**3GPP TSG-WG SA2 Meeting #154 *S2-220xxxx***

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**Source: Huawei, HiSilicon**

**Title: Discussion on emergency service over L2 UE-to-Network Relay**

**Document for: Discussion**

**Agenda Item: 9.26.1**

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

*Abstract: Analysis of the ENs in conclusion related to emergency service over L2 UE-to-Network Relay and corresponding proposals.*

# 1. Introduction

This DP analyses the ENs in conclusion part related to emergency service over L2 UE-to-Network Relay, and provide the responding proposals.

Editor's note: It is FFS whether the Dedicated RSC(s) are needed for Layer-2 relay and whether a 5G ProSe Layer-2 Relay UE can set its RRC establishment cause to "emergency" when connected from RRC\_IDLE based on the "emergency" RRC establishment cause received from the 5G ProSe Layer-2 Remote UE.

Editor's note: When the L2 Relay UE advertise emergency RSC, whether the L2 Relay needs to check if its serving PLMN supports the relaying of emergency service is FFS.

Editor's note: How the 5G ProSe Layer-2 Relay UE's serving AMF get the information that the Relay is involved in emergency service from a Remote UE is FFS.

# 2. Discussion

## 2.1 Observation

TS 23.304 v17.4.0 specifies the following:

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| A UE is considered to be a 5G ProSe Layer-2 Remote UE if it has successfully established a PC5 link to the 5G ProSe Layer-2 UE-to-Network Relay. |

**[Observation-1] Only one PC5 link is needed for a UE to be a Remote UE.**

TS 23.304 v17.4.0 specifies the following:

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| A 5G ProSe Remote UE and a 5G ProSe UE-to-Network Relay shall set up a separate PC5 unicast links if an existing unicast link(s) was established with a different Relay Service Code or without a Relay Service Code. |

**[Observation-2] The PC5 link between L2 Remote UE and L2 Relay UE is associated with one RSC.**

TS 23.304 v17.4.0 specifies the following:

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| In a Non-Allowed Area, a 5G ProSe enabled UE follows the principles of a UE in limited service state as specified in clause 5.9. It cannot perform the Relay operation as 5G ProSe Layer-2 UE-to-Network Relay or 5G ProSe Layer-3 UE-to-Network Relay based on the conditions described in clause 5.9.  NOTE 3: Principles of operation for emergency services (incl. exceptions from mobility restrictions) are not specified in Rel-17. |

**[Observation-3] L2 Relay UE cannot perform Relay operations in Non-Allowed Area, and it is undefined for emergency service operation.**

TS 38.331 clause 6.2.2 (SIB1) specifies the following:

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| ***ims-EmergencySupport***  Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported by the network in the cell for UEs in limited service mode. |

**[Observation-4] A L2 Relay UE knows in limited service mode that the serving cell supports ims-Emergency or not.**

TS 38.331 clause 5.3.3.3 specifies the following:

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| NOTE 2: In case the L2 U2N Relay UE initiates RRC connection establishment triggered by reception of message from a L2 U2N Remote UE via SL-RLC0 or SL-RLC1 as specified in 5.3.3.1a, the L2 U2N Relay UE sets the *establishmentCause* by implementation, but it can only set the *emergency*, *mps-PriorityAccess*, or *mcs-PriorityAccess* as *establishmentCause* if the same cause value is in the message received from the L2 U2N Remote UE via SL-RLC0. |

And similar is also defined for RRC connection resume in clause 5.3.13.2:

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| NOTE 2: In case the L2 U2N Relay UE initiates RRC connection resume triggered by reception of message from a L2 U2N Remote UE via SL-RLC0 or SL-RLC1 as specified in 5.3.13.1a, the L2 U2N Relay UE sets the *resumeCause* by implementation, but it can only set the *emergency*, *mps-PriorityAccess*, or *mcs-PriorityAccess* as *resumeCause*, if the same cause value in the message received from the L2 U2N Remote UE via SL-RLC0. |

