**3GPP TSG-SA5 Meeting #136-e *S5-212133rev1***

electronic meeting, online, 1 March - 9 March 2021

**Source: CATT, Ericsson?**

**Title: pCR Add possilbe solution for ProSe Unicast mode Direct Communication**

**Document for: Approval**

**Agenda Item: 7.5.3**

# 1 Decision/action requested

***The group is asked to discuss and agree on the proposal.***

# 2 References

[1] 3GPP TR 32.846: “Study on charging aspects of Proximity-based Services in 5GS”.

# 3 Rationale

This contribution adds possible solutions for ProSe Unicast Direct Communication.

# 4 Detailed proposal

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| **1st Modified Section** |

#### 6.2.4.x Solution #2.1: ProSe unicast mode of Direct Communication event-based charging for Key issues #2.1

##### 6.2.4.x.1 Consideration for ProSe unicast mode of Direct Communication charging

This reporting is achieved by sending Charging Data Request to the CHF from the ProSe related CTF or CEF.

The Received Direct Communication Usage Report event for the unicast (one-to-one) mode communication is triggered by the CTF(ADF) located in ProSe related NF (e.g.,5G DDNMF) receiving a usage information report from the UE(AMC) for the unicast communiction over PC3ch. The CTF(ADF) or CEF goes through the reported usage information, and if it contains valid ProSe Direct Communication usage data for the unicast mode communication, then sends the events to the CHF, which triggers the generation of the CDR for the unicast mode communication.

The AMC part of the CTF would be located in the UE. When the UE decides that reporting criteria are met and have network connection, the UE sends the collected usage information to the ADF part of the CTF.

Editor's note: It is FFS for where the ADF part of the CTF would be located.

The 5GS shall collect the following charging information for ProSe Direct communication from following table selectively:

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| Information Element | Description |
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| User Location Information | The location of the UE |
| UE identity | The identity of the ProSe UE |
| Serving PLMN ID | PLMN identity of the PLMN which signalled the carrier frequency |
| ProSe Relay UE ID  | A link layer identifier that uniquely represents the ProSe UE-to-Network Relay UE |
| ProSe Target Layer-2 ID | The identifier of target UE, uniquely represents a specific one-to-one or one-to-many discovery/communication |
| ProSe Group IP multicast address | The IP multicast address to be used for performing ProSe direct discovery/communication. |
| Coverage Info | This IE provides information on the coverage status (i.e., whether the UE is served by NG-RAN or not) and the time when the coverage status changed to its current state. |
| Radio Resources indicator | This IE identifies whether the operator-provided radio resources or the configured radio resources were used for ProSe direct discovery /communication |
| Usage Data Container | This field holds the container associated to a trigger conditions (e.g. go out of coverage, come back to coverage, etc.) on a specific ProSe communication |

Figure 6.2.4.x.1-1 Structure of the ProSe direct communication charging Information

Editor's note: Whether other information elements are needed is FFS.

##### 6.2.4.x.2 Architecture Description

A set of trigger conditions are defined for the CTF or CEF to invoke a Charging Data Request [Event] towards the CHF.

The converged charging architecture is proposed for the event based charging for 5GS ProSe under the alternatives：

- Charging Trigger Function (CTF) based, as depicted in figure 6.1.4.1.2-1.

- Charging Enablement Function (CEF) based, depicted in figure 6.1.4.1.2-2.

##### 6.2.4.x.3 Flow Description

6.2.4.x.3.1 Message flows with CTF



Figure 6.2.4.x.3.1: Message flow for ProSe ProSe Direct Communication (event based)

Editor’s Note: This message flow needs to align with future TS 23.304 based on TR 23.752 conclusion.

1. UE-1 sends a Direct Communication Request message to UE-2 in order to trigger mutual authentication.

2-3. UE-2 initiates the procedure for mutual authentication. The successful completion of the authentication procedure completes the establishment of the secure layer-2 link over PC5 and then UE performs unicast mode Direct Communication.

4. UE-1 sends a Disconnect Request message to UE-2 in order to release the layer-2 link and deletes all context data associated with.

5. Upon reception of the Disconnect Request message UE-2 responds with a Disconnect Response message and deletes all context data associated with the layer-2 link.

6. When the UE-1 decides that reporting criteria are met, according to the pre-configuration, the UE creates the corresponding usage information report.

NOTE 1: Both UE-1 and UE-2 can decide that reporting criteria are met and trigger the usage reporting procedure.

7. Upon reception of the Disconnect Response from UE-2, the UE-1 triggers the usage reporting procedure. UE-1 sends the usage information report to the CTF(ADF).

8ch-a. Upon reception of Direct Communication usage information report, the CTF(ADF) triggers the Charging Data Request[Event].The CTF(ADF) sends Charging Data Request [Event] to CHF.

8ch-b. The ProSe unicast mode Direct Communication CDR is generated by CHF for the UE-1 and UE-2.

8ch-c. The CHF acknowledges by sending Charging Data Response [Event] to the CTF(ADF).

