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# Foreword

This Technical Report 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 is related to Study on NR Sidelink Relay with a scope as defined in [2].

The document describes NR enhancements to sidelink relay, which were analyzed as part of the study such as sidelink-based UE-to-network and UE-to-UE relay, and discovery model/procedure for sidelink relaying.

# 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 RP-193253 "New SID: Study on NR sidelink relay".

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[x] <doctype> <#>[ ([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

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

Definition format (Normal)

**<defined term>:** <definition>.

**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 format (EW)

<symbol> <Explanation>

## 3.3 Abbreviations

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

Abbreviation format (EW)

<ABBREVIATION> <Expansion>

# 4 Sidelink-based UE-to-network Relay

## 4.1 Scenario, Assumption and Requirment

## 4.2 Discovery

## 4.3 Relay (re-)selection criterion and procedure

## 4.4 Relay/Remote UE authorization

## 4.5 Layer-2 Relay

### 4.5.1 Architecture and Protocol Stack

### 4.5.2 QoS

### 4.5.3 Security

### 4.5.4 Service Continuity

### 4.5.5 Control Plane Procedure

*Editor notes: This section is to describe CP procedure other than service continuity.*

## 4.6 Layer-3 Relay

### 4.6.1 Architecture and Protocol Stack

SA2 specified two user plane protocol stacks for L3 UE-to-NW relay in TR 23.752 (Figure 6.6.1-2 of solution#6 and Figure 6.23.2-3 of solution#23), which are illustrated in Figure 4.6-1 and Figure 4.6-2. No issues are identified to support them from RAN2 perspective, and RAN2 leaves future work to SA2.



Figure 4.6-1: user plane protocol stack of L3 UE-to-NW relay specified in solution#6 of [1]



Figure 4.6-2: user plane protocol stack of L3 UE-to-NW relay specified in solution#23 of [1]



Figure 4.6-3: basic connection setup procedure of L3 UE-to-NW relay based on Figure 6.6.2-1 of [1]

The basic connection setup procedure for the both SA2 specified protocol stacks is illustrated in Figure 4.6-3 which is based on Figure 6.6.2-1 in TS 23.752 [1]. Among them, the following procedures are identified with RAN2 impacts:

* Step 3: the discovery procedure, which are described in Section 4.2.
* Step 4: the relay (re)selection procedure, which are described in Section 4.3.
* Step 5: Rel-16 NR V2X PC5-RRC establishment procedure is reused to setup a secure unicast link between Remote UE and Relay UE before traffic relaying

Editor notes: whether new PC5-S signaling is introduced depends on SA2

RAN2 leaves design of control plane protocol stacks of L3 UE-to-NW relay to SA2.

### 4.6.2 QoS

The basic QoS support mechanism for L3 UE-to-NW relay is illustrated in Figure 4.6-4 from TR 23.752 [1].



Figure 4.6-4: basic QoS support meshanism of L3 UE-to-NW relay specified in [1]

SA2 specified two solutions for QoS support of L3 UE-to-NW relay:

1. PCF sets separate Uu QoS parameters and PC5 QoS parameters in solution#25 of [1].
2. End-to-End QoS support in solution#24 of [1], where relay can obtain a mapping between PQI and 5QI from SMF/PCF

No RAN2 impacts are identified.

Editor notes: whether other QoS solution is introduced depends on SA2.

### 4.6.3 Security

SA2 specified two solutions for security support of L3 UE-to-NW relay:

1. Hop-by-hop security (via legacy Uu security and PC5 security)
2. End-to-end security via N3IWF in solution #23 of TR 23.752

Editor notes: whether the SA2 specifeid solutions can satisfy the security requirement depends on SA3

Editor notes: whether other security solution is introduced depends on SA2.

### 4.6.4 Service Continuity

SA2 specified one solution for the service continuity of L3 UE-to-NW relay in upper layer via N3IWF (i.e. solution#23 in [1]). RAN2 didn’t identify RAN2 impact and thereby leave the evaluation of service continuity to SA2.

### 4.6.5 Control Plane Procedure

*Editor notes: This section is to describe CP procedure other than service continuity.*

# 5 Sidelink-based UE-to-UE Relay

## 5.1 Scenario, Assumption and Requirement

## 5.2 Discovery

*Editor notes: The need of discovery for UE-to-UE relay is FFS.*

## 5.3 Relay (re-)selection criterion and procedure

## 5.4 Relay/Remote UE authorization

## 5.5 Layer-2 Relay

### 5.5.1 Architecture and Protocol Stack

### 5.5.2 QoS

### 5.5.3 Security

### 5.5.4 Control Plane Procedure

## 5.6 Layer-3 Relay

### 5.6.1 Architecture and Protocol Stack

RAN2 leaves design of protocol stacks of L3 UE-to-UE relay to SA2.

### 5.6.2 QoS

### 5.6.3 Security

### 5.6.4 Control Plane Procedure

# 6 Comparison of Layer-2 and Layer-3 Relay

## 6.1 UE-to-Network Relay

## 6.2 UE-to-UE Relay

# 7 Conclusion

Annex A: Change history

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| **Change history** |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2020-08 | RAN2#110 | R2-2006602 |  |  |  | Skeleton TR | 0.0.0 |