**[Observation-5] L2 U2N Relay UE set the *establishmentCause*/*resumeCause* to emergency only if it receives the emergency case received from L2 U2N Remote UE.**

TS 23.304 v17.4.0 specifies the following:

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| *If the UE is authorised to use 5G ProSe services, then the AMF should not initiate the release of the signalling connection after the completion of the Registration procedure. The release of the signalling connection relies on the decision of NG-RAN, as specified in TS 23.502 [5]* |

**[Observation-6] The signalling connection release relies on the decision of NG-RAN not the AMF, when the L2 Relay is in CM-CONNECTED.**

TS 38.413 defines that the RRC Establishment Cause IE (clause 9.3.1.111) which is set to the RRC *establishmentCause*/*resumeCause* received from a UE during RRC connection setup/resume. This RRC Establishment Cause is provided the AMF along in the Initial UE Message (clause 9.2.5.1) and UE Context Resume Request (clause 9.2.2.19).

**[Observation-7] The AMF knows the RRC establishment cause used by the Relay UE when entering RRC\_CONNECTED.**

The above observations (**[Observation-1]-[Observation-7]**) are from the Rel-17 specifications, and should be considered for the backward compatibility.

TS 23.700-33 v1.1.0 specifies the following in KI#7 conclusion:

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| *Mobility Restrictions that are overruled for UE requesting direct emergency service are overruled also for 5G ProSe UE-to-Network Relay that is relaying emergency service.* |

**[Observation-8]** **L2 Relay UE could perform the Relay operation for the emergency service in a Non-Allowed Area.**

## 2.2 Discussion and Proposals

As described in [**Observation-3**]and **[Observation-8]**, a L2 Remote UE needs to be aware that only emergency service can be transmitted if the L2 Relay UE is in a Non-Allowed Area. It means that L2 Remote UE cannot transmit non-emergency service data if the L2 Relay UE is in a Non-Allowed Area. During Model A discovery, an RSC that indicates L2 Relay indicator and emergency service is used in the discovery message, and then Remote UE knows only emergency service can be transferred via this L2 Relay. During the Model B discovery, L2 Relay can respond to a requested RSC for L2 Relay and emergency service from the L2 Remote UE.

**[Proposal-1] A dedicated emergency service RSC are needed for the Layer-2 relay case, and only emergency services can be transmitted by L2 Remote UE if a dedicated emergency RSC is used in discovery and connection establishment.**

**[Proposal-2] When a L2 Relay UE is in a Non-Allowed Area, it can only participate the discovery operation with an emergency RSC in the discovery message.**

As described in [**Observation-3**], a L2 Relay UE can perform Relay operation in an Allowed Area, where general L2 RSCs defined in Rel-17 ProSe are used in discovery, and based on [**Observation-5**], the operation related to emergency of both the L2 Remote UE and the L2 Relay has been designed in Rel-17 ProSe from RAN2 view. The same can be used for Rel-18.

Based on **[Observation-1]** and **[Observation-2]**, the L2 Remote UE cannot connect to two L2 Relay UEs for relaying at the same time and also only one RSC can be used for relaying. So if a L2 Remote UE is already connected (i.e. in RRC\_CONNECTED) to RAN via a L2 Relay UE with a general (i.e. non-emergency) L2 RSC, if emergency services are required, the L2 Remote UE can reuse the existing connection to transmit the emergency service by setting up emergency PDU session with its PLMN. If the connection does not exist (i.e. the Remote UE is in RRC\_IDLE), the L2 Remote UE may use a dedicated RSC or a general L2 RSC to discovery a L2 relay and further connect to RAN to setup an emergency PDU session. In this case, it is up to UE implementation to choose dedicated RSC or the general L2 RSC.