NOTE 2: The procedure applies to UE1 to UE2 independently, i.e. each of the UE sends the respective usage information reports to the network using either the under coverage procedure or out of coverage procedure.

6.2.4.x.3.2 Message flows with CEF



Figure 6.2.4.x.3.1: CEF-Message flow for ProSe ProSe Direct Communication (event based)

1. Determination by CEF to subscribe to ProSe Service provider which is able to handle usage information report from the UE.

2. Subscribe Request: the CEF subscribes to ProSe Service provider.

3. Subscribe Request: the ProSe Service Producer sends successful subscription response.

4-10. These steps are the same as procedure described in 6.2.4.x.4.

11. Notification: ProSe Service provider notifies the CEF that usage information report has been processed.

12. Notification Acknowledge sent by the CEF.

13ch-a. The CEF sends Charging Data Request [Event] to CHF.

13ch-b. The CHF creates a CDR.

13ch-c The CHF acknowledges by sending Charging Data Response to the CEF.

Editor’s Note: This message flow needs to align with future TS 23.304 based on TR 23.752 conclusion.

Editor’s Note: It is FFS for the use of services proved from ProSe Service provider for charging information.

##### 6.2.4.x.4 Solution evaluation

TBD

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| **Next Modified Section** |

#### 6.2.4.y Solution #2.1: ProSe unicast mode of Direct Communication session-based charging for Key issues #2.1

##### 6.2.4.y.1 Consideration for ProSe unicast mode of Direct Communication session-based charging

The 5G ProSe charging service may be configured to use session based charging in order to reduce the number of CDRs generated.

The CTF(ADF) or CEF generates charging data related to the service delivered that is based on a trigger for usage reporting is met.

The Charging Data Request[Initial] is sent when the ProSe CTF(ADF) receives a Received Direct Communication Usage Report event, and there is no open charging session for the group communication and unicast communication including the UE-Network-relay

The Charging Data Request[Update] is sent when the ProSe CTF(ADF) receives a Received Direct Communication Usage Report event, and there is an open charging session for the group communication and unicast communication including the UE-Network-relay.

The Charging Data Request[Termination] is sent when the ProSe service provider decides one of the following conditions is met:

- operator configured maximum number of reports, or

- operator configured maximum time limit.

##### 6.2.4.y.2 Architecture Description

See clause 6.2.4.x.2.

##### 6.2.4.y.3 Flow Description

6.2.4.y.3.1 Message flows with CTF



Figure 6.2.4.y.3.1: Message flow for ProSe ProSe Direct Communication (session based)

1-3. These steps are the same as described in figure 6.2.4.x.3.1.

4. When the UE decides that reporting criteria are met, according to the pre-configuration, the UE creates the corresponding usage information report. UE triggers the usage reporting procedure.

5. UE sends the usage information report to the ProSe service.

6ch-a. The NF (CTF) determines the number of units depending on the service requested by the UE, and sends the Charging Data Request[Initial] to the CHF when there is no open charging session.

6ch-b. Based on policies, the CHF opens a CDR related to the service.

6ch-c. The CHF grants authorization to NF (CTF) for the service to start, and returns Charging Data Response.

7. UE triggers the usage reporting procedure when the reporting criteria are met.

NOTE 1: Both UE-1 and UE-2 can decide that reporting criteria are met and trigger the usage reporting procedure.

8. UE sends the usage information report to the ProSe NF (CTF).

9ch-a. If there is a charging session for the session of one-to-one direct communication, upon reception of direct communication usage information report for the session, the NF (CTF) triggers the Charging Data Request[Update]. The NF (CTF) sends the Charging Data Request[Interim] to the corresponding CHF.

9ch-b. The CDR for the ProSe unicast Direct Communication is updated by CHF for the UE.

9ch-c. The CHF returns Charging Data Response corresponding to the received Charging Data Request.

NOTE 2: The Step 9ch-a to 9ch-c may occur multiple times for update.

10. Upon reception of the Disconnect Request message UE2 responds with a Disconnect Response message and deletes all context data associated with the layer-2 link.

11. Upon reception of the Disconnect Response from UE-2, the UE-1 triggers the usage reporting procedure.UE1 sends the usage information report to the NF (CTF),

12. UE sends the usage information report to the NF (CTF).

NOTE 2: The Step 16 may occur before step 14 and step 15.

13ch-a. The NF (CTF) decides that the charging session should be closed, and triggers the Charging Data Request[Termination]. The NF (CTF) sends the Charging Data Request[Termination] to the corresponding CHF.

13ch-b. The CDR for the ProSe unicast Direct Communication is closed by CHF for the UE.

13ch-c. The CHF returns Charging Data Response corresponding to the received Charging Data Request.

NOTE 3: The procedure applies to UE1 to UE2 independently, i.e. each of the UE sends the respective usage information reports to the network using either the under coverage procedure or out of coverage procedure.

6.1.4.y.3.2 Message flows with CEF

TBD

##### 6.2.4.y.4 Solution evaluation

TBD

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| **End of Modified Sections** |