**3GPP TSG-CT WG3 Meeting #128 *C3-232338***

**Bratislava, Slovakia, 22nd - 26th May, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **29.522** | **CR** | **0954** | **rev** | **-** | **Current version:** | **18.1.0** |  |
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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 Packet Delay Variation monitoring and reporting |
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| ***Source to WG:*** | China Mobile |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | XRM |  | ***Date:*** | 2022-05-14 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-18 |
|  | *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)* |
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| ***Reason for change:*** | As per S2-2306199, S2-2306200 and S2-2304168 in SA2#156e, the interaction between AF and 5GC is updated to support to derive Packet Delay Variation (PDV) as requested by AF.S2-2304168 to TS 23.503 agreed in SA2#156 specifies the AF and PCF behavior to report Packet Delay Variation based on the requested Packet Delay Variation requirements. |
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| ***Summary of change:*** | Nnef\_AFsessionWithQoS service is updated to describe how the AF may subscribe to Packet Delay Variation reports. |
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| ***Consequences if not approved:*** | There is an inconsistency between SA2 and CT3 in terms of Nnef\_AFsessionWithQoS parameters PDV. |
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| ***Clauses affected:*** | 4.4.9 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **N** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **N** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **N** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR has no impact in OpenAPI file |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* \* First change \* \* \* \*

### 4.4.9 Procedures for setting up an AF session with required QoS

The procedures for setting up an AF session with required QoS in 5GS are described in clause 4.4.13 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;

- description of the SCEF applies to the NEF;

- description of the PCRF applies to the PCF;

- the NEF may interact with BSF by using Nbsf\_Management\_Discovery service as defined in 3GPP TS 29.521 [9] to retrieve the PCF address;

- the NEF shall interact with the PCF by using Npcf\_PolicyAuthorization service as defined in 3GPP TS 29.514 [7];

- in the HTTP POST request, the AF may include a "dnn" attribute and/or a "snssai" attribute; and in the HTTP PUT request, the AF shall keep the same value(s) of the "dnn" attribute and/or the "snssai" attribute as set in the HTTP POST request if provided;

- description about the INDICATION\_OF\_SUCCESSFUL\_RESOURCES\_ALLOCATION event and INDICATION\_OF\_FAILED\_RESOURCES\_ALLOCATION event apply to the SUCCESSFUL\_RESOURCES\_ALLOCATION event and FAILED\_RESOURCES\_ALLOCATION event respectively; In addition, description about the INDICATION\_OF\_RELEASE\_OF\_BEARER, INDICATION\_OF\_LOSS\_OF\_BEARER and INDICATION\_OF\_RECOVERY\_OF\_BEARER events are not applicable in this specification.

- if the EthAsSessionQoS\_5G feature as defined in clause 5.14.4 of 3GPP TS 29.122 [4] is supported and the request is for Ethernet UE:

- in the HTTP POST/PUT request, the AF shall include the UE MAC address within the "macAddr" attribute instead of the UE IP address. If the AppId feature is not supported, the AF shall include the Ethernet Flow description within the "ethFlowInfo" attribute instead of the IP Flow description; otherwise, the AF shall include either the External Application Identifier within the "exterAppId" attribute or the Ethernet Flow description within the "ethFlowInfo" attribute;

- in the HTTP PATCH request, the AF may update the Ethernet Flow description within the "ethFlowInfo" attribute or the External Application Identifier within the "exterAppId" attribute;

- if the "QoSMonitoring\_5G" feature as defined in clause 5.14.4 of 3GPP TS 29.122 [4] is supported, in order to support the QoS Monitoring, the AF shall include "qosMonInfo" attribute. The AF shall also include the "directNotifInd" attribute set to true if the "ExposureToEAS" feature is supported and the direct notification is required. Within the QosMonitoringInformation data structure, the AF shall include:

- one or more requested QoS Monitoring Parameter(s) within the "reqQosMonParams"; and

- one or more report frequency within the "repFreqs" attribute; and

- when the "repFreqs" attribute includes the value "PERIODIC", the periodic time for reporting and, if the feature "PacketDelayFailureReport" is supported, the maximum period with no QoS measurement results reported within the "repPeriod" attribute; and

- when the "repFreqs" attribute includes the value "EVENT\_TRIGGERED", for QoS monitoring for packet delay, the AF shall include:

- the delay threshold for downlink with the "repThreshDl" attribute;

- the delay threshold for uplink with the "repThreshUl" attribute; and/or

- the delay threshold for round trip with the "repThreshRp" attribute;

- the minimum waiting time between subsequent reports within the "waitTime" attribute; and

- if the feature "PacketDelayFailureReport" is supported, the maximum period with no QoS measurement results reported within the "repPeriod" attribute.