**[Proposal-3] A L2 Remote UE can use a L2 Relay which indicates either or both of non-emergency service and emergency service RSC for emergency service access. An RSC for emergency access can only be used for emergency access. A non-emergency RSC can be used for either normal access or emergency access.**

As described in [**Observation-4**], a L2 Relay UE in limited service mode knows that the serving cell supports ims-Emergency or not and the L2 Remote UE may request emergency service in limited service state. So if the serving cell of L2 Relay does not support the ims-Emergency, the L2 Remote UE cannot get the emergency service through the L2 Relay UE when L2 Remote UE accesses via the same cell.

**[Proposal-4] The L2 Relay UE needs to check if its serving cell supports the emergency service, before L2 Relay UE advertises emergency RSCs.**

As described in[**Observation-5**], RAN2 already defined in Rel-17 ProSe that L2 Relay UE sets the *establishmentCause*/*resumeCause* to emergency only if it receives the emergency case received from L2 U2N Remote UE. The mechanism can be used for Rel-18.

**[Proposal-5] The L2 U2N Relay UE sets the *establishmentCause*/*resumeCause* to emergency following the existing Rel-17 RAN2 procedures.**

As described in **[Observation-6]**, the AMF will not initiate the release the AN Release procedure when the L2 Relay is in CM-CONNECTED. 5G ProSe Layer-2 Relay UE's serving AMF does not need to know that the L2 Relay is involved in emergency service as it will not initiate the AN Release procedure. The decision is on the RAN on whether to release the Relay UE to IDLE.

**[Proposal-6] Enhancement on prioritized handling in the L2 Relay UE's serving AMF is not needed when the L2 Relay is in RRC-CONNECTED (i.e. CM\_CONNECTED).**

When a UE establishes an RRC Connection for emergency access the *establishmentCause*/*resumeCause* are set to ‘emergency’ and the RAN and AMF know that a UE is establishing a connection for emergency service access. This provides them with information to allow a UE to avoid access restrictions, congestion controls and be suitability prioritized for emergency access. **[Observation-5]** and **[Observation-7]** show that the Relay will be providing a *establishmentCause*/*resumeCause* set to ‘emergency’ when connecting because of a Remote UEs request for emergency access and that information is then shared with the Relay’s RAN/AMF, and the same prioritizations are applied.

**[Proposal-7] Enhancement on prioritized handling in the L2 Relay UE's serving AMF is not needed when the L2 Relay is establishing an RRC connection from RRC\_IDLE or Inactive (i.e. CM\_IDLE or CM\_CONNECTED with RRC\_Inactive).**

# 3. Conclusion and proposal(s)

The following proposals are made and the conclusions in TR 23.700-33 and/or normative work is based on these proposals for Layer-2 Relay emergency support.

**[Proposal-1] A dedicated emergency service RSC are needed for the Layer-2 relay case, and only emergency services can be transmitted by L2 Remote UE if a dedicated emergency RSC is used in discovery and connection establishment.**

**[Proposal-2] When a L2 Relay UE is in a Non-Allowed Area, it can only participate the discovery operation with an emergency RSC in the discovery message.**

**[Proposal-3] A L2 Remote UE can use a L2 Relay which indicates either or both of non-emergency service and emergency service RSC for emergency service access. An RSC for emergency access can only be used for emergency access. A non-emergency RSC can be used for either normal access or emergency access.**

**[Proposal-4] The L2 Relay UE needs to check if its serving cell supports the emergency service, before L2 Relay UE advertises emergency RSCs.**

**[Proposal-5] The L2 U2N Relay UE sets the *establishmentCause*/*resumeCause* to emergency following the existing Rel-17 RAN2 procedures.**

**[Proposal-6] Enhancement on prioritized handling in the L2 Relay UE's serving AMF is not needed when the L2 Relay is in RRC-CONNECTED (i.e. CM\_CONNECTED).**

**[Proposal-7] Enhancement on prioritized handling in the L2 Relay UE's serving AMF is not needed when the L2 Relay is establishing an RRC connection from RRC\_IDLE or Inactive (i.e. CM\_IDLE or CM\_CONNECTED with RRC\_Inactive).**