3GPP TSG-WG SA2 Meeting #164 *S2-2408823*

**Maastricht, Netherlands, August 19 – 23, 2024 (revision of S2-2407565)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.316** | **CR** | **2129** | **rev** | **1** | **Current version:** | **18.5.0** |  |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  | XRM\_Ph2 KI#6 L4S support in wireline access |
|  |  |
| ***Source to WG:*** | Charter Communications, CableLabs, Tencent, Tencent Cloud, Nokia, Samsung |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | XRM\_Ph2 |  | ***Date:*** | 2024-08-09 |
|  |  |  |  |  |
| ***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 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | The following R19 TR23700-70 conclusions for Key Issue #6 (i.e., clause 8.6) were agreed as principles for normative work:1. Dedicated 5G QoS Flow(s) and non-3GPP access resources (e.g. IPsec Child SAs) are used for carrying L4S enabled IP traffic.
2. For wireline access:
	1. ECN marking for L4S is supported in W-AGF. It is controlled via N2 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS profile(s) and L4S-enabled W-UP resource(s).
	2. ECN marking for L4S is supported in 5G-RG in UL. It is controlled via N1 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS rule(s) and L4S-enabled W-UP resource(s).

NOTE: To support this functionality, the UE needs to support UL L4S feedback as described in IETF RFC 9330 [14] which is not in the scope of 3GPP. |
|  |  |
| ***Summary of change:*** | Introduction of L4S functionality on non-3GPP access resources, according to KI#6 conclusion in TR23.700-70 clause 8.6, including a new clause 4.x.2 for L4S to align with S2-2408586 new clause 4.x Support for high data rate low latency services, eXtended Reality (XR) and interactive media services |
|  |  |
| ***Consequences if not approved:*** | New feature not implemented in the specification.  |
|  |  |
| ***Clauses affected:*** | 2, 4.4.1, 4.x.2, 5.1.1, 7.2.2.1, 7.3.1.1, 7.3.2 |
|  |  |
|  | **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 \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G system, Stage 2".

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[5] BBF TR-124 issue 5: "Functional Requirements for Broadband Residential Gateway Devices".

[6] BBF TR-101 issue 2: "Migration to Ethernet-Based Broadband Aggregation".

[7] BBF TR-178 issue 1: "Multi-service Broadband Network Architecture and Nodal Requirements".

[8] CableLabs DOCSIS MULPI: "Data-Over-Cable Service Interface Specifications DOCSIS 3.1, MAC and Upper Layer Protocols Interface Specification".

[9] BBF TR-456 issue 2: "AGF Functional Requirements".

[10] BBF WT-457: "FMIF Functional Requirements".

NOTE: Technical Report of BBF WT-457 will be TR-457 which will be available when finalized by BBF.

[11] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[12] BBF TR-177 Issue 1 Corrigendum 1: "IPv6 in the context of TR-101".

[13] IETF RFC 6788: "The Line-Identification Option".

[14] 3GPP TS 23.003: "Numbering, Addressing and Identification".

[15] Void.

[16] IETF RFC 6603: "Prefix Exclude Option for DHCPv6-based Prefix Delegation".

[17] Void.

[18] BBF TR-069: "CPE WAN Management Protocol".

[19] BBF TR-369: "User Services Platform (USP)".

[20] IETF RFC 3046: "DHCP Relay Agent Information Option".

[21] IETF RFC 4604: "Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast".

[22] 3GPP TR 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[23] 3GPP TS 38.413: "NG RAN; NG Application Protocol (NGAP)".

[24] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[25] 3GPP TS 22.011: "Service accessibility".

[26] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

[27] CableLabs WR-TR-5WWC-ARCH: "5G Wireless Wireline Converged Core Architecture".

[28] IETF RFC 3376: "Internet Group Management Protocol, Version 3".

[29] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS)".

[30] BBF TR-198: "DQS:DQM systems functional architecture and requirements".

[31] 3GPP TS 23.203: "Policy and charging control architecture".

[32] 3GPP TS 33.126: "Lawful Interception Requirements".

[33] IETF RFC 2236: "Internet Group Management Protocol, Version 2".

[34] IETF RFC 4861: "Neighbor Discovery for IP version 6 (IPv6)".

[35] IETF RFC 1112: "Internet Group Management Protocol".

[36] IETF RFC 2710: "Multicast Listener Discovery Version for IPv6".

[37] IETF RFC 2010: "Operational Criteria for Root Name Servers".

[38] BBF TR-470: "5G FMC architecture".

