**3GPP TSG-WG SA2 Meeting #166S2-2412617**

**Orlando, USA, 18th Nov- 22nd Nov, 2024 (revision of S2-2411173, S2-2411958)**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.502** | **CR** | **5115** | **rev** | **5** | **Current version:** | **19.1.0** |  |
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| *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** |

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| ***Title:*** | Support of additional MPQUIC functionalities and enabling correct header compression in NG-RAN | | | | | | | | | |
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| ***Source to WG:*** | [Samsung], Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | MASSS | | | | |  | ***Date:*** | | | 2024-11-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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 can be 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) Rel-19 (Release 19)*  *Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | As part of the Rel-19 study, it was concluded to define a new steering functionalities based on MPQUIC called “MPQUIC-E steering functionality” and “MPQUIC-IP steering functionalitity” using connect-ethernet and connect-ip extension of HTTP protocol.  The CR proposes relevant changes to introduce the new MPQUIC based functionalities.  Furthermore, NG-RAN applies specific Header compression algorithm based on the type of PDU Session provided to it in the N2 SM information by the SMF. For MPQUIC-Ethernet, the actual network protocol as seen by NG-RAN would be IP even though the PDU Session type (as seen be UE and the core network) is Ethernet.  Hence the SMF behaviour needs to be specified in order for the NG-RAN to behave correctly.  For the Editor’s note in clause 4.22.2.1, since there will be RAN impact if both ATSSS-LL and MPQUIC-E are enabled in the same MA PDU session, which is not aligned with SID assumption. Therefore, the NOTE that either ATSSS-LL or MPQUIC-E functionality is enabled for the same Ethernet MA PDU Session is added to clarify Steering functionality supported by Ethernet MA PDU Session. | | | | | | | | |
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| ***Summary of change:*** | | * In clause 4.22.2.1, SM * F behaviour is specified in order for the NG-RAN to apply the correct Header compression algorithm. * A NOTE is added in cluase 4.22.2.1 that either ATSSS-LL or MPQUIC-E functionality is enabled for the same Ethernet MA PDU Session. | | | | | | | | |
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| ***Consequences if not approved:*** | | Undetermined behaviour of NG-RAN in terms of applying header compression algorithm | | | | | | | | |
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| ***Clauses affected:*** | | 4.22.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

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

4.22.2.1 Non-roaming and Roaming with Local Breakout

The signalling flow for a MA PDU Session establishment when the UE is not roaming, or when the UE is roaming and the PDU Session Anchor (PSA) is located in the VPLMN, is based on the signalling flow in Figure 4.3.2.2.1-1 with the following differences and clarifications:

- The PDU Session Establishment Request message may be sent over the 3GPP access or over the non-3GPP access. In the steps below, it is assumed that it is sent over the 3GPP access, unless otherwise specified.

- In step 1, the UE provides Request Type as "MA PDU Request" in UL NAS Transport message and its ATSSS Capabilities as defined in clause 5.32.2 of TS 23.501 [2] in PDU Session Establishment Request message.

The "MA PDU Request" Request Type in the UL NAS Transport message indicates to the network that this PDU Session Establishment Request is to establish a new MA PDU Session and to apply one or more steering functionalities (defined in TS 23.501 [2], clause 5.32.6) for steering the traffic of this MA PDU session over multiple accesses.

If the UE requests an S-NSSAI and the UE is registered over both accesses, it shall request an S-NSSAI that is allowed on both accesses.

The UE indicates to AMF whether it supports non-3GPP access path switching, i.e. whether the UE can transfer the non-3GPP access path of the MA PDU Session from a source non-3GPP access (N3IWF/TNGF) to a target non-3GPP access (a different N3IWF/TNGF).

- In step 2, if the AMF supports MA PDU sessions, then the AMF selects an SMF, which supports MA PDU sessions. If the AMF supports non-3GPP access path switching and the UE indicated in step 1 that the UE supports non-3GPP access path switching, the AMF selects a SMF that supports non-3GPP access path switching, if such an SMF is available.

- In step 3, the AMF informs the SMF that the request is for a MA PDU Session by including "MA PDU Request" indication and in addition, it indicates to SMF whether the UE is registered over both accesses. If the AMF determines that the UE is registered via both accesses, but the requested S-NSSAI is not allowed on both accesses, then the AMF shall reject the MA PDU session establishment. If the AMF supports non-3GPP access path switching while maintaining two N2 connections for non-3GPP access, the selected SMF supports non-3GPP path switching and UE indicated in step 1 that the UE supports non-3GPP access path switching, the AMF indicates whether the UE supports non-3GPP path switching to the SMF.

The AMF shall reject the PDU Session Establishment request if the request is for a LADN.

- In step 4, the SMF retrieves, via Session Management subscription data, the information whether the MA PDU session is allowed or not.

- In step 7, if dynamic PCC is to be used for the MA PDU Session, the SMF sends an "MA PDU Request" indication to the PCF in the SM Policy Control Create message and the ATSSS Capabilities of the MA PDU session. The SMF provides the currently used Access Type(s) and RAT Type(s) to the PCF. The PCF decides whether the MA PDU session is allowed or not based on operator policy and subscription data.

The PCF provides PCC rules that include MA PDU session control information, as specified in TS 23.503 [20]. From the received PCC rules, the SMF derives (a) ATSSS rules, which will be sent to UE for controlling the traffic steering, switching and splitting in the uplink direction and (b) N4 rules, which will be sent to UPF for controlling the traffic steering, switching and splitting in the downlink direction. If the UE indicates the support of "ATSSS-LL Capability", the SMF may derive the Measurement Assistance Information.

