**3GPP TSG-CT WG1 Meeting #136-eC1-223378**

**E-Meeting, 12th – 20th May 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **554** | **CR** | **0075** | **rev** | **-** | **Current version:** | **.0.0** |  |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Procedures for PC3ch Control Protocol for 5G ProSe direct communication |
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| ***Source to WG:*** | CATT, Ericsson |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5G\_ProSe |  | ***Date:*** | 2022-05-05 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-17 |
|  | *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:*** | Procedures for PC3ch Control Protocol for 5G ProSe direct communication is to be defined, to support 5G ProSe charging as specified in TS 32.277.Compared to charging for ProSe services in EPS, the UE and network shall collect the charging information for 5G ProSe with the following modifications:- the 5G DDNMF takes the role of "ProSe Function";- the E-UTRAN is replaced by NG-RAN and E-UTRA is replaced with NR;- the ECGI is replaced by NCGI;- corresponding 5GS identifiers replace the EPS identifiers, e.g. use SUPI instead of IMSI, and use GPSI instead of MSISDN.- if the UE is configured to report QoS flow information, the UE shall include the PC5 QoS flow information in the usage information report. |
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| ***Summary of change:*** | Add procedures for PC3ch Control Protocol for 5G ProSe direct communication. |
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| ***Consequences if not approved:*** | 5G ProSe charging cannot be supported, without defining the PC3ch procedures. |
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| ***Clauses affected:*** | 7.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:*** |  |

\* \* \* First Change \* \* \* \*

### 7.x.2 Procedures for PC3ch control protocol for 5G ProSe direct communication

#### 7.x.2.1 Usage information report list sending procedure

##### 7.x.2.1.1 General

The purpose of the usage information report list sending procedure is to enable a 5G ProSe-enabled UE to provide information necessary for composing of charging events related to the 5G ProSe direct communication as defined in 3GPP TS 32.277 [yy].

The UE shall perform the usage information report list sending procedure with the Accounting Data Forwarding (ADF) function block of the Charging Trigger Function (CTF) in the 5G DDNMF (5G DDNMF CTF (ADF)) residing in the HPLMN.

The UE shall construct the usage information report based on the configuration described in clause 5.2.

##### 7.x.2.1.2 Usage information report list sending procedure initiation

The UE shall perform the usage information report list sending procedure if the UE is in NG-RAN coverage and if:

a) the following is true:

1) the configured collection period has elapsed, either since the beginning of 5G ProSe direct communication (if it is the first usage information report list sending procedure performed after the beginning of 5G ProSe direct communication) or since the end of the previous usage information report list sending procedure;

2) the configured reporting window has not elapsed after the configured collection period elapsed;

3) the UE is in the RRC\_CONNECTED mode (see 3GPP TS 38.300 [21]); and

4) the UE has usage information for at least one collection period; or

b) the following is true:

1) the configured collection period has elapsed, either since the beginning of 5G ProSe direct communication (if it is the first usage information report list sending procedure performed after the beginning of 5G ProSe direct communication) or since the end of the previous usage information report list sending procedure;

2) the configured reporting window has elapsed after the configured collection period elapsed; and

3) the UE has usage information for at least one collection period.

The UE shall initiate the usage information report list sending procedure by sending a PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message to the 5G DDNMF CTF (ADF).

If the UE is configured with the address of the 5G DDNMF CTF (ADF) for uploading the usage information reports, the UE shall send the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message to the configured address of the 5G DDNMF CTF (ADF). If the UE is not configured with the address of the 5G DDNMF CTF (ADF) for uploading the usage information reports, the UE shall send the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message to the IP address of the 5G DDNMF discovered as described in clause 6.1.2.2.

