3GPP TSG-SA WG2#150E e-meeting S2-22xxxxx

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**Source: CATT**

**Title: Solution for Layer-2 UE-to-UE Relay**

**Document for: Discussion/Approval**

**Agenda Item: 9.26**

**Work Item / Release: FS\_5G\_ProSe\_Ph2/Rel-18**

*Abstract of the contribution: This contribution proposes a solution for supporting Layer-2 UE-to-UE Relay.*

# Introduction

This paper proposes a Layer-2 UE-to-UE Relay solution that covers both UE-to-UE Relay discovery and UE-to-UE Relay communication.

# Proposal

It is proposed to capture the following texts into TR 23.700-33.

**>>>>Start Changes<<<<**

## 6.X Solution #X: Layer-2 UE-to-UE Relay discovery and communication

### 6.X.1 Description

The solution applies to Key Issue #1 "Support of UE-to-UE Relay".

In this solution, the Layer-2 UE-to-UE Relay operation is supported with the following principles:

- Authorization and configuration:

- Only the UE authorized by the service authorization configuration can act as a UE-to-UE Relay. These UEs will be configured according to the service authorization and provisioning solutions for Key Issue #6.

- UE-to-UE Relay discovery:

- Model A and Model B direct discovery as defined in clause 6.3.2 of TS 23.304 [3] are supported for UE-to-UE Relay discovery.

- Relay Service Code (RSC) is used to indicate the connectivity service that UE-to-UE Relay can support.

- In order to serve as a UE-to-UE Relay, it is required to discover other UEs in proximity in advance or on demand.

- The Source and Destination Layer-2 IDs used for discovery message are determined based on the principles as defined in clause 5.8 of TS 23.304 [3].

- The Layer-2 ID of Target UE is obtained by the Source UE during discovery procedure.

- UE-to-UE Relay communication:

- Source UE initiates the Layer-2 link establishment procedure as defined in clause 6.4.3.1 of TS 23.304 [3] with Target UE via the UE-to-UE Relay, and the QoS Info and IP address are negotiated during this procedure.

- IP, Ethernet and Unstructured traffic type are supported.

- Both UE-to-UE Relay allocated IP address and Link-Local IPv6 address are supported.

- QoS handling:

- The PC5 QoS Flows are set up end-to-end between Source UE and Target UE.

NOTE: How to perform QoS enforcement for the two PC5 reference points (between Source UE and UE-to-UE Relay, as well as between UE-to-UE Relay and Target UE) is to be determined by RAN2.

The Control Plane and User Plane protocol stacks are defined in TR 38.836 [xx] as followings.



Figure 6.X.1-1: User plane protocol stack for Layer-2 UE-to-UE Relay



Figure 6.X.1-2: Control plane protocol stack for Layer-2 UE-to-UE Relay

### 6.X.2 Procedures

#### 6.X.2.1 Procedures for UE-to-UE Relay discovery

##### 6.X.2.1.1 Procedure for UE-to-UE Relay discovery with Model A

Depicted in figure 6.X.2.1.1-1 is the procedure for UE-to-UE Relay discovery with Model A.



Figure 6.X.2.1.1-1: UE-to-UE Relay discovery with Model A

1. The UE-to-UE Relay has discovered other UEs in proximity via the previous direct discovery or direct communication procedures. The UE-to-UE Relay obtains the User Info ID, Relay Service Code (RSC) and Layer-2 ID of other UEs in proximity.

2. The UE-to-UE Relay sends an Announcement message. The Announcement message may include the Type of Discovery Message, User Info ID of the UE-to-UE Relay, RSC, and a list of User Info ID and Layer-2 ID of the Target UEs (UEs discovered in step 1).

The Source Layer-2 ID of the Announcement message is self-assigned by the UE-to-UE Relay, and the Destination Layer-2 ID is selected based on the ProSe policy.

##### 6.X.2.1.2 Procedure for UE-to-UE Relay discovery with Model B

Depicted in figure 6.X.2.1.2-1 is the procedure for UE-to-UE Relay discovery with Model B.



Figure 6.X.2.1.2-1: UE-to-UE Relay discovery with Model B

1. The UE-to-UE Relay may have discovered other UEs in proximity via the previous direct discovery or direct communication procedures. The UE-to-UE Relay obtains the User Info ID, Relay Service Code (RSC) and Layer-2 ID of other UEs in proximity.

2. The Source UE sends a Solicitation message. The Solicitation message may include the Type of Discovery Message, User Info ID of Source UE, RSC, and User Info ID of Target UE.

The Source Layer-2 ID of the Announcement message is self-assigned by the Source UE, and the Destination Layer-2 ID is selected based on the ProSe policy.

3. The UE-to-UE Relay may perform direct discovery procedure to discover the Target UE if it has not been discovered in step 1.

4. The UE-to-UE Relay that match the values of the User Info ID of Target UE and RSC contained in the Solicitation message respond to the Source UE with a Response message. The Response message contains the Type of Discovery Message, User Info ID of UE-to-UE Relay, RSC, and User Info ID and Layer-2 ID of Target UE.

The Source Layer-2 ID of the Response message is self-assigned by the UE-to-UE Relay, and the Destination Layer-2 ID is set to the Source Layer-2 ID of the received Solicitation message.

#### 6.X.2.2 Procedures for UE-to-UE Relay communication

Depicted in figure 6.X.2.2-1 is the procedure for Layer-2 UE-to-UE Relay communication.



1. Service authorization and provisioning are performed for Source UE, Target UE and UE-to-UE Relay as described for solutions for Key Issue #6.

2. The Source UE performs discovery of a UE-to-UE Relay as described in clause 6.X.2.1.

3. The Source UE and UE-to-UE Relay, as well as the UE-to-UE Relay and Target UE establish the PC5 connection using the procedure as defined in clause 6.4.3.1 of TS 23.304 [xx].

4. The Source UE sends a Direct Communication Request message to initiate the unicast Layer-2 link establishment procedure with the Target UE. The Direct Communication Request message includes User Info ID of Source UE, User Info ID of Target UE and Relay Service Code (RSC).

The Source Layer-2 ID of the DCR message is self-assigned by the Source UE, and the Destination Layer-2 ID is set to the Layer-2 ID of Target UE obtained during discovery procedure.

5. If the User Info ID of Target UE, User Info ID of Source UE and RSC are included in the Direct Communication Request, the Target UE responds by establishing the security with Source UE. When the security protection is enabled, the Source UE sends IP Address Configuration or Link-Local IPv6 address (if IP communication is used), QoS Info (PFI and PC5 QoS parameters).

The Source Layer-2 ID used for the security establishment procedure is self-assigned by the Target UE, and the Destination Layer-2 ID is set to the Source Layer-2 ID of the received Direct Communication Request message.

Upon receiving the security establishment procedure messages, the Source UE obtains the Target UE's Layer-2 ID for future communication, for signaling and data traffic for this unicast link.

6. The Target UE sends a Direct Communication Accept message to the Source UE that has successfully established security with Target UE. The Direct Communication Accept message includes User Info ID of Source UE, User Info ID of Target UE, QoS Info (PFI and PC5 QoS parameters), RSC, IP Address Configuration or Link-Local IPv6 address (if IP communication is used).

NOTE: How the PC5-S messages in step 4, 5 and 6 are forwarded by the UE-to-UE Relay is to be determined by RAN2.

7. The data is transferred between the Source UE and the Target UE via the UE-to-UE Relay.

### 6.X.3 Impacts on services, entities and interfaces

UE:

- New functionality related to UE-to-UE Relay discovery, as well as communication via UE-to-UE Relay.

**>>>>End Changes<<<<**