**TSG SA WG2 Meeting #165 S2-2409754**

 **Hyderabad, India, October 14-18, 2024**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** | **5651** | **rev** | **-** | **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:***  | 23.501 Data boosting triggered by AS/AF |
|  |  |
| ***Source to WG:*** | Lenovo, Tencent, Tencent Cloud, CATT, China Telecom, Meta USA |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | XRM\_Ph2 |  | ***Date:*** | 2024-9-30 |
|  |  |  |  |  |
| ***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:*** | It is agreed in 23.700-70 KI#5 conclusion to support data boosting triggered by AS/AF.  |
|  |  |
| ***Summary of change:*** | Following enhancements are introduced: * Add decription of dynamic traffic characteristics change in 5.37.1
* Add description of AS/AF triggered data boosting in 5.37.x
* Add “Expedited Transfer Indication” in PDR
* Add the “dynamic traffic characteristics change” feature into the selection of UPF
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| ***Consequences if not approved:*** | The data boosting scheme is not supported  |
|  |  |
| ***Clauses affected:*** | 5.37.1,5.37.x(new), 5.8.5.3,6.3.3.3 |
|  |  |
|  | **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 \* \* \* \*

### 5.37.1 General

This clause provides an overview of 5GS functionalities for support of XR services (AR/VR applications) and interactive media services that require high data rate and low latency communication, e.g. cloud gaming and tactile/multi-modal communication services according to service requirements documented in TS 22.261 [2]. The standardized 5QI characteristics for such interactive services are provided in Table 5.7.4-1 and TSCAI is used to describe the related traffic characteristics as defined in clause 5.27.2. Further enhancements for these interactive media services are as follows:

- The 5GS may support QoS policy control for multi-modal traffic, see clause 5.37.2.

- The 5GS may support network information exposure which can be based on ECN markings for L4S, see clause 5.37.3 or 5GS exposure API, see clause 5.37.4.

- The 5GS may support PDU Set based QoS handling including PDU Set identification and marking, see clause 5.37.5.

- The 5GS may ensure that the UL and DL packets together meet the requested round trip delay and also update the delay for UL and DL considering QoS monitoring results, see clause 5.37.6.

- The 5GS may perform per-flow Packet Delay Variation (PDV) monitoring and policy control according to AF provided requirements, see clause 5.37.7.

- The 5GC may provide traffic assistance information to the NG-RAN to enable Connected mode DRX power saving, see clause 5.37.8.

- the 5GC may consider dynamically changed traffic characteristics for better resource management and/or data boosting with reflective QoS, see clause 5.37.x.

\* \* \* Next Change \* \* \* \*

### 5.37.x Support of dynamic traffic characteristics change

#### 5.37.x.1 General

The following dynamic traffic characteristics related information and scheme is supported:

* Provision of the DL traffic characteristics information change dynamically to the RAN in-band for the DL resource scheduling, e.g., Burst size, Time to Next Burst
* Support data boosting triggered by AS/AF

#### 5.37.x.2 Provision of the DL traffic characteristics information change

#### 5.37.x.3 Data boosting with reflective QoS

Data boosting triggered by AS/AF is used to expedite the transfer of larger payload for IP flow(s) of XR application. Data boosting may be used for non-GBR QoS flow only.

To enable data boosting, AF provides two media flows with corresponding QoS requirements, one media flow (with a normal 5QI) includes the Expedited Transfer Indication (ETI) set to TRUE and another media flow (with an additonal non-GBR 5QI) includes the Expedited Transfer Indication (ETI) set to FALSE, and DL Protocol Description for dynamic PCC control. The two media flows share the same packet filter. The PCF generates two PCC rules (one per media flow) with Reflective QoS Control, based on the AF request. The SMF generates two PDRs based on the two PCC rules. Based on the two PDRs, PSA UPF maps the data of the SDF to the corresponding QoS flow according to the value of “Expedited Transfer Indication” contained in application layer metadata or N6 metadata.

\* \* \* Next Change \* \* \* \*

5.8.5.3 Packet Detection Rule

The following table describes the Packet Detection Rule (PDR) containing information required to classify a packet arriving at the UPF. Every PDR is used to detect packets in a certain transmission direction, e.g. UL direction or DL direction.

