N Relay UE corresponding to *sl-EgressRLC-ChannelPC5* configured for the concerned *sl-RemoteUE-RB-Identity* as specified in TS 38.331 [3].

## 5.3.2 Receiving operation of U2N Relay UE

Upon receiving an SRAP Data PDU from lower layer, the receiving part of the SRAP entity on the PC5 interface shall:

- Deliver the SRAP data packet to the transmitting part of the collocated SRAP entity on the Uu interface.

## 5.3.3 Transmitting operation of U2N Relay UE

The transmitting part of the SRAP entity on the Uu interface of U2N Relay UE can receive SRAP data packets from the receiving part of the SRAP entity on the PC5 interface of the same U2N Relay UE, and construct SRAP Data PDUs as needed (see clause 4.2.2).

When the transmitting part of the SRAP entity on the Uu interface has an SRAP Data PDU to transmit, the transmitting part of the SRAP entity on the Uu interface shall:

- If the SRAP Data PDU is received from SL-RLC0 as specified in TS 38.331 [3]:

  - Determine the UE ID field and BEARER ID field in accordance with clause 5.3.3.1;

  - Construct an SRAP Data PDU with SRAP header, where the UE ID field and BEARER ID field are set to the determined values, in accordance with clause 6.2.2;

- Determine the egress RLC channel in accordance with clause 5.3.3.2;

- Submit this SRAP Data PDU to the determined egress RLC channel.

### 5.3.3.1 UE ID field and BEARER ID field determination

For an SRAP Data PDU received from SL-RLC0 as specified in TS 38.331 [3], the SRAP entity shall:

- If there is an entry in *sl-RemoteUE-ToAddModList*, whose *sl-L2IdentityRemote* matches the Layer-2 ID of the remote UE from which the SRAP Data PDU is received:

  - Determine the UE ID field corresponding to *sl-LocalIdentity* configured for the concerned *sl-L2IdentityRemote* as specified in TS 38.331 [3];

  - Determine the BEARER ID field as 0 (i.e., set BEARER ID field as 0).

### 5.3.3.2 Egress RLC channel determination

For a SRAP Data PDU to be transmitted, the SRAP entity shall:

- If there is an entry in *sl-RemoteUE-ToAddModList*, whose *sl-LocalIdentity* included in *sl-SRAP-ConfigRelay* matches the UE ID field in SRAP Data PDU:

  - If the SRAP Data PDU is for SRB0:

    - Determine the egress Uu Relay RLC channel corresponding to *sl-EgressRLC-ChannelUu* configured for SRB0 for the concerned *sl-LocalIdentity* as specified in TS 38.331 [3].

  - Else if the SRAP Data PDU is received from SL-RLC1 as specified in TS 38.331 [3]:

    - Determine the egress Uu Relay RLC channel corresponding to *sl-EgressRLC-ChannelUu* configured for SRB1 for the concerned *sl-LocalIdentity* as specified in TS 38.331 [3].

- Else if there is an entry in *sl-RemoteUE-ToAddModList* which includes an *sl-RemoteUE-RB-Identity* matches SRB identity or DRB identity of the SRAP Data PDU determined by the BEARER ID field (For the BEARER ID shared by both SRB and DRB, SRB and DRB are differentiated based on *sl-RemoteUE-RB-Identity* associated with the entry containing the *sl-EgressRLC-ChannelPC5* which matches LCID of the PC5 Relay RLC Channel from which the SRAP Data PDU is received, and for DRB, the DRB identity is BEARER ID plus 1):

  - Determine the egress Uu Relay RLC channel corresponding to *sl-EgressRLC-ChannelUu* configured for the concerned *sl-LocalIdentity* and concerned *sl-RemoteUE-RB-Identity* as specified in TS 38.331 [3].

# 5.3a U2U SL Data transfer

## 5.3a.1 Transmitting operation of U2U Remote UE

### 5.3a.1.1 General

The transmitting part of the SRAP entity on the PC5 interface of U2U Remote UE can receive SRAP SDU from upper layer and constructs U2U SRAP Data PDU.

