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| **3GPP TSG-SA5 Meeting #142-e *S5-222310rev1*****e-meeting, 4 - 12 April 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **32.277** | **CR** |  | **rev** | **-** | **Current version:** |  |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |

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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |
|  |
| ***Title:***  | message flows for 5G ProSe Direct Communication converged charging |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | SA5 |
|  |  |
| ***Work item code:*** | 5G\_ProSe |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Message flow for 5G ProSe Direct Communication converged charging is missing  |
|  |  |
| ***Summary of change:*** | Adding of the message flows for the converged charging both PEC and SCUR |
|  |  |
| ***Consequences if not approved:*** | No message flows for the converged charging of 5G ProSe Direct Communication. |
|  |  |
| ***Clauses affected:*** | 5.4.x.2 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| **1st modified section** |

#### 5.4.2.x 5G ProSe Direct Communication

##### 5.4.2.x.1 Triggers for converged charging for 5G ProSe Direct Communication

For converged charging, the Received Direct Communication Usage Report event for a Broadcast, Groupcast or Unicast Direct Communication is triggered by the 5G-DDNMF receiving a usage information report from the UE over PC3. The following tables summarize the set of trigger conditions for 5G ProSe Direct Communication.

Table 5.4.2.x.1-1: Triggers for charging events for 5G ProSe Direct Communication

| Trigger Conditions | Trigger level | Default category | CHF allowed to change category | CHF allowed to enable and disable | Message when "immediate reporting" category |
| --- | --- | --- | --- | --- | --- |
| Received Direct Communication Usage Report, which contains valid ProSe Direct Communication usage data for Unicast Direct Communication or via UE-to-Network relay  | - | Immediate | Not Applicable | Not Applicable | PEC: Charging Data Request [Event]SCUR: Charging Data Request [Initial]SCUR: Charging Data Request [Update]SCUR: Charging Data Request [Termination] |
| Received Direct Communication Usage Report, which contains valid ProSe Direct Communication usage data for Groupcast or Broadcast Direct communication | - | Immediate | Not Applicable | Not Applicable | PEC: Charging Data Request [Event]SCUR: Charging Data Request [Initial]SCUR: Charging Data Request [Update]SCUR: Charging Data Request [Termination] |

NOTE : The UE creates the Usage Information Report when UE decides that reporting criteria are met. The detailed description of criteria are defined in clause 5.1.1.

|  |  |
| --- | --- |
| Table 5.4.2.x.1-2: Triggers for Charging Data Request from CTF-ADFmessage | Triggering conditions |
| Charging Data Request [Event] | Usage information report from the UE for ProSe Unicast Direct Communication over PC3, and from UE-to-Network relay UE for the ProSe Unicast communication via UE-Network relay. Usage information report from the UE for ProSe Broadcast Direct Communication over PC3Usage information report from the UE for ProSe Groupcast Direct Communication over PC3 |
| Charging Data Request [Initial] | CTF-ADF (e.g. 5G-DDNMF) receives a Direct Communication Usage Report event over PC3, and there is no open charging session for the Groupcast Direct communication, Broadcast Direct Communication and/or Unicast Direct communication, including the UE-Network-relay.  |
| Charging Data Request [Update] | CTF-ADF (e.g. 5G-DDNMF) receives a Direct Communication Usage Report event over PC3, and there is an open charging session for the Groupcast Direct communication, Broadcast Direct Communication and/or Unicast Direct communication, including the UE-Network-relay.  |
| Charging Data Request [Termination] | CTF-ADF (e.g. 5G-DDNMF) decides one of the following conditions is met: - operator configured maximum number of reports, or - operator configured maximum time limit. |

PC5 QoS flow Based Charging allows the ProSe enabled UE to collect charging information related to data volumes per PC5 link, categorized per PC5 QoS Flow. This reporting is achieved by sending Charging Data Request from the 5G DDNMF to the CHF.

For ProSe QoS flow Based Charging, the trigger conditions are same as in table 5.4.2.x.1-1.

5G ProSe converged charging operation flows in the following subclauses are based on the above triggers and the procedures defined in TS 23.304 [241].

##### 5.4.2.x.2 Message flows for ProSe Unicast Direct Communication - PEC



Figure 5.4.2.x.2 -1: Message flows for ProSe Unicast Direct Communication - PEC

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 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. UE-1 triggers the usage reporting procedure 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).

##### 5.4.2.x.3 Message flows for ProSe Unicast Direct Communication - SCUR



Figure 5.4.2.x.3-1: Message flows for ProSe Unicast Direct Communication - SCUR

1-3. These steps are the same as described in figure 5.4.2.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 CTF located in ProSe NF (e.g. 5G-DDNMF).

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-1 triggers the usage reporting procedure sends the usage information report to the CTF(ADF).

9ch-a. If there is a charging session for the session of unicast mode 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[Update] 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 3: 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 4: 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.

##### 5.4.2.x.4 Message flows for ProSe Broadcast Direct Communication – PEC



Figure 5.4.2.x.4-1: Message flows for ProSe Broadcast Direct Communication – PEC

1. The receiving UE(s) determine the destination Layer-2 ID for broadcast reception. The destination Layer-2 ID is passed down to the AS layer of receiving UE(s) for the reception.

2. The transmitting UE ProSe application layer provides data unit and may provide ProSe Application Requirements to ProSe layer.

3. The transmitting UE determines the destination Layer-2 ID for broadcast, and self-assigns the source Layer-2 ID.

4. The transmitting UE sends the ProSe data using the source Layer-2 ID and the destination Layer-2 ID as defined in TS 23.304 [241].