 If the NEF authorizes the AF request, the NEF may create a QoS monitoring notification correlation identifier for the AF transaction during the creation of the AF resource and may provision it together with the received QoS monitoring parameters to the PCF by invoking the Npcf\_PolicyAuthorization service as defined in 3GPP TS 29.514 [7] or, if the "TSC\_5G" feature is supported, to the TSCTSF by invoking the Ntsctsf\_QoSandTSCAssistance service as defined in 3GPP TS 29.565 [50];

- when the NEF receives the event notification for the AF transaction as defined in clause 4.2.2 of 3GPP TS 29.508 [26] or clauses 4.2.4.12 and 4.2.5.14 of 3GPP TS 29.514 [7] or, if the "TSC\_5G" feature is supported, clause 5.3.2.5.7 of 3GPP TS 29.565 [50], or when the AF requested direct notification, as defined in clause 5.2.2.3 of 3GPP TS 29.564 [61], the NEF shall include one or more QoS monitoring reports within the "qosMonReports" attribute. Within the QosMonitoringReport data structure, the NEF shall include the received monitored QoS information. For QoS monitoring for packet delay, it shall be:

- one or two uplink packet delays within the "ulDelays" attribute;

- one or two downlink packet delays within the "dlDelays" attribute; and/or

- one or two round trip packet delays within the "
rtDelays" attribute; or

- if the feature "PacketDelayFailureReport" is supported, the packet delay measurement failure indicator within the "pdmf" attribute;

- if the "AlternativeQoS\_5G" feature is supported, the AF may include an ordered list of QoS references within the "altQosReferences" attribute and, if the "DisableUENotification\_5G" feature is also supported, an indication that the UE does not need to be informed about changes related to Alternative QoS Profiles within the "disUeNotif" attribute.

 When the NEF interfaces directly with the PCF, the NEF shall transfer them to the PCF in the Npcf\_PolicyAuthorization service and subscribe to PCF event "QOS\_NOTIF" in the Npcf\_PolicyAuthorization service. When the NEF receives the notification of PCF event "QOS\_NOTIF", it shall notify the AF with "QOS\_GUARANTEED" event or with "QOS\_NOT\_GUARANTEED" event and the currently applied QoS reference if received. When the NEF receives the notification of PCF event "SUCCESSFUL\_RESOURCES\_ALLOCATION", it shall notify the AF the event together with the currently applied QoS reference if received.

 If the "TSC\_5G" feature is supported, when the NEF interfaces with the TSCTSF, the NEF shall transfer the received alternative QoS references to the TSCTSF in the Ntsctsf\_QoSandTSCAssistance service and subscribe with TSCTSF to "QOS\_GUARANTEED" and "QOS\_NOT\_GUARANTEED" events. When the NEF receives the event notification from the TSCTSF, the NEF shall notify the AF with "QOS\_GUARANTEED" event or with "QOS\_NOT\_GUARANTEED" event and the currently applied QoS reference if received. When the NEF receives the notification of TSCTSF event "SUCCESSFUL\_RESOURCES\_ALLOCATION", it shall notify the AF the event together with the currently applied QoS reference if received.

 If the feature "AltQoSProfilesSupportReport" is supported, when the NEF receives the indication from the PCF or the TSCTSF about the support of alternative QoS profiles, the NEF shall notify the AF forwarding the received indication within the "altQosNotSuppInd" attribute.

NOTE 1: Based on the operator configuration, the QoS reference identifiers received from the AF can be the same or different as the QoS reference identifiers known at the PCF. The NEF can perform a mapping for the QoS reference identifier.