Upon receiving an SRAP SDU from upper layer, the transmitting part of the SRAP entity on the PC5 interface shall:

- Determine the UE ID fields, egress link and BEARER ID field in accordance with clause 5.3a.1.2;

- Construct an U2U SRAP Data PDU with SRAP header, where the UE ID fields and BEARER ID field are set to the determined values, in accordance with clause 6.2.2;

- Determine the egress RLC channel in accordance with clause 5.3a.1.3;

- Submit this U2U SRAP Data PDU to the determined egress PC5 Relay RLC channel of the determined egress link.

### 5.3a.1.2 UE ID fields and BEARER ID field determination

For an U2U SRAP SDU received from upper layer, the SRAP entity shall:

- Determine the UE ID (for SRC) field corresponding to *sl-RemoteUE-LocalIdentity* configured for the concerned *sl-RemoteUE-L2Identity* and UE ID (for DST) field corresponding to *sl-PeerRemoteUE-LocalIdentity* configured for the concerned *sl-PeerRemoteUE-L2Identity* as specified in TS 38.331 [3];

- Determine the egress link on PC5 interface towards the U2U relay UE based on the concerned *sl-RemoteUE-L2Identity* and *sl-PeerRemoteUE-L2Identity* as specified in TS 38.331 [3];

- Determine the BEARER ID field for SL-SRBs as the fixed value (i.e., set 0/1/2/3 for SL-SRB0/1/2/3 respectively) or for SL-DRBs as the 5 LSBs of *slrb-PC5-ConfigIndex* used in end-to-end SL DRB configuration procedure as specified in TS 38.331 [3].

### 5.3a.1.3    Egress RLC channel determination

For a U2U SRAP Data PDU to be transmitted, the SRAP entity shall:

- If the U2U SRAP Data PDU is for SL SRB (i.e., the BEARER ID field is 0/1/2/3):

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to *logicalChannelIdentity* for SL-U2U-RLC as specified in TS 38.331 [3].

- Else if the U2U SRAP Data PDU is for SL DRB:

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to SRAP configuration indicated by upper layer for the concerned bearer as specified in TS 38.331 [3].

## 5.3a.2    Receiving operation of U2U Relay UE

Upon receiving an U2U SRAP Data PDU from lower layer, the receiving part of the SRAP entity on the PC5 interface between the U2U Relay UE and the U2U Remote UE shall:

- Deliver the SRAP data packet to the transmitting part of the SRAP entity on the PC5 interface between the U2U Relay UE and the peer U2U Remote UE.

## 5.3a.3    Transmitting operation of U2U Relay UE

### 5.3a.3.1    General

The transmitting part of the SRAP entity of U2U Relay UE on the PC5 interface between the U2U Relay UE and the peer U2U Remote UE can receive SRAP data packets from the receiving part of the SRAP entity of the same U2U Relay UE on the PC5 interface between the U2U Relay UE and the U2U Remote UE, and constructs U2U SRAP Data PDUs as needed (see clause 4.2.2).

When the transmitting part of the SRAP entity of the U2U Relay UE has an U2U SRAP Data PDU to transmit on the PC5 interface between U2U Relay UE and the peer U2U Remote UE, the transmitting part of the SRAP entity of U2U Relay UE shall:

- Determine the egress link in accordance with clause 5.3a.3.2;

- Determine the egress RLC channel in accordance with clause 5.3a.3.3;

- Submit this U2U SRAP Data PDU to the determined egress RLC channel of the determined egress link.

### 5.3a.3.2    Egress link determination

For a U2U SRAP Data PDU to be transmitted, the SRAP entity shall:

- If there is an entry in *sl-LocalID-PairToAddModList*, in which the *sl-RemoteUE-LocalIdentity* and *sl-PeerRemoteUE-LocalIdentity* match the UE ID fields in the U2U SRAP Data PDU:

    - Determine the egress link on PC5 interface towards the peer U2U remote UE identified by *sl-PeerRemoteUE-L2Identity* configured for the concerned *sl-PeerRemoteUE-LocalIdentity* as specified in TS 38.331 [3].

### 5.3a.3.3    Egress RLC channel determination

For a U2U SRAP Data PDU to be transmitted, the SRAP entity shall:

- If the U2U SRAP Data PDU is for SRB (i.e., the BEARER ID field is 0/1/2/3):

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to *logicalChannelIdentity* for SL-U2U-RLC as specified in TS 38.331 [3].