In the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message, the UE:

a) shall include a new transaction ID;

b) for each collection period:

1) shall include a sequence number of the usage information report;

2) if the UE is configured to report the time stamps when it went in and out of NG-RAN coverage during the collection period in the usage information, for each going in or out of NG-RAN coverage:

i) shall include the information of whether the UE was in or out of NG-RAN coverage;

ii) shall include the time stamp of the move; and

iii) if the UE was in NG-RAN coverage and the UE is configured to report the list of locations of the UE when in NG-RAN coverage during the collection period in the usage information, for each camping on a cell or usage of a cell in the 5GMM-CONNECTED mode:

A) shall include the NG-RAN cell global identification of the cell; and

B) shall include the time stamp of beginning of the camping on the cell or of beginning of the usage of the cell in the 5GMM-CONNECTED mode;

3) in case of broadcast and groupcast mode 5G ProSe direct communication, for each group identified by ProSe layer-2 group ID:

i) if the UE is configured to report the group parameters in the usage information, shall include the ProSe layer-2 group ID, ProSe group IP multicast address, the IP address used by the UE as a source IP address, and the layer-2 ID used by the UE as a source layer-2 ID;

ii) if the UE transmitted data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first transmission to the ProSe Group IP multicast address in the collection period;

iii) if the UE received data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first reception from the ProSe Group IP multicast address in the collection period;

iv) for each transmitter in groupcast mode 5G ProSe direct communication, shall include the source layer-2 ID and IP address of the transmitter;

v) if the UE is configured to report the amount of data transmitted during the collection period with location information in the usage information, per each in or out of NG-RAN coverage period and per each NG-RAN cell used when in NG-RAN coverage:

A) shall indicate whether the data are sent in or out of NG-RAN coverage;

B) if the UE transmitted data in an NG-RAN cell during an in NG-RAN coverage period:

- shall include the NG-RAN cell global identification of the NG-RAN cell;

- shall include the amount of data transmitted in the NG-RAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission in the NG-RAN cell; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE transmitted data during out of NG-RAN coverage period:

- shall include the amount of data transmitted during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency;

vi) if the UE is configured to report the amount of data transmitted during the collection period without location information in the usage information, per each in or out of NG-RAN coverage period:

A) shall indicate whether the data are sent in or out of NG-RAN coverage;

B) if the UE transmitted data during in NG-RAN coverage period:

- shall include the amount of data transmitted during the in NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the in NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE transmitted data during out of NG-RAN coverage period:

- shall include the amount of data transmitted during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency;

vii) if the UE is configured to report the amount of data received during the collection period with location information in the usage information, per each in or out of NG-RAN coverage period and per each NG-RAN cell used when in NG-RAN coverage:

A) shall indicate whether the data are received in or out of NG-RAN coverage;

B) if the UE received data in an NG-RAN cell during an in NG-RAN coverage period:

- shall include the NG-RAN cell global identification of the NG-RAN cell;

- shall include the amount of data received in the NG-RAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception in the NG-RAN cell; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE received data during out of NG-RAN coverage period:

- shall include the amount of data received during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency; and

viii) if the UE is configured to report the amount of data received during the collection period without location information in the usage information, per each in or out of NG-RAN coverage period:

A) shall indicate whether the data are received in or out of NG-RAN coverage;

B) if the UE received data during in NG-RAN coverage period:

- shall include the amount of data received during the in NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the in NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE received data during out of NG-RAN coverage period:

- shall include the amount of data received during the out of NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency; and

ix) if the UE is configured to report QoS flow information, per each QoS flow identified by the PQFI:

A) if the UE transmitted the QoS flow during the collection period:

- shall include the time stamp for start of transmission of the QoS flow in the collection period;

- shall include the time stamp for end of transmission of the QoS flow in the collection period;

- shall include the (initial) PC5 QoS parameters of the QoS flow in the collection period as specified in clause 10.x.4.2;

- shall include the amount of data of the QoS flow transmitted with the (initial) PC5 QoS parameters in the collection period; and

- if the PC5 QoS parameters of the QoS flow were changed during the collection period, shall include the time stamp for start of transmission of the QoS flow with the new PC5 QoS parameters, the new PC5 QoS parameters of the QoS flow as specified in clause 10.x.4.2, and the amount of data of the QoS flow transmitted with the new PC5 QoS parameters in the collection period; or

B) if the UE received the QoS flow during the collection period:

