**SA WG2 Meeting #S2-152E S2-2205570r01**

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**Source: China Telecom**

**Title: KI#5: Update to Solution#41 to resolve ENs**

**Document for: Approval**

**Agenda Item: 9.26**

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

***Abstract of the contribution:****This paper proposes update to Solution#41 for KI#5 to resolve ENs.*

# 1 Introduction

This pCR aims to resolve some of the ENs in solution#41.

# 2 Text Proposal

It is proposed to adopt the following proposal into TR23.700-33

 **\* \* \* \* 1st Change \* \* \* \***

## 6.41 Solution #41: Improve communication reliability with two-path transmission

### 6.41.1 Description

This solution addresses the Key Issue 5 on Multi-path transmission using U2N Relay to improve the communication reliability. It applies for scenario when the indirect network communication path is through L-3 U2N relay.

This solution assumes the following mechanism to support communication reliability:

- In case of L-3 U2N relay without N3IWF, it is assumed that the Remote UE uses its own PDU session as the direct comunication path and the PDU session of the relay UE as the indirect network communication path to realize communication reliability. These two redundant PDU sessions use two different UPFs.

- In case of L-3 U2N relay with N3IWF, it is assumed that the Remote UE uses its own PDU session as the direct comunication path and the Non-3GPP PDU session established through N3IWF as the indirect communication path to realize communication reliability, The Non-3GPP PDU session established through N3IWF is over the PDU session of L-3 U2N relay. These two redundant PDU sessions use two different UPFs.

- In case of L-3 U2N relay with N3IWF, it is assumed that the Remote UE can use ATSSS mechanism to setup two redundant User Plane paths in a MA PDU session to realize communication reliability. One path is over 3GPP access as the direct comunication path, and the other one is over Non-3GPP access as the indirect communication path which is through N3IWF and the path of PDU session of the L-3 U2N relay. The traffic distributed across the two redundant User Plane paths may apply cooresponding Streering Mode, e.g. Active-Standby or Duplication.

- In the above 3 cases, the two redundant User Plane paths may go through two different NG-RANs or same NG-RAN, depending on the scenarios. In case of two different NG-RANs, communication reliability at RAN side is natrually supported. In case of a same NG-RAN, the NG-RAN needs to internally realize the communication reliability, e.g. by allocate different, redundant user plane resources for the each User Plane path.

- It is assmumed NG-RAN is provided with the ID of the communication path in the PDU session of L-3 U2N relay. This ID is generated by L-3 U2N relay. The NG-RAN is also provided with ID of redundant communication path in the PDU session established by Remote UE over 3GPP acces. This ID is determined by Remote UE, and the Remote UE get this ID information from L-3 U2N relay. In case within a NG-RAN there are two PDU session with the same ID for the communication path and redundant communication path, this NG-RAN should realize communication reliability for these two PDU session.

- The Remote UE and L-3 U2N relay should support the above redundancy mechanism. The Remote UE and L-3 U2N relay need to be authorized for the additional service of redundancy communication when performing authorization and provision for L-3 U2N Relay. In the discovery procedure, the Remote UE selects a L-3 U2N relay which supports redundancy communication.

### 6.41.2 Procedures

#### 6.41.2.1 Procedures for communication reliability

Figure 6.41.2.1-1 describes the general procedures of the solution



Figure 6.41.2.1-1: General procedures for the solution

1. Redundancy service Authorization and Provisioning procedures following R17 are performed for L-3 U2N Relay and Remote UE. The Prose policy for remote UE can include authorization for redundancy communication between multi-path transmission. The Prose policy for L-3 U2N UE can include authorization for redundancy handing on PDU session for L3 relay.

2. The 5G ProSe L-3 U2N Relay may establish a PDU Session for relay that supports redundancy. The L-3 U2N Relay may generate the ID of the communication path and send to its SMF. The SMF sends the ID of the communication path to NG-RAN in the PDU session establish procedures, e.g. in N2 SM information.

NOTE: Uniqueness of the ID is required to be guaranteed to avoid the case that multiple L-3 U2N Relay generate the same ID. The The L-3U2N Relay UE may generate the ID of the communication path by some algorithm, e.g. based on random number, to ensure it is unique across all Relay UEs in a RAN node.

3. The Remote UE performs discovery of a ProSe L-3 U2N Relay with redundancy capability and service. This may be triggered by UE implementation, when some application needs reliable communication.

4. The Remote UE establishes a connection to L-3 U2N Relay. If there is no PDU Session associated with the Relay Service Code or a new PDU Session for relaying is needed, the 5G ProSe L-3 U2N Relay initiates a new PDU Session establishment procedure for relaying as described in step 2 before completing the PC5 connection establishment. In the procedures for establishment of unicast PC5 link, the L-3 U2N Relay sends the ID of the communication path to Remote UE, e.g. in Direct Communication Accept message, then the Remote UE treats it as ID of the redundancy communication path to the communication path establisned at 3GPP access side in step 6.