- Else if the U2U SRAP Data PDU is for DRB:

    - Determine the egress PC5 Relay RLC channel in the determined egress link corresponding to SRAP configuration indicated by upper layer for the concerned bearer as specified in TS 38.331 [3].

## 5.3a.4    Receiving operation of U2U Remote UE

Upon receiving an U2U SRAP Data PDU from lower layer, the receiving part of the SRAP entity shall:

- Remove the SRAP header of this U2U SRAP Data PDU and deliver the U2U SRAP SDU to upper layer entity corresponding to the BEARER ID and UE ID fields of this U2U SRAP Data PDU.

## 5.4    Handling of unknown, unforeseen, and erroneous protocol data

For U2N Remote UE, if *sl-LocalIdentity* and *sl-RemoteUE-RB-Identity* are both configured, when a SRAP Data PDU with SRAP header that contains a UE ID field or BEARER ID field which does not match *sl-LocalIdentity* or *sl-RemoteUE-RB-Identity* included in *sl-SRAP-ConfigRemote* is received, the SRAP entity shall:

- Discard the received SRAP Data PDU.

For U2N Relay UE, when a SRAP Data PDU with SRAP header that contains a UE ID field or BEARER ID field which does not match *sl-LocalIdentity* or *sl-RemoteUE-RB-Identity* included in *sl-SRAP-ConfigRelay* is received except in the case where the SRAP Data PDU from SL-RLC1 as specified in TS 38.331 [3] is the first SRAP Data PDU received from a U2N Remote UE, or when a SRAP Data PDU that contains a UE ID which does not match the concerned *sl-LocalIdentity* corresponding to *sl-L2IdentityRemote* of the ingress link is received by U2N Relay UE, the SRAP entity shall:

- Discard the received SRAP Data PDU.

For U2U Remote UE, if *sl-RemoteUE-LocalIdentity* and *sl-PeerRemoteUE-LocalIdentity* are both configured, when a SRAP Data PDU with SRAP header that contains UE ID fields which does not match *sl-PeerRemoteUE-LocalIdentity* and *sl-RemoteUE-LocalIdentity* included in *sl-SRAP-ConfigPC5* or a SRAP Data PDU with SRAP header that contains BEARER ID field which does not match 0/1/2/3 or the 5 bits LSBs of *slrb-PC5-ConfigIndex* used in end-to-end SL DRB configuration procedure is received, the SRAP entity shall:

- Discard the received SRAP Data PDU.

For U2U Relay UE, when a SRAP Data PDU with SRAP header that contains a DST UE ID field which does not match *sl-PeerRemoteUE-LocalIdentity* included in *sl-SRAP-ConfigPC5* configured by the U2U Relay UE or a SRAP Data PDU with SRAP header contains BEARER ID field which does not match 0/1/2/3 or the 5 bits LSBs of *slrb-PC5-ConfigIndex* used in end-to-end SL DRB configuration procedure is received, or when a SRAP Data PDU that contains a SRC UE ID field which does not match the concerned *sl-RemoteUE-LocalIdentity* corresponding to *sl-RemoteUE-L2Identity* of the ingress link is received by U2U Relay UE, the SRAP entity shall:

- Discard the received SRAP Data PDU.

When any of the U2N Remote UE, the U2N Relay UE, the U2U Remote UE or the U2U Relay UE receives a SRAP PDU with invalid or reserved values, the SRAP entity shall:

- Discard the received SRAP PDU.

# 6 Protocol data units, formats, and parameters

## 6.1 Protocol data units

### 6.1.1 Data PDU

The SRAP Data PDU is used to convey the following with or without the PDU header:

- Upper layer data.

## 6.2 Formats

### 6.2.1 General

An SRAP Data PDU is a bit string that is byte aligned (i.e. multiple of 8 bits) in length. The formats of SRAP Data PDUs are described in clause 6.2.2 and their parameters are described in clause 6.3.

### 6.2.2 Data PDU

Figure 6.2.2-1 shows the format of the U2N SRAP Data PDU with SRAP header being configured. This SRAP Data PDU format is applicable to U2N SRAP SDU except those for SRB0 delivered over PC5 interface.