[39] 3GPP TS 29.519: "Policy Data, Application Data and Structured Data for exposure".

[40] 3GPP TS 23.041: "Public Warning System".

[41] IEEE Publication (2017): "Guidelines for Use of Extended Unique Identifier (EUI), Organizationally Unique Identifier (OUI), and Company ID (CID)". https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/tutorials/eui.pdf.

[42] 3GPP TS 29.413: "Application of the NG Application Protocol (NGAP) to non-3GPP access".

[43] Void.

[44] 3GPP TS 24.502: "Access to the 3GPP 5G Core Network (5GCN) via non-3GPP access networks".

[45] 3GPP TS 23.402: " Architecture enhancements for non-3GPP accesses".

[46] BBF TR-181: "Device Data Model for TR-069".

[47] IETF RFC 8415: "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)".

[x1] IETF RFC 9330:"Low Latency, Low Loss, Scalable Throughput (L4S) Internet Service: Architecture".

[x2] IETF RFC 9331: "Explicit Congestion Notification (ECN) Protocol for Very Low Queuing Delay (L4S)".

[x3] IETF RFC 9332: "Dual-Queue Coupled Active Queue Management (AQM) for Low Latency, Low Loss, and Scalable Throughput (L4S)".

[x4] IETF RFC 6040: " Tunnelling of Explicit Congestion Notification".

\* \* \* \* Second change \* \* \* \*

### 4.4.1 Session management for 5G-RG

Session management of 5G-RG connected to 5GC via wireline access follows the principle defined in TS 23.501 [2] clause 5.6 with the following difference:

- UE is replaced by 5G-RG.

- 5G-RG is connected to 5GC via wireline RAT type instead of 3GPP access.

- ECN marking for L4S in 5G-RG in UL, controlled via N1 signaling (Indication of ECN marking for L4S for an L4S enabled QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS rule(s) and L4S enabled W-UP resource(s).

\* \* \* \* Third change \* \* \* \*

4.x.2 ECN marking for L4S

In order to support ECN marking for L4S at W-AGF as specified in TS 23.501[2], SMF provides ECN marking request per QoS flow level to the W-AGF as part of PDU Session Management procedure. If the W-AGF supports ECN marking, it applies proper mapping between L4S-enabled QoS profile(s) and L4S-enabled W-UP resource(s).

ECN marking for L4S in 5G-RG may be supported in UL. It is controlled via N1 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies proper mapping between L4S-enabled QoS rule(s) and L4S-enabled W-UP resource(s).

When ECN marking for L4S at W-AGF is enabled for downlink or uplink or 5G-RG in UL, the W-AGF or 5G-RG should set the Congestion Experienced (CE) codepoint in downlink or uplink IP packet inner header per the recommendations in IETF RFC 9330 [x1], IETF RFC 9331 [x2], IETF RFC 9332 [x3], and implement IP-in-IP encapsulation and decapsulation as specified in IETF RFC 6040 [x4].

The 5G-RG shall indicate in the UE 5GSM Core Network Capability whether the 5G-RG supports:

- ECN marking for L4S in UL (as referred to in TS 23.501[2] clause 5.37.3)

NOTE: Any non-3GPP access node (i.e., W-AGF and 5G-RG) supporting L4S and acting as an IP-in-IP tunnel endpoint between the XR application client and server is assumed to implement encapsulation and decapsulation as specified in IETF RFC 6040 [x1].

The criteria based on which W-AGF and 5G-RG decides to mark ECN bits for L4S is implementation specific.

\* \* \* \* Fourth change \* \* \* \*

5.1.1 W-AGF

The functionality of W-AGF in the case of Wireline 5G Access network includes the following:

- Termination of N2 and N3 interfaces to 5G Core Network for control - plane and user-plane respectively.

- Handling of N2 signalling from SMF (relayed by AMF) related to PDU Sessions and QoS.

- Support of ECN marking for L4S: The SMF provides ECN marking request per QoS flow level to the W-AGF as part of PDU session management procedures.

- When ECN marking for L4S at W-AGF is enabled for downlink or uplink, the W-AGF applies the proper mapping between L4S-enabled QoS profile(s) and L4S-enabled W-UP resource(s) and the W-AGF should set the Congestion Experienced (CE) codepoint in downlink or uplink as per the recommendations in IETF RFC 9330 [x1], IETF RFC 9331 [x2], IETF RFC 9332 [x3], IETF RFC 6040 [x4].

- Relaying uplink and downlink user-plane packets between the 5G-RG and UPF and between FN-RG and UPF. This involves:

- Enforcing QoS corresponding to N3 packet marking, taking into account QoS requirements associated to such marking received over N2.