If the SMF receives a UP Security Policy for the PDU Session with Integrity Protection set to "Required" and the MA PDU session is being established over non-3GPP access, the SMF does not verify whether the access can satisfy the UP Security Policy.

- In the remaining steps of Figure 4.3.2.2.1-1, the SMF establishes the user-plane resources over the 3GPP access, i.e. over the access where the PDU Session Establishment Request was sent on:

- In step 10, the N4 rules derived by SMF for the MA PDU session are sent to UPF and two N3 UL CN tunnels info are allocated by the UPF. If the ATSSS LL functionality is supported for MA PDU Session, the SMF may instruct the UPF to initiate performance measurement for this MA PDU Session. If the MPTCP functionality and/or the MPQUIC functionality is supported for the MA PDU Session, the SMF may instruct the UPF to activate the MPTCP functionality and/or the MPQUIC functionality for this MA PDU Session. In step 10a, the UPF allocates addressing information for the Performance Measurement Function (PMF) in the UPF. If the UPF receives from the SMF a list of QoS flows over which access performance measurements may be performed, the UPF allocates different UDP ports or different MAC addresses per QoS flow per access. In step 10b, the UPF sends the addressing information for the PMF in the UPF to the SMF. If UDP ports or MAC addresses are allocated per QoS flow and per access, the UPF sends the PMF IP address information and UDP ports with the related QFI to the SMF in the case of IP PDU sessions and sends the MAC addresses with the related QFI to the SMF in the case of Ethernet PDU sessions.

In step 10a, if the message from the SMF instructs the UPF to activate MPTCP functionality, the UPF allocates the UE "MPTCP link-specific multipath" addresses/prefixes. In step 10b, the UPF sends the "MPTCP link-specific multipath" addresses/prefixes and MPTCP proxy information to the SMF. If the message from the SMF instructs the UPF to activate MPQUIC functionality, the UPF allocates the UE "MPQUIC link-specific multipath" addresses/prefixes. In step 10b, the UPF sends the "MPQUIC link-specific multipath" addresses/prefixes and MPQUIC proxy information to the SMF. The "MPTCP link-specific multipath" addresses/prefixes and the "MPQUIC link-specific multipath" addresses/prefixes may be the same.

- In step 11, for the MA PDU session, the SMF includes an "MA PDU session Accepted" indication in the Namf\_Communication\_N1N2MessageTransfer message to the AMF and indicates to AMF that the N2 SM Information included in this message should be sent over 3GPP access. The AMF marks this PDU session as MA PDU session based on the received "MA PDU session Accepted" indication. If the AMF indicated in step 3 that non-3GPP path switching while maintaining two N2 connections for non-3GPP access is supported, the SMF indicates support of non-3GPP path switching in the PDU Session Establishment Accept message.

In case the PDU Session Type is “Ethernet”, then:

* If the Steering functionality parameter in the MA PDU Session control information of the received PCC rule(s) is set only to MPQUIC-E, then SMF provides the PDU Session type as “IP” in the N2 SM information to NG-RAN,

NOTE Y1: When only MPQUIC-E functionality is enabled for an MA PDU Session, the packets exchanged between UE and UPF are IP packets of the "MPQUIC link-specific multipath" addresses/prefixes (i.e. the (R)AN transports IP packets between UE and UPF). PDU Session type IP is provided to the (R)AN so that the NG-RAN can apply ROHC.

* If the Steering functionality parameter in the MA PDU Session control information of the received PCC rule(s) is set only to ATSSS-LL, then SMF behaviour is as per the clause 4.3.2.2.1 (i.e. PDU Session type “Ethernet” is provided in the N2 SM information).

NOTE Y2: Either ATSSS-LL or MPQUIC-E functionality is enabled for the same Ethernet MA PDU Session.

- In step 13, the UE receives a PDU Session Establishment Accept message, which indicates to UE that the requested MA PDU session was successfully established. This message includes the ATSSS rules for the MA PDU session, which were derived by SMF. If the ATSSS -LL functionality is supported for the PDU Session, the SMF may include the addressing information of PMF in the UPF into the Measurement Assistance Information. If the MPTCP functionality is supported for the MA PDU Session, the SMF shall include the "MPTCP link-specific multipath" addresses/prefixes of the UE and the MPTCP proxy information. If the MPQUIC functionality is supported for the MA PDU Session, the SMF shall include the "MPQUIC link-specific multipath" addresses/prefixes of the UE and the MPQUIC proxy information.

- After step 18 in Figure 4.3.2.2.1-1, if the SMF was informed in step 2 that the UE is registered over both accesses, then the SMF initiates the establishment of user-plane resources over non-3GPP access too. The SMF sends an Namf\_Communication\_N1N2MessageTransfer to the AMF including N2 SM Information and indicates to AMF that the N2 SM Information should be sent over non-3GPP access. Namf\_Communication\_N1N2MessageTransfer does not include an N1 SM Container for the UE because this was sent to UE in step 13. After this step, the two N3 tunnels between the PSA and RAN/AN are established.

The last step above is not executed when the UE is registered over one access only, in which case the MA PDU Session is established with user-plane resources over one access only. How user-plane resources can be added over an access of the MA PDU Session is specified in clause 4.22.7.