**Figure 6.2.2-1: U2N SRAP Data PDU format with SRAP header**

Figure 6.2.2-2 shows the format of the U2N SRAP Data PDU consisting only of a data field without any SRAP header. This SRAP Data PDU format is applicable to U2N SRAP SDU for SRB0 delivered over PC5 interface.
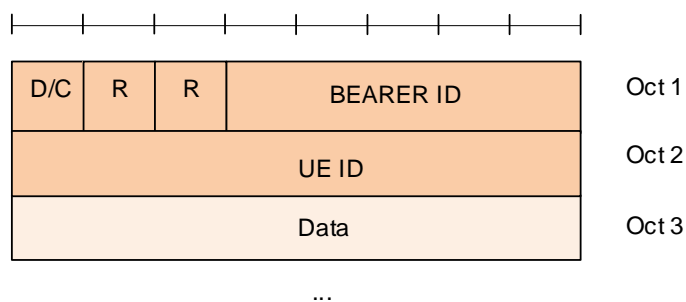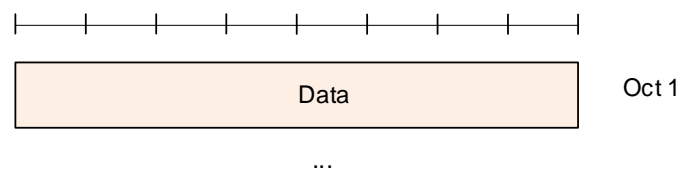


**Figure 6.2.2-2: U2N SRAP Data PDU format without SRAP header**

Figure 6.2.2-3 shows the format of the U2U SRAP Data PDU. This SRAP Data PDU format is applicable to U2U SRAP SDU delivered over PC5 interface.
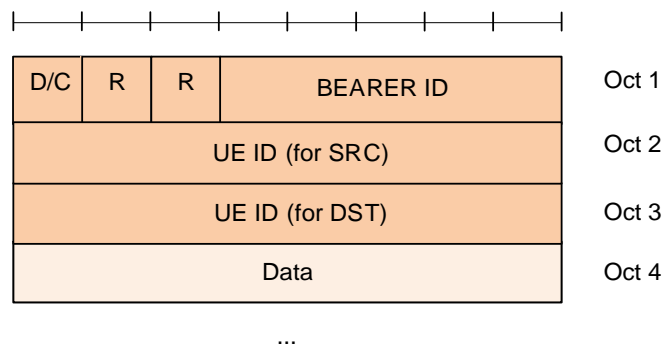
| D/C | R | R | BEARER ID | Oct 1 |
|-----|---|---|-----------|-------|
| UE ID (for SRC) | | | | Oct 2 |
| UE ID (for DST) | | | | Oct 3 |
| Data | | | | Oct 4 |

...

**Figure 6.2.2-3: U2U SRAP Data PDU format with SRAP header**

# 6.3 Parameters

## 6.3.1 General

If not otherwise mentioned in the definition of each field the bits in the parameters shall be interpreted as follows: the left most bit is the first and most significant and the right most bit is the last and least significant bit.

Unless otherwise mentioned, integers are encoded in standard binary encoding for unsigned integers. In all cases the bits appear ordered from MSB to LSB when read in the PDU.

## 6.3.2 UE ID

Length: 8 bits.

In U2N Relay case, this field carries local identity of U2N Remote UE. In U2U Relay case, there are two UE ID fields: first one carrying the local identity of SRC U2U Remote UE, second one carrying the local identity of DST U2U Remote UE.

## 6.3.3 BEARER ID

Length: 5 bits.

In U2N Relay case, this field carries information to identify Uu radio bearer for U2N Remote UE. For SRBs, the value is set to SRB Identity (which is configured by RRC parameter *srb-Identity*). For DRBs, the value is set to DRB Identity (which is configured by RRC parameter *drb-Identity*) minus 1.

In U2U Relay case, this field carries information to identify end-to-end PC5 radio bearer for U2U Remote UE. For SL-SRBs, the value is set to 0/1/2/3 for SL-SRB 0/1/2/3 respectively. For SL-DRBs, the value is set to the 5 LSBs of *slrb-PC5-ConfigIndex* used in end-to-end SL DRB configuration procedure as specified in TS 38.331 [3].