**Table 5.8.5.3-1: Attributes within Packet Detection Rule**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Description** | **Comment** |
| N4 Session ID | Identifies the N4 session associated to this PDR. NOTE 5. |  |
| Rule ID | Unique identifier to identify this rule. |  |
| Precedence | Determines the order, in which the detection information of all rules is applied. |  |
| Packet  | Source interface | Contains the values "access side", "core side", "SMF", "N6-LAN", "5G VN internal". | Combination of UE IP address (together with Network instance, if necessary), CN tunnel info, |
| Detection | UE IP address  | One IPv4 address and/or one IPv6 prefix with prefix length (NOTE 3). | packet filter set, application identifier, Ethernet PDU Session |
| Information.NOTE 4. | Network instance (NOTE 1) | Identifies the Network instance associated with the incoming packet. | Information and QFI are used for traffic detection.Source interface identifies the |
|  | CN tunnel info | CN tunnel info on N3, N9 interfaces, i.e. F-TEID. | interface for incoming packets |
|  | Packet Filter Set | Details see clause 5.7.6. | where the PDR applies, e.g. from access side (i.e. up-link), |
|  | Application identifier |  | from core side (i.e. down-link), |
|  | QoS Flow ID | Contains the value of 5QI or non-standardized QFI. | from SMF, from N6-LAN (i.e. the |
|  | Ethernet PDU Session Information | Refers to all the (DL) Ethernet packets matching an Ethernet PDU session, as further described in clause 5.6.10.2 and in TS 29.244 [65]. | DN), or from "5G VN internal" (i.e. local switch). |
|  | Framed Route Information | Refers to Framed Routes defined in clause 5.6.14. | Details like all the combination possibilities on N3, N9 interfaces are left for stage 3 decision. |
|  | FQDN Filter for DNS Query | Contains one or more FQDN, FQDN range, and/or any FQDN. | The FQDN or FQDN range only used for detection of plain DNS Query message (i.e. not subject to ciphering). The usage is described in TS 23.548 [130]. |
|  | Protocol Description | Indicates service protocol used by the flow (NOTE 8). |  |
|  | Expedited Transfer Indication | Indicates to filter the N6 metadata with “Expedited Transfer Indication”(NOTE 9) |  |
| Packet replication and detection carry on information | Packet replication skip information NOTE 7 | Contains UE address indication or N19/N6 indication. If the packet matches the packet replication skip information, i.e. source address of the packet is the UE address or the packet has been received on the interface in the packet replication skip information, the UP function neither creates a copy of the packet nor applies the corresponding processing (i.e. FAR, QER, URR). Otherwise the UPF performs a copy and applies the corresponding processing (i.e. FAR, QER, URR). |  |
| NOTE 6 | Carry on indication | Instructs the UP function to continue the packet detection process, i.e. lookup of the other PDRs. |  |
| Outer header removal | Instructs the UP function to remove one or more outer header(s) (e.g. IP+UDP+GTP, IP + possibly UDP, VLAN tag), from the incoming packet. | Any extension header shall be stored for this packet.  |
| Forwarding Action Rule ID (NOTE 2) | The Forwarding Action Rule ID identifies a forwarding action that has to be applied. |  |
| Multi-Access Rule ID (NOTE 2) | The Multi-Access Rule ID identifies an action to be applied for handling forwarding for a MA PDU Session. |  |
| List of Usage Reporting Rule ID(s) | Every Usage Reporting Rule ID identifies a measurement action that has to be applied. |  |
| List of QoS Enforcement Rule ID(s) | Every QoS Enforcement Rule ID identifies a QoS enforcement action that has to be applied. |  |
| NOTE 1: Needed e.g. if: - UPF supports multiple DNN with overlapping IP addresses; - UPF is connected to other UPF or AN node in different IP domains. - UPF "local switch", N6-based forwarding and N19 forwarding is used for different 5G LAN groups. - UPF "local switch" may be used for DNN/S-NSSAI dedicated for PIN.NOTE 2: Either a FAR ID or a MAR ID is included, not both.NOTE 3: The SMF may provide an indication asking the UPF to allocate one IPv4 address and/or IPv6 prefix. When asking to provide an IPv6 Prefix the SMF provides also an IPv6 prefix length.NOTE 4: When in the architecture defined in clause 5.34, a PDR is sent over N16a from SMF to I-SMF, the Packet Detection Information may indicate that CN tunnel info is to be locally determined. This is further defined in clause 5.34.6.NOTE 5: In the architecture defined in clause 5.34, the rules exchanged between I-SMF and SMF are not associated with a N4 Session ID but are associated with a N16a association.NOTE 6: Needed in the case of support for broadcast/multicast traffic forwarding using packet replication with SMF-provided PDRs and FARs as described in clause 5.8.2.13.3.2.NOTE 7: Needed in the case of packet replication with SMF-provided PDRs and FARs as described in clause 5.8.2.13.3.2, to prevent UPF from sending the broadcast/multicast packets back to the source UE or source N19/N6.NOTE 8: Not for PDR matching. It may be provided to assist PDU Set identification when PDU Set Identification and marking applies to the PDR and/or to assist identification of the last packet of the Data burst in downlink when End of Data Burst identification and marking in downlink applies to the PDR. See clause 5.8.2.4.2 and TS 26.522 [179].NOTE 9: Needed in the case of data boosting with reflective QoS as described in clause 5.37.x |

\* \* \* Next Change \* \* \* \*

#### 6.3.3.3 Selection of an UPF for a particular PDU Session

The following parameter(s) and information may be considered by the SMF for UPF selection and re-selection:

- UPF's dynamic load.

