**3GPP TSG-RAN WG2 Meeting #118 electronicR2-20xxxx**

**Online, May 09-20, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **37.985** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.1.1** |  |
|  |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)*** *on using this form: comprehensive instructions can be found at <http://www.3gpp.org/Change-Requests>.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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|  |
| ***Title:***  | Draft CR to introduce Rel-17 sidelink relay and discovery for TR 37.985 |
|  |  |
| ***Source to WG:*** | ZTE, Sanechips |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_SL\_Relay-Core  |  | ***Date:*** | 2022-04-21 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | SL relay and discovery operation should be added to TR 37.985. |
|  |  |
| ***Summary of change:*** | Add SL relay and discovery operation to TR 37.985.  |
|  |  |
| ***Consequences if not approved:*** | SL relay and discovery operation in TR 37.985 is not completed. |
|  |  |
| ***Clauses affected:*** | 2,3,6 |
|  |  |
|  | Y | N |  |  |
| ***Other specs*** |  | **X** |  Other core specifications | TS/TR ... CR ... |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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*Start Change*

# 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 TR 36.885: "Study on LTE-based V2X Services".

[3] ETSI EN 302 637-2: "Specification of Cooperative Awareness Basic Service".

[4] SAE J2735: "Dedicated Short Range Communications (DSRC) Message Set Dictionary".

[5] ETSI EN 302 637-3 "Specifications of Decentralized Environmental Notification Basic Service".

[6] 3GPP TS 22.185: "Service requirements for V2X services".

[7] 3GPP TS 22.186: "Enhancement of 3GPP support for V2X scenarios".

[8] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation".

[9] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[10] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC)".

[11] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[12] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Measurements".

[13] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[14] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC)".

[15] 3GPP TS 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP)".

[16] 3GPP TS 38.211: "NR; Physical channels and modulation".

[17] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[18] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[19] 3GPP TS  37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Stage 2".

[20] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[21] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[22] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[23] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

*Next 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].

**example:** text used to clarify abstract rules by applying them literally.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

## 3.3 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].

Where the same abbreviation is used for LTE V2X and NR V2X, which is meant can be derived from the clause within which it appears, unless otherwise stated.

5GC Fifth Generation core network

AGC Automatic gain control

AMBR Aggregate maximum bit rate

BSM Basic safety message

BWP Bandwidth part

CA Carrier aggregation

CAM Cooperative awareness message

CBR Channel busy ratio

CPS Contiguous partial sensing

CR Channel occupancy ratio

DENM Decentralized environmental notification message

DMRS Demodulation reference signal

DRX Discontinuous reception

EPC Evolved packet core

L2 Layer-2

L3 Layer-3

MBSFN Multicast-broadcast single-frequency network

MNO Mobile network operator

PBPS Periodic-based partial sensing

PPPP ProSe per-packet priority

PPPR ProSe per-packet reliability

PSBCH Physical sidelink broadcast channel

PSCCH Physical sidelink control channel

PSSCH Physical sidelink shared channel

PSSS, S-PSS Primary sidelink synchronization signal (LTE), sidelink primary synchronization signal (NR)

PT-RS Phase-tracking reference signal

P-UE Pedestrian UE

RSU Roadside unit

SA Scheduling assignment

SCI Sidelink control information

SC-PTM Single-cell point-to-multipoint

SL-BCH Sidelink broadcast channel

SLSS Sidelink synchronization signal

SRAP Sidelink Relay Adaptation Protocol

S-RSSI Sidelink received signal strength indicator

S-SSB Sidelink synchronization signal block

SSSS, S-SSS Secondary sidelink synchronization signal (LTE), sidelink secondary synchronization signal (NR)

U2N UE-to-Network

V2I Vehicle-to-infrastructure

V2P Vehicle-to-pedestrian

V2V Vehicle-to-vehicle

V2X Vehicle-to-everything

*Next Change*

## 6.x Sidelink Relay

Sidelink-based UE-to-Network relaying functionality is specified in order to support network coverage extension and power efficiency. Both L2 and L3 U2N Relay architectures are supported.

For L3 U2N Relay, the coresponding architecture is transparent to the serving RAN of the L3 U2N Relay UE, except for controlling sidelink resources. The detailed architecture and procedures for L3 U2N Relay can be found in TS 23.304 [23].

