**3GPP TSG-RAN2 Meeting # 124 *R2-2311881***

**Chicago, USA, November 13 - 17**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.351** | **CR** | **0027** | **rev** | **-** | **Current version:** | **17.6.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Introduction of NR sidelink relay enhancements |
|  |  |
| ***Source to WG:*** | OPPO |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_SL\_relay\_enh-Core |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Rel18 features for NR sidelink relay enhancements are introduced. |
|  |  |
| ***Summary of change:*** | Rel18 features for NR sidelink relay enhancements are introduced. |
|  |  |
| ***Consequences if not approved:*** | Rel18 features for NR sidelink relay enhancements are not supported. |
|  |  |
| ***Clauses affected:*** | 3.1, 3.2, 4.2.2, 4.5, 5.x, 5.x.1, 5.x.1.1, 5.x.1.2, 5.x.2, 5.x.3, 5.x.3.1, 5.x.3.2, 5.x.4, 5.4, 6.2.2, 6.3, 6.3.1, 6.3.2, 6.3.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS 38.331 CR 4441TS 38.300 CR ...TS 38.304 CR 0365TS 38.323 CR 0127TS 38.322 CR 0054TS 38.321 CR 1703 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*Start of Change*

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

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### 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.

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## 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.

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## 5.x U2U SL Data transfer

### 5.x.1 Transmitting operation of U2U Remote UE

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 and BEARER ID field in accordance with clause 5.x.1.1;

- 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.x.1.2;

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

#### 5.x.1.1 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* and UE ID (for DST) field corresponding to *sl-PeerRemoteUE-LocalIdentity*, configured 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.x.1.2 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 corresponding to *SL-U2U-RLC* as specified in TS 38.33 [3] for the determined egress link.

- Else if the SRAP Data is for DRB, and if there is an entry in SRAP configuration from the network as specified in TS 38.331 [3], whose bearer IDmatches the DRB identityof the U2U SRAP Data PDU:

- Determine the egress PC5 Relay RLC channel corresponding to RLC channel ID configured for the concerned bearer ID as specified in TS 38.331 [3] for the determined egress link.

### 5.x.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.x.3 Transmitting operation of U2U Relay UE

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.x.3.1;

- Determine the egress RLC channel in accordance with clause 5.x.3.2;

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

#### 5.x.3.1 Egress link determination

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

- Determine the egress link on PC5 interface towards the peer U2U remote UE based on the UE ID fields in the U2U SRAP Data PDU.

#### 5.x.3.2 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 corresponding to *SL-U2U-RLC* as specified in TS 38.33 [3] for the determined egress link.

- Else if the U2U SRAP Data PDU is for DRB, and if there is an entry in SRAP configuration from the network as specified in TS 38.331 [3], whose bearer IDmatches the DRB identityof the U2U SRAP Data PDU:

- Determine the egress PC5 Relay RLC channel corresponding to RLC channel configured for the concerned bearer ID as specified in TS 38.331 [3] for the determined egress link.

### 5.x.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.

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## 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 linkis received by U2N 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.

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### 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.



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

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## 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, two such fields are present, one for local identity of each 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].

*End of Change*