5. When the UE decides that reporting criteria are met, according to the configuration, and the connection to the network is available, the UE creates the corresponding usage information report.

NOTE 1: Both transmitting UE and receiving UE(s) can decide that reporting criteria are met and trigger the usage reporting procedure.

NOTE 2: When the UE is out of NR coverage and has no connection to the 5G network, the usage information is stored in a secure environment in the UE, it will trigger the reporting when UE comes back to NR coverage.

6. UE triggers the usage reporting procedure. UE (CTF-AMC) sends the usage information report to the ProSe NF（CTF-ADF), according to the configuration.

7ch-a. Upon reception of Direct Communication usage information report, the NF(CTF) triggers the Charging Data Request [Event]. The NF(CTF) sends Charging Data Request [Event] to CHF.

7ch-b. The ProSe broadcast mode Direct Communication CDR is generated by CHF.

7ch-c. The CHF acknowledges by sending Charging Data Response [Event] to the NF(CTF).

##### 5.4.2.x.5 Message flows for ProSe Broadcast Direct Communication – SCUR



Figure 5.4.2.x.5-1: Message flows for ProSe Broadcast Direct Communication – SCUR

1-4 These steps are the same as described in Figure 5.4.2.x.4-1.

5. When the UE decides that reporting criteria are met, according to the configuration, and the connection to the network is available, the UE creates the corresponding usage information report.

NOTE 1: Both transmitting UE and receiving UE(s) can decide that reporting criteria are met and trigger the usage reporting procedure.

NOTE 2: When the UE is out of NR coverage and has no connection to the 5G network, the usage information is stored in a secure environment in the UE, it will trigger the reporting when UE comes back to NR coverage.

6. UE (CTF-AMC) sends the usage information report to the NF (CTF-ADF).

7ch-a. If the CTF located with ProSe Service is configured to use session based charging, upon reception of direct communication usage information report for a broadcast, the NF (CTF) triggers the Charging Data Request[Init] when there is no open charging session. The NF (CTF) sends the Charging Data Request[Update] to the corresponding CDF, and starts a charging session.

7ch-b. Based on policies, the CHF opens a CDR related to the service.

7ch-c. The CHF grants authorization to NF (CTF) for the service to start, and returns Charging Data Response.

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

9ch-a. Upon reception of direct communication usage information report, the NF (CTF) triggers the Charging Data Request[Update]. The NF (CTF) sends the Charging Data Request[Update] to the corresponding CHF.

9ch-b. The CDR is updated by CHF for the UE.

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

NOTE 3: The Step 9ch-a to 9ch-c may occur multiple times for update.

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

11ch-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.

11ch-b. The CDR is closed by CHF for the UE.

11ch-c. The CHF returns Charging Data Response corresponding to the received Charging Data Request.

##### 5.4.2.x.6 Message flows for ProSe Groupcast Direct Communication – PEC

In order to support for 5G ProSe Groupcast Direct Communication charging for PEC mode, the message flow defined in clause 5.4.2.x.4 can be reused with the following differences:

- 5G ProSe direct communication over PC5 reference point in groupcast mode operation

- Procedure for groupcast mode 5G ProSe Direct communication is defined in TS 23.304 [241]

##### 5.4.2.x.7 Message flows for ProSe Groupcast Direct Communication – SCUR

In order to support for 5G ProSe Groupcast Direct Communication charging for SCUR mode, the message flow defined in clause 5.4.2.x.5 can be reused with the following differences:

- 5G ProSe direct communication over PC5 reference point in groupcast mode operation

- Procedure for groupcast mode 5G ProSe Direct communication is defined in TS 23.304 [241]

##### 5.4.2.x.8 Message flows for ProSe UE-to-Network Direct Communication - PEC



Figure 5.4.2.x.8-1: Message flow for ProSe Direct Communication via Layer-3 UE-to-Network Relay

1-7. These steps are the same as message flow for ProSe UE-to-Network Direct Communication via Layer-3 procedures described in TS 23.304 [241] clause 6.5.1.1.

8. 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.

9. The Remote UE sends the usage reporting to ProSe UE-to-Network Relay UE. Then Relay UE sends the usage information report to the CTF located in ProSe NF (e.g., 5G-DDNFM).

9ch-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.

9ch-b. The 5G ProSe Direct communication via UE-to-Network Relay CDR is generated by CHF for the Remote UE.

9ch-c. The CHF acknowledges by sending Charging Data Response [Event] to the CTF (ADF).

10. 5G ProSe UE-to-Network Relay UE triggers the usage reporting procedure and creates the corresponding usage information report when the reporting criteria are met.

11. 5G ProSe UE-to-Network Relay UE sends the usage information report to the ProSe NF (CTF).

NOTE 1: Step 10 and Step 11 can occur before Step 8 and Step 9.

11ch-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.

11ch-b. The 5G ProSe Direct communication via UE-to-Network Relay CDR is generated by CHF for the Relay UE.

11ch-c. The CHF acknowledges by sending Charging Data Response [Event] to the CTF (ADF).

NOTE 2: The procedure applies to Remote UE to UE-to-Network Relay UE independently, i.e. each of the UE sends the respective usage information reports according to different reporting criteria.



Figure 5.4.2.x.8-2: Message flow for ProSe Direct Communication via Layer-2 UE-to-Network Relay

1-8. These steps are the same as message flow for ProSe UE-to-Network Direct Communication via Layer-2 procedures described in TS 23.304 [241] clause 6.5.2.2.

9-11. These steps are the same as message flow for Layer-3 UE-to-Network Relay in figure 6.2.4.5.3.1-1.

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| --- |
| **End of changes** |