For L2 U2N Relay, the L2 U2N Remote UE establishes the RRC connection with gNB via a L2 U2N Relay UE. A single unicast link is established between one L2 U2N Relay UE and one L2 U2N Remote UE. The protocol stacks for the user plane and control plane of L2 U2N Relay architecture are presented in Figure 6.x-1 and Figure 6.x-2 (specified in TS 38.300 [20, clause 16.12.2.1]). A new sublayer(i.e. SRAP sublayer) is placed above the RLC sublayer for both CP and UP at both PC5 interface and Uu interface for bearer mapping purpose. The SRAP header include the Uu RB ID of L2 U2N Remote UE and a local Remote UE ID. The SRAP sublayer of L2 U2N Relay UE performs bearer mapping according to the local Remote UE ID and Uu RB ID included in both PC5 SRAP header and Uu SRAP header.



Figure 6.x-1: User plane protocol stack for L2 UE-to-Network Relay



Figure 6.x-2: Control plane protocol stack for L2 UE-to-Network Relay

For both L3 U2N relay and L2 U2N relay, the U2N remote UE need to perform the U2N relay discovery and relay selection. The relay discovery can refer to clause 6.y. For the relay selection, a U2N Relay UE is considered suitable by a U2N Remote UE in terms of radio criteria if the PC5 link quality measured by U2N Remote UE towards the U2N Relay UE exceeds (pre)configured threshold. The U2N Remote UE searches for suitable U2N Relay UE candidates that meet all AS layer and higher layer criteria. If there are multiple such suitable U2N Relay UEs, it is up to U2N Remote UE implementation to choose one U2N Relay UE among them.

Once U2N remote UE select a suitable U2N relay UE, it establishes the PC5 connection with U2N relay UE. For the L2 U2N remote UE, it needs to further establish its own PDU sessions and DRBs with the network before user plane data transmission. The RRC connection management for L2 U2N remote UE is specified in TS 38.300[20, 16.12.5.1].

The in-coverage L2 U2N Remote UE is allowed to acquire any necessary SIB(s) over Uu interface irrespective of its PC5 connection to L2 U2N Relay UE. The L2 U2N Remote UE can also receive the system information from the L2 U2N Relay UE after PC5 connection establishment with L2 U2N Relay UE.

When both L2 U2N Relay UE and L2 U2N Remote UE are in RRC IDLE or RRC INACTIVE, the L2 U2N Relay UE monitors paging occasions of its connected U2N Remote UE(s). When L2 U2N Relay UE is in RRC CONNECTED and L2 U2N Remote UE(s) is in RRC\_IDLE or RRC\_INACTIVE, the L2 U2N relay UE may monitors POs of its connected L2 U2N Remote UE(s) or receive the L2 U2N remote UE’s paging via dedicated RRC message from the gNB. Upon receving the paging message, L2 U2N relay UE sends relevant paging record to the L2 U2N Remote UE accordingly.

For service continuity of L2 U2N relay, the L2 U2N remote UE’s switching between indirect and direct path is supported, detailed procedure is specified in TS 38.300[20, clause 16.12.6].

## 6.y Sidelink Discovery

The UE may perform NR sidelink discovery while in-coverage or out-of-coverage for L2 relay, L3 relay and non-relay operation. Model A and Model B discovery models are defined in TS 23.304 [23]. The protocol stack used for discovery is presented in Figure 6.y-1 as specified in TS 38.300 [20, clause 16.12.3].



Figure 6.y-1: Protocol Stack of Sidelink Discovery

For L2 and L3 relay discovery, the network may broadcast a threshold, which is used by the U2N Remote UE to determine if it can transmit Relay discovery messages to U2N Relay UE(s). The network may also broadcast a maximum Uu RSRP threshold and/or a minimum Uu RSRP threshold, which are used by the U2N Relay UE to determine if it can transmit Relay discovery messages to U2N Remote UE(s).

For L2 and L3 relay discovery, the resource pool(s) used for NR sidelink communication can be used for Relay discovery or the network may configure a resource pool(s) dedicated for Relay discovery. Whether a dedicated resource pool(s) for Relay discovery is configured is based on network implementation.

*End of Change*