- shall include the time stamp for start of reception of the QoS flow in the collection period;

- shall include the time stamp for end of reception of the QoS flow in the collection period;

- shall include the (initial) PC5 QoS parameters of the QoS flow in the collection period as specified in clause 10.x.4.2;

- shall include the amount of data of the QoS flow received with the (initial) PC5 QoS parameters in the collection period; and

- if the PC5 QoS parameters of the QoS flow were changed during the collection period, shall include the time stamp for start of reception of the QoS flow with the new PC5 QoS parameters, the new PC5 QoS parameters of the QoS flow as specified in clause 10.x.4.2, and the amount of data of the QoS flow received with the new PC5 QoS parameters in the collection period; and

4) in case of unicast mode 5G ProSe direct communication, for each 5G ProSe direct communication identified by the source layer-2 ID and destination layer-2 ID for unicast communication:

i) shall include the IP address used by the UE as a source IP address, and the layer-2 ID used by the UE as a source layer-2 ID;

ii) if the UE transmitted data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first transmission in the 5G ProSe direct communication in the collection period;

iii) if the UE received data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first reception in the 5G ProSe direct communication in the collection period;

iv) for each transmitter in unicast mode 5G ProSe direct communication not between the remote UE and the 5G ProSe UE-to-network relay UE, shall include the source layer-2 ID and IP address of the transmitter, target layer-2 ID and IP address of the receiver;

v) for each transmitter in unicast mode 5G ProSe direct communication between the remote UE and the 5G ProSe UE-to-network relay UE, shall include the source layer-2 ID and IP address of the transmitter, layer-2 ID and IP address of 5G ProSe UE-to-network relay UE;

vi) if the UE is configured to report the amount of data transmitted during the collection period with location information in the usage information, per each in or out of NG-RAN coverage period and per each NG-RAN cell used when in NG-RAN coverage:

A) shall indicate whether the data are sent in or out of NG-RAN coverage;

B) if the UE transmitted data in an NG-RAN cell during an in NG-RAN coverage period:

- shall include the NG-RAN cell global identification of the NG-RAN cell;

- shall include the amount of data transmitted in the NG-RAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission in the NG-RAN cell; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE transmitted data during out of NG-RAN coverage period:

- shall include the amount of data transmitted during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency;

vii) if the UE is configured to report the amount of data transmitted during the collection period without location information in the usage information, per each in or out of NG-RAN coverage period:

A) shall indicate whether the data are sent in or out of NG-RAN coverage;

B) if the UE transmitted data during in NG-RAN coverage period:

- shall include the amount of data transmitted during the in NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the in NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE transmitted data during out of NG-RAN coverage period:

- shall include the amount of data transmitted during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency;

viii) if the UE is configured to report the amount of data received during the collection period with location information in the usage information, per each in or out of NG-RAN coverage period and per each NG-RAN cell used when in NG-RAN coverage:

A) shall indicate whether the data are received in or out of NG-RAN coverage;

B) if the UE received data in an NG-RAN cell during an in NG-RAN coverage period:

- shall include the NG-RAN cell global identification of the NG-RAN cell;

- shall include the amount of data received in the NG-RAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception in the NG-RAN cell; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE received data during out of NG-RAN coverage period:

- shall include the amount of data received during the out of NG-RAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency; and

ix) if the UE is configured to report the amount of data received during the collection period without location information in the usage information, per each in or out of NG-RAN coverage period:

A) shall indicate whether the data are received in or out of NG-RAN coverage;

B) if the UE received data during in NG-RAN coverage period:

- shall include the amount of data received during the in NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the in NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and radio frequency used; and

C) if the UE received data during out of NG-RAN coverage period:

- shall include the amount of data received during the out of NG-RAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of NG-RAN coverage period; and

- if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the used radio frequency; and

x) if the UE acts as a 5G ProSe UE-to-network relay UE, per each NG-RAN cell used during the 5G ProSe direct communication between the remote UE and the 5G ProSe UE-to-network relay UE:

A) shall include the NG-RAN cell global identification of the NG-RAN cell;