- Analytics (i.e. statistics or predictions) for UPF load, Service Experience analytics and/or DN Performance analytics per UP path (including UPF and/or DNAI and/or AS instance) and UE related analytics (UE mobility, UE communication, and expected UE behavioural parameters) as received from NWDAF (see TS 23.288 [86]), if NWDAF is deployed.

- UPF's relative static capacity among UPFs supporting the same DNN.

- UPF location available at the SMF.

- UE location information.

- Capability of the UPF and the functionality required for the particular UE session: An appropriate UPF can be selected by matching the functionality and features required for an UE.

- Data Network Name (DNN).

- PDU Session Type (i.e. IPv4, IPv6, IPv4v6, Ethernet Type or Unstructured Type) and if applicable, the static IP address/prefix.

- SSC mode selected for the PDU Session.

- UE subscription profile in UDM.

- DNAI as included in the PCC Rules and described in clause 5.6.7.

- Local operator policies.

- S-NSSAI.

- Access technology being used by the UE.

- Information related to user plane topology and user plane terminations, that may be deduced from:

- 5G-AN-provided identities (e.g. CellID, TAI), available UPF(s) and DNAI(s);

- Identifiers (i.e. a FQDN and/or IP address(es)) of N3 terminations provided by a W-AGF or a TNGF or a TWIF;

NOTE 1: A W-AGF or a TNGF may provide Identifiers of its N3 terminations when forwarding over N2 uplink NAS signalling to the 5GC. The AMF may relay this information to the SMF, as part of session management signalling for a new PDU Session.

- Information regarding the user plane interfaces of UPF(s). This information may be acquired by the SMF using N4;

- Information regarding the N3 User Plane termination(s) of the AN serving the UE. This may be deduced from 5G-AN-provided identities (e.g. CellID, TAI);

- Information regarding the N9 User Plane termination(s) of UPF(s) if needed;

- Information regarding the User plane termination(s) corresponding to DNAI(s).

- RSN, support for redundant GTP-U path or support for redundant transport path in the transport layer (as in clause 5.33.2) when redundant UP handling is applicable.

- Information regarding the ATSSS Steering Capability of the UE session (e.g. any combination of ATSSS-LL capability, MPTCP capability, MPQUIC capability) and information on the UPF support of RTT measurements without PMF.

- Support for UPF allocation of IP address/prefix.

- Support of the IPUPS functionality, specified in clause 5.8.2.14.

- Support for High latency communication (see clause 5.31.8).

- Support for functionality associated with high data rate low latency services, eXtended Reality (XR) and interactive media services, specified in clause 5.37 (for example, ECN marking for L4S, specified in clause 5.37.3, PDU Set Marking, specified in clause 5.37.5, UE power saving management, specified in clause 5.37.8, Dynamic Traffic characteristic change, specified in clause 5.37.x).

- User Plane Latency Requirements within AF request (see clause 5.6.7.1 and clause 6.3.6 of TS 23.548 [130]).

- List of supported Event ID(s) for exposure of UPF-related information via service based interface (see clause 7.2.29 and clause 5.2.26.2 of TS 23.502 [3]).

- Information regarding required and/or preferred UPF functionalities. If received from UDM, the SMF selects a PSA UPF supporting the required UPF functionalities and the best set of preferred functionalities based on their priorities.

- Support for operator configurable UPF capability as described in clause 5.8.2.21.

NOTE 2: How the SMF determines information about the user plane network topology from information listed above, and what information is considered by the SMF, is based on operator configuration.

NOTE 3: In this release the SMF uses no additional parameters for UPF selection for a PDU Session serving TSC or Deterministic Networking. If a PDU Session needs to connect to a specific UPF hosting a specific TSN 5GS bridge or 5GS router, this can be achieved e.g. by using a dedicated DNN/S-NSSAI combination.

If there is an existing PDU Session, and the SMF receives another PDU Session request to the same DNN and S-NSSAI, and if the SMF determines that interworking with EPC is supported for this PDU Session (as specified in clause 4.11.5 of TS 23.502 [3]), the SMF should select the same UPF if it supports all capabilities required for the new PDU Session. Otherwise, if the SMF determines that interworking with EPC is not supported for the new PDU Session or the UPF of the existing PDU Session does not support all capabilities required for the new PDU Session, a different UPF may be selected according to operator policy.

For the same DNN and S-NSSAI if different UPFs are selected at 5GC, when the UE is moved to EPC network, there is no requirement to enforce APN-AMBR. Whether and how to apply APN-AMBR for the PDN Connection associated with this DNN/APN is implementation dependent, e.g. possibly only AMBR enforcement per PDU Session applies.

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