- N3 user-plane packet marking in the uplink.

- Supporting AMF discovery and selection defined in TS 23.501 [2] clause 6.3.5 where the 5G-S-TMSI is not used for AMF selection since the wireline AS layer can only carry the GUAMI.

- Termination of wireline access protocol on Y4 and Y5.

- In the case of FN-RG the W-AGF acts as end point of N1 on behalf of the FN-RG.

In the case of Wireline 5G Broadband Access network the definition of W-AGF functionalities is specified in BBF TR-456 [9] and WT-457 [10].

NOTE: The W-AGF is specified as AGF (Access Gateway Function) in BBF TR-456 [9] for supporting 5G-RG and FN-RG and as FMIF (Fixed Mobile Interworking Function) for supporting FN-RG only in the case of presence of BNG in WT-457 [10]. Both cases for FN-RG support, i.e. AGF and FMIF, have identical interfaces towards 5GC, i.e. it is transparent to 5GC whether AGF or FMIF is used and no difference between AGF or FMIF cases is defined in this specification.

In the case of Wireline 5G Cable Access network the definition of W-AGF functionalities is specified by Cablelabs WR-TR-5WWC-ARCH [27].

\* \* \* \* Fifth change \* \* \* \*

7.2.2.1 5G-RG Service Request procedure via W-5GAN Access

The Service Request procedure via W-5GAN shall be used by a 5G-RG in CM-IDLE state over W-5GAN to request the re-establishment of the NAS signalling connection and the re-establishment of the user plane for all or some of the PDU Sessions which are associated to non-3GPP access.

NOTE 1: For a W-5GAN access, the Service Request procedure is never a response to a Paging i.e. Paging does not apply on a W-5GAN access.

The Service Request procedure via W-5GAN shall be used by a 5G-RG in CM-CONNECTED state over wireline access to request the re-establishment of the user plane for one or more PDU Sessions which are associated to non-3GPP access.

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**Figure 7.2.2.1-1: 5G-RG Triggered Service Request procedure via W-5GAN**

1. The 5G-RG connects to a W-5GAN as described in step 1 of Figure 7.2.1.1-1.

2. Void.

3. The 5G-RG using W-CP protocol stack sends a message that contains the Access Network parameters (GUAMI and Establishment Cause) and a NAS Service Request message (List Of PDU Sessions To Be Activated, security parameters, PDU Session status, Uplink Data Status, 5G-S-TMSI). The Establishment cause provides the reason for requesting a signalling connection with 5GC. In this release of the specification no Selected PLMN or SNPN parameter is sent by a 5G RG.

4. The W-AGF shall then forward the Service Request received from the 5G-RG to the selected AMF within an N2 initial UE message (NAS Service Request message, User Location Information, Establishment cause, UE context request).

5. The AMF may initiate NAS authentication/security procedure as defined in step 6 and step 7 in clause 7.2.1.1.

 If the UE in CM-IDLE state triggered the Service Request to establish a signalling connection only, after successful establishment of the signalling connection the UE and the network can exchange NAS signalling and steps 6 and 14 are skipped.

6. Steps 4-11 in TS 23.502 [3] figure 4.2.3.2-1 are performed for each requested PDU session user plane.

For each QoS Flow, the SMF may request the following to the W-AGF or 5G-RG:

 - ECN marking for L4S at 5G-RG in UL in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

 - ECN marking for L4S at W-AGF in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

7. (If the 5G RG was CM-IDLE) AMF sends an N2 Initial Context Setup Request message (N2 SM information received from SMF(s), RG Level Wireline Access Characteristics, GUAMI, Allowed NSSAI, UE security capability, Security Key, Trace Activation, Masked IMEISV).

 If the 5G RG was CM-CONNECTED the AMF sends N2 SM information received from SMF(s).

 The W-AGF ignores any UE security capability received in a N2 Initial Context Setup Request message.

NOTE 2: The UE Security Capability IE is mandatory in NGAP protocol, but it is not applicable to wireline access, so the AMF can provide any value and the W-AGF ignores it.

8. Void.

9. [Conditional, if the 5G RG was CM-IDLE] A signalling connection using W-CP protocol stack is established between the 5G-RG and W-AGF.

NOTE 3: Steps 9-11 are defined by BBF/Cablelabs.

 Steps 10 and 11 are carried out for each PDU Session indicated in step 7

10. Based on its own policies and configuration and based on the QoS flows and QoS parameters received in the previous step, the W-AGF shall determine what W-UP resources are needed for the PDU session.