B) shall include the amount of data relayed by the UE;

C) shall include time stamp of the first data relay via the UE in the NG-RAN cell;

D) if the UE is configured to report the radio parameters used for 5G ProSe direct communication during the reporting period in the usage information, shall include the indicator of which radio resources were used and the radio frequency used; and

xi) if the UE is configured to report QoS flow information, per each QoS flow identified by the PQFI:

A) if the UE transmitted the QoS flow during the collection period:

- shall include the time stamp for start of transmission of the QoS flow in the collection period;

- shall include the time stamp for end of transmission of the QoS flow in the collection period;

- shall include the (initial) PC5 QoS parameters of the QoS flow in the collection period as specified in clause 10.x.4.2;

- shall include the amount of data of the QoS flow transmitted with the (initial) PC5 QoS parameters in the collection period; and

- if the PC5 QoS parameters of the QoS flow were changed during the collection period, shall include the time stamp for start of transmission of the QoS flow with the new PC5 QoS parameters, the new PC5 QoS parameters of the QoS flow as specified in clause 10.x.4.2, and the amount of data of the QoS flow transmitted with the new PC5 QoS parameters in the collection period; or

B) if the UE received the QoS flow during the collection period:

- shall include the time stamp for start of reception of the QoS flow in the collection period;

- shall include the time stamp for end of reception of the QoS flow in the collection period;

- shall include the (initial) PC5 QoS parameters of the QoS flow in the collection period as specified in clause 10.x.4.2;

- shall include the amount of data of the QoS flow received with the (initial) PC5 QoS parameters in the collection period; and

- if the PC5 QoS parameters of the QoS flow were changed during the collection period, shall include the time stamp for start of reception of the QoS flow with the new PC5 QoS parameters, the new PC5 QoS parameters of the QoS flow as specified in clause 10.x.4.2, and the amount of data of the QoS flow received with the new PC5 QoS parameters in the collection period; and

5) if configured radio parameters for the 5G ProSe direct communication applicable in the geographical area of the UE were used during the collection period, shall include the configured radio parameters for the 5G ProSe direct communication applicable in the geographical area of the UE; and

c) for each application specific data received from upper layers during the collection period, shall include the received application specific data.

Figure 7.x.2.1.2.1 illustrates the interaction of the UE and the 5G DDNMF CTF (ADF) in the usage information report list sending procedure.



Figure 7.x.2.1.2.1: Usage information report list sending procedure

##### 7.x.2.1.3 Usage information report list sending procedure accepted by the 5G DDNMF

Upon receiving a PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message from UE, the 5G DDNMF CTF (ADF) triggers one or more charging data requests according to 3GPP TS 32.277 [yy].

If the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message is accepted by the 5G DDNMF CTF (ADF), the 5G DDNMF CTF (ADF) shall send a PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message to the UE, containing a <response-accept> element with transaction ID set to the value of the transaction ID included in the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message.

##### 7.x.2.1.4 Usage information report list sending procedure successful completion by the UE

Upon receipt of the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message containing a <response-accept> element with transaction ID set to the value of the transaction ID included in the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message, the usage information report list sending procedure is successfully completed.

##### 7.x.2.1.5 Usage information report list sending procedure not accepted by the 5G DDNMF

If the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message is not accepted by the 5G DDNMF CTF (ADF), the 5G DDNMF CTF (ADF) shall send a PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message to the UE. In the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message, the 5G DDNMF CTF (ADF):

1) shall include a <response-reject> element with transaction ID set to the value of the transaction ID included in the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message; and

2) shall include appropriate cause value.

##### 7.x.2.1.6 Usage information report list sending procedure unsuccessful completion by the UE

Upon receipt of the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message containing a <response-reject> element with transaction ID set to the value of the transaction ID included in the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST message, the usage information report list sending procedure is unsuccessfully completed.

If the PROSE\_USAGE\_INFORMATION\_REPORT\_LIST\_RESPONSE message contains the cause value set to #3 "Invalid message format", the UE shall not perform the usage information report list sending procedure until the UE powers off and powers on again or the USIM is removed.

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