5. Subsequent steps for different L-3 U2N communication mode, after Remote UE connected to L-3 U2N Relay

5a. In case of L-3 U2N relay without N3IWF, for IP PDU Session Type and IP traffic over PC5 reference point, IPv6 prefix or IPv4 address (including NAT case) is allocated for the Remote UE. The UE use the IP address for communication.

5b. In case of L-3 U2N relay with N3IWF, the Remote UE registers in 5GC through N3IWF via the communication path of L-3 U2N Relay. The Remote UE establishs PDU session or MA PDU session at Non-3GPP side. If the UE is configured with ATSSS and the network supports MA PDU session, then the UE decides to establish MA PDU session at Non-3GPP side. It is assumed the MA PDU session is prior to two single PDU sessions when redundant communication is required.

6. If it is following step 5a in which the Remote UE uses the PDU session of L-3 U2N relay for communication, or in step 5b the Remote UE establishes PDU session at at Non-3GPP side, the Remote UE establishs a new PDU session at 3GPP access side. These two redundant PDU sessions use two different UPFs which could be achieved by operator configuration.

 If in step 5b the Remote UE established MA PDU session at Non-3GPP side, the Remote UE establishs another access leg of the MA PDU session at 3GPP access side.

 In the above PDU session establish procedures, the Remote UE may send the ID of redundant communication path to its SMF. The SMF sends this ID to NG-RAN in the PDU session establish procedures, e.g. in N2 SM information. With ID of redundant communication path, NG-RAN knows the PDU session is from L3 remote UE and needs the redundancy handling with another UE’s PDU session.

 After step 6, two redundant communication paths are established, then they can be used for redundant traffic delivery end-to-end following the methods defined in URLLC. If it is a MA PDU session, then the traffic distributed across the two redundant paths may apply cooresponding Streering Mode for ATSSS, e.g. Active-Standby or Duplication. How to support redundant handling for ATSSS at UE side and 5GC side will be standardized in R18 ATSSS\_Ph3.

7. This step includes the assumed redundant handling at RAN side. If the PDU session of L-3 U2N Relay and PDU session of Remote UE at 3GPP access are in a same NG-RAN node, this NG-RAN should realize communication reliability for these two PDU session, e.g. allocating different, redundant user plane resources for each PDU session. The NG-RAN can identify the two PDU sessions by comparing the ID of the communication path in a PDU session of Relay with the ID of the redundant communication path in a PDU session of Remote UE. If the two PDU sessions are separately at different NG-RAN nodes, then each of the NG-RAN can check out that the two PDU sessions are not paired in the NG-RAN. When multiple Remote UEs share a same Relay in a NG-RAN, the NG-RAN should realize communication reliability for PDU session of Relay and PDU sessions of multiple Remote UEs, e.g. the allocated user plane resources for PDU session of Relay is different from the allocated user plane resources for PDU sessions of multiple Remote UEs. It is assumed that the NG-RAN could identify the two PDU sessions by finding out a PDU session of Remote UE whose ID of redundant communication path has the same value with the ID of communication path of the PDU sessions of Relay, when there is new PDU session of Relay in the NG-RAN, e.g. due to Relay mobility. The NG-RAN could identify the two PDU sessions by finding out a PDU session of Relay whose ID of communication path has the same value with the ID of redundant communication path of the PDU sessions of Remote UE when there is new PDU session of Remote UE in the NG-RAN. If the NG-RAN support Master Node and Secondary Node, the NG-RAN could realize redundant user plane resources for the two PDU Sessions with two NG-RAN nodes, by dividing each of the two PDU sessions on different Node.

Editor's note: Confirmation of feasibility on RAN impacts by RAN WGs is required before concluding this solution.

Editor's note: It is up to RAN decision on whether and how to identify the paired PDU session for redundancy belonging to different two UEs in a NG-RAN.

### 6.41.3 Impacts on services, entities and interfaces

The following impacts are foreseen by this solution:

Remote UE:

- Authorization of ProSe service of L3 Relay supporting communication redundancy

- Selection of a L-3 U2N relay support communication redundancy mechanism in ProSe discovery procedure

- Provision of ID of redundant communication path

L-3 U2N relay:

- Authorization of ProSe service of L3 Relay supporting communication redundancy

- Provision of ID of communication path

5G DDNMF:

* Authorization and discovery for ProSe service of L3 Relay supporting communication redundancy

SMF:

* Provision to NG-RAN with ID of communication path, ID of redundant communication path

NG-RAN

* Redundancy handing between the two PDU sessions identified by same ID of communication path

 **\* \* \* \* 2nd Change \* \* \* \***

**\* \* \* \* End of Changes \* \* \* \***