11. The W-AGF sets up the W-UP resources for the PDU session. This step is specified by BBF for W-5BGAN and by CableLabs for W-5GCAN. The access dependent W-UP resource setup procedure shall map to the identity of the PDU Session associated with the W-UP resource.

12. W-AGF notifies the AMF that the 5G-RG context was created by sending a N2 Initial Context Setup Response (N2 SM information that provides AN Tunnel Info, List of accepted QoS Flows, List of rejected QoS Flows per PDU Session ID for PDU Sessions whose UP connections are activated,).

13. AMF sends NAS Service Accept via W-AGF to the 5G-RG.

14. All steps after step 14 in TS 23.502 [3] figure 4.2.3.2-1 are performed for each requested PDU Session user plane.

When the 5G-RG is in CM-CONNECTED state over W-5GAN access and the network receives downlink data for a PDU Session over wireline access that has no user plane connection, the steps 1-4a in clause 4.2.3.3 of TS 23.502 [3] (Network Triggered Service Request) shall be performed with the following exceptions:

- The (R)AN corresponds to an W-AGF.

- The UE corresponds to the 5G-RG.

- In step 4a of TS 23.502 [3] clause 4.2.3.3, the steps 2b-6 in figure 7.3.1.1-1 are performed to establish the W-UP resources and to establish N3 tunnel. In steps 2b and 6, no NAS message is exchanged with the UE.

\* \* \* \* Sixth change \* \* \* \*

7.3.1.1 5G-RG PDU Session establishment via W-5GAN

Clause 7.3.1.1 specifies how a 5G-RG can establish a PDU Session via an W-5GAN as well as to hand over an existing PDU Session between 3GPP access and W-5GAN. The procedure applies in non-roaming scenarios.

The PDU Session Establishment procedure specified in TS 23.502 [3] clause 4.3.2.2.1 applies with the following changes.

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**Figure 7.3.1.1-1: 5G-RG PDU Session establishment via W-5GAN**

1. The 5G-RG shall send a PDU Session Establishment Request message to AMF as specified in step 1 in clause 4.3.2.2.1 of TS 23.502 [3]. This message shall be sent to W-AGF via the W-CP signalling connection and the W-AGF shall transparently forward it in a N2 Uplink NAS transport message (NAS message, User location information, W-AGF identities) to AMF in the 5GC.

 The W-AGF identities parameter may be included by the W-AGF and contains a list of Identifiers (i.e. a FQDN and/or IP address(es)) of N3 terminations at W-AGF and can be used by SMF in step 8 in TS 23.502 [3] clause 4.3.2.2.1 as input to select an UPF.

 If the 5G-RG needs Hybrid Access with Multi-Access PDU Session service, the 5G-RG requests a MA PDU Session as defined in clause 4.12. In that case, Steps of TS 23.502 [3] clause 4.3.2.2.1 apply as modified by clause 4.12.

5G-RG may include an indication for support of ECN marking for L4S in 5GSM Core Network Capability included in the PDU Session Establishment Request within the N1 SM container.

2a. Steps 2-11 specified in TS 23.502 [3] clause 4.3.2.2.1 are executed according to the PDU Session Establishment procedure over 3GPP access with the deviation that in step 3 an additional parameter W-AGF identities received by the AMF from the W-AGF can be sent from AMF to SMF. SMF can use W-AGF identities in step 8 of TS 23.502 [3] clause 4.3.2.2.1 for UPF selection.

 For each QoS Flow, if the 5G-RG indicated support for ECN marking in UL via N1 signalling the SMF may request the following to the W-AGF/5G-RG:

 - ECN marking for L4S at W-AGF in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

- ECN marking for L4S at 5G-RG in UL in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

NOTE x: The SMF is assumed to have corresponding PCC rule(s) for the specific DNN and S-NSSAI associated with the L4S QoS flow for which ECN marking is expected.

For the LADN service, if the AMF detects the requested DNN is corresponding to a LADN DNN or the default DNN of the requesting S-NSSAI is a LADN DNN, and the access type of 5G-RG equals to wireline access, the AMF will assign "UE Presence in LADN service area" indication to be "OUT", and provide this indication to SMF.

NOTE: This induces the SMF to reject the PDU Session establishment request

2b. As described in steps 11 and 12 of TS 23.502 [3] clause 4.3.2.2.1, the AMF shall under request of the SMF send a N2 PDU Session Resource Setup Request message to W-AGF to establish the access resources for this PDU Session. The differences with steps 11 and 12 of TS 23.502 [3] clause 4.3.2.2.1 are:

- The W-AGF shall ignore RSN if received from 5GC.