## 6.3.4 Data

Length: Variable

This field carries the SRAP SDU (i.e. PDCP PDU or RRC PDU).

## 6.3.5 R

Length: 1 bit

Reserved. In this release, reserved bits shall be set to 0. Reserved bits shall be ignored by the receiver.

# 6.3.6 D/C

Length: 1 bit

This field indicates whether the corresponding SRAP PDU is an SRAP Data PDU or an SRAP Control PDU (not used in this release).

**Table 6.3.6-1: D/C field**

| Bit | Description |
|-----|-------------|
| 0 | SRAP Data PDU |
| 1 | SRAP Control PDU (not used in this release) |

# Annex A (informative): Change history

| Change history | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 11/2021 | RAN2#116 | R2-2109400 | | | | Skeleton | 0.0.0 |
| 11/2021 | RAN2#116 | R2-2111485 | | | | Skeleton update | 0.0.1 |
| 11/2021 | RAN2#116 | R2-2111489 | | | | Capture the agreement till R2#116 | 0.1.0 |
| 01/2022 | RAN2#116bis | R2-2200364 | | | | Capture the agreement till R2#116 that related to the 38.331 running CR | 0.2.0 |
| 01/2022 | RAN2#116bis | R2-2201996 | | | | Capture the agreement during R2#116bis | 0.3.0 |
| 02/2022 | RAN2#117 | R2-2202276 | | | | Capture the agreement till R2#116bis that related to the 38.331 running CR | 0.4.0 |
| 02/2022 | RAN2#117 | R2-2203594 | | | | Capture the agreement during R2#117 | 0.5.0 |
| 03/2022 | RAN#95 | RP-220794 | | | | Submit to RAN for approval | 1.0.0 |
| 03/2022 | RP-95 | | | | | Upgraded to Rel-17 by MCC | 17.0.0 |
| 06/2022 | RP-96 | RP-221732 | 0001 | 1 | F | Correction on SRAP for L2 UE-to-Network Relay | 17.1.0 |
| 09/2022 | RP-97 | RP-222524 | 0009 | 2 | F | Correction on SRAP for L2 U2N Relay | 17.2.0 |
| 12/2022 | RP-98 | RP-223412 | 0012 | 2 | F | Corrections for L2 U2N Relay | 17.3.0 |
| 03/2023 | RP-99 | RP-230692 | 0015 | 1 | F | Corrections on SRAP for SL relay | 17.4.0 |
| | RP-99 | RP-230692 | 0016 | 1 | F | Correction to error handling in SRAP | 17.4.0 |
| | RP-99 | RP-230692 | 0017 | 2 | F | Correction on SRAP for L2 U2N Relay | 17.4.0 |
| | RP-99 | RP-230692 | 0018 | - | F | 38.351 SRAP corrections | 17.4.0 |
| 06/2023 | RP-100 | RP-231416 | 0020 | 3 | F | Corrections on SRAP for SL relay | 17.5.0 |
| | RP-100 | RP-231416 | 0021 | 1 | F | Corrections on SRAP for SL relay | 17.5.0 |
| | RP-100 | RP-231416 | 0022 | 1 | F | Clarification on the SRAP configuration used in SRAP | 17.5.0 |
| 09/2023 | RP-101 | RP-232667 | 0023 | - | F | Correction of IE name sl-SRAP-ConfigRemote | 17.6.0 |
| | RP-101 | RP-232667 | 0024 | 2 | F | Correction on SRAP for sidelink relay | 17.6.0 |
| | RP-101 | RP-232667 | 0025 | 1 | F | Clarification on the BEARER ID in SRAP data PDU | 17.6.0 |
| 12/2023 | RP-102 | RP-233904 | 0027 | 3 | B | Introduction of NR sidelink relay enhancements | 18.0.0 |
| 03/2024 | RP-103 | RP-240700 | 0030 | 1 | F | Corrections for NR sidelink relay enhancements | 18.1.0 |
| | RP-103 | RP-240657 | 0032 | 2 | A | Miscellaneous corrections for NR sidelink relay enhancements | 18.1.0 |

# History

| Document history | | |
|---|---|---|
| V18.1.0 | May 2024 | Publication |
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