3. Based on its own policies and configuration and based on the QoS flows and QoS parameters received in the previous step, the W-AGF shall determine what W-UP resources are needed for the PDU session. For example, the W-AGF may decide to establish one W-UP resource and associate all QoS profiles with this W-UP resource. In this case, all QoS Flows of the PDU Session would be transferred over one W-UP resource.

4a. The W-AGF sets up the W-UP resources for the PDU session. This step is specified by BBF for W-5BGAN and by CableLabs for W-5GCAN. The access dependent W-UP resource setup procedure shall provide the identity of the PDU Session associated with the W-UP resource. The W-UP resource setup procedure should support to bind W-UP resources to individual QFI(s) as specified in clause 4.4. The W-UP resource request may also contain other access layer information (e.g., VLAN id) specific for the W5GAN.

5. After all W-UP resources are established, the W-AGF shall forward to 5G-RG via the W-CP signalling connection the PDU Session Establishment Accept message received in step 2b.

6. The W-AGF shall send to AMF an N2 PDU Session Resource Setup Response (PDU Session ID, AN Tunnel Info, List of accepted/rejected QFI(s), User Plane Security Enforcement Policy Notification,).

7. All steps specified in TS 23.502 [3] clause 4.3.2.2.1 after step 14 are executed according to the PDU Session Establishment procedure over 3GPP access.

\* \* \* \* Seventh change \* \* \* \*

7.3.2 5G-RG or Network Requested PDU Session Modification via W-5GAN

The UE or network requested PDU Session Modification procedure via W-5GAN access is depicted in figure 7.3.2-1. The procedure applies in non-roaming scenarios.

The procedure below is based on the PDU Session Modification procedure specified in TS 23.502 [3] clause 4.3.3.2.

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**Figure 7.3.2-1: 5G-RG or Network Requested PDU Session Modification via W-5GAN**

1. If the PDU Session Modification procedure is initiated by the UE, the UE shall send a PDU Session Modification Request message to AMF as specified in TS 23.502 [3] step 1 of clause 4.3.2.2. The message shall be sent to W-AGF via W-CP signalling connection. The W-AGF shall transparently forward the PDU Session Modification Request to AMF/SMF.

2. The steps 1a (from AMF) to 1e and steps 2-3 as per the PDU Session Modification procedure in TS 23.502 [3] clause 4.3.3.2 are executed.

For each QoS Flow, the SMF may request the following to the W-AGF or 5G-RG:

 - ECN marking for L4S at W-AGF in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

- ECN marking for L4S at 5G-RG in UL in the case of ECN marking for L4S in non-3GPP access as described in clause 5.37.3 of TS 23.501 [2].

3. The AMF sends N2 PDU Session Resource Modify Request (N2 SM information received from SMF, NAS message) message to the W-AGF. This step is the same as step 4 in clause 4.3.3.2.

4. The W-AGF may issue W-CP resource modification procedure (out of scope of 3GPP) with the 5G-RG that is related with the information received from SMF. Based on the N2 SM information received from the SMF, the W-AGF may perform following:

4a. [Conditional] The W-AGF may decide to create a new W-UP resource for the new QoS Flow(s).

4b. [Conditional] The W-AGF may decide to add or remove QoS Flow(s) to/from an existing W-UP resource.

4c. [Conditional] The W-AGF may decide to delete an existing W-UP resource, e.g. when there is no QoS Flow mapped to this W-UP resource.

NOTE: If the W-AGF has included the Default W-UP resource indication during the establishment of one of the W-UP resources of the PDU Session, the W-AGF may not update the mapping between QoS Flows and W-UP resources.

5. The W-AGF acknowledges N2 PDU Session Resource Modify Request by sending a N2 PDU Session Resource Modify Response Message to the AMF to acknowledge the success or failure of the request.

6. Step 7 as per the PDU Session Modification procedure in TS 23.502 [3] clause 4.3.3.2 is executed.

7. The W-AGF sends the PDU Session Modification Command to 5G-RG (if received in step 3) and receives the response message from 5G-RG.

 Steps 4a/4c and step 7 may happen consecutively. Steps 7b map happen before step 4b/4d.

8. The W-AGF forwards the NAS message to the AMF.

9. All the steps after step 10 in TS 23.502 [3] clause 4.3.3.2 are executed according to the general PDU Session Modification procedure.

\* \* \* End of changes \* \* \* \*