- if the "TSC\_5G" feature is supported, the AF may include:

- the TSC QoS requirement within the "tscQosReq" attribute. Within the TscQosRequirement data structure, the AF may include:

- the input information to construct the TSC Assistance Container within the "tscaiInputUl" attribute and/or "tscaiInputDl"attribute;

And, if individual QoS parameters instead of QoS reference is provided, may include:

- requested GBR within the "reqGbrDl" attribute and/or "reqGbrUl" attribute;

- requested MBR within the "reqMbrDl" attribute and/or "reqMbrUl" attribute; and

- the maximum burst size within the "maxTscBurstSize" attribute;

- the priority within the "priority" attribute;

- the requested 5GS delay within the "req5Gsdelay" attribute.

- the requested packet error rate within the "reqPer" attribute, if the "ExtQoS\_5G" feature is also supported.

 If the NEF authorizes the AF request, the NEF may provision the received QoS requirements to the TSCTSF by invoking the Ntsctsf\_QoSandTSCAssistance\_Create/Update request as defined in 3GPP TS 29.565 [50]. The NEF determines whether to invoke the TSCTSF or to directly contact the PCF based on operator configuration. This determination may consider the AF identifier, whether the "tscaiInputUl" and/or "tscaiInputDl" attributes within the "tscQosReq" attribute were received in the subscription request, whether the "qosReference" attribute or individual QoS parameters within the "tscQosReq" attribute were received in the subscription request, and SLA between operator and application provider. A TSCTSF address may be locally configured in the NEF or the NEF uses the DNN/S-NSSAI (which may be provided in the request or determined based on the AF identifier) to discover the TSCTSF from the NRF. If the NEF directly contacts the PCF while the NEF determined to invoke the TSCTSF when authorizing the update request, the NEF shall reject the request message by sending an HTTP response to the AF with a status code set to 403 Forbidden and may include the "INVALID\_SESSION\_UPDATE" error in the "cause" attribute of the "ProblemDetails" structure and indicate which parameters can not be served in current session in the "invalidParams" attribute of the "ProblemDetails" structure.

NOTE 2: The NEF can determine whether the TSCTSF needs to be involved based on the DNN/S-NSSAI for the AF session according to the SLA.

- if the "AltQosWithIndParams\_5G" feature is supported, the AF may include:

- an ordered list of alternative service requirements that include individual QoS parameter sets within the "altQosReqs" attribute and, if the "DisableUENotification\_5G" feature is also supported, an indication that the UE does not need to be informed about changes related to Alternative QoS Profiles within the "disUeNotif" attribute. Within the AlternativeServiceRequirementsData data structure, the AF shall include:

- a reference to the alternative individual QoS related parameter(s) included in this set within the "altQosParamSetRef" attribute; and

- at least one of the following:

- The guaranteed bandwidth in uplink within the "gbrUl" attribute and the guaranteed bandwidth in downlink within the "gbrDl" attribute;

- The requested packet delay budget within the "pdb" attribute;

- The requested packet error rate within the "per" attribute if the "ExtQoS\_5G" feature is supported;

 If the NEF authorizes the AF request, and if the "TSC\_5G" feature is supported, the NEF may provision the received QoS requirements and subscribe with the TSCTSF to "QOS\_GUARANTEED" and "QOS\_NOT\_GUARANTEED" events by invoking the Ntsctsf\_QoSandTSCAssistance\_Create request as defined in 3GPP TS 29.565 [50]. The NEF determines whether to invoke the TSCTSF or to directly contact the PCF based on operator configuration. This determination may consider the AF identifier, whether the "tscaiInputUl" and/or "tscaiInputDl" attributes within the "tscQosReq" attribute were received in the subscription request, whether the "qosReference" attribute or individual QoS parameters within the "altQosReqs" attribute were received in the subscription request, and SLA between operator and application provider. A TSCTSF address may be locally configured in the NEF or the NEF uses the DNN/S-NSSAI (which may be provided in the request or determined based on the AF identifier) to discover the TSCTSF from the NRF. When the NEF receives the notification of TSCTSF "QOS\_GUARANTEED" event or "QOS\_NOT\_GUARANTEED" event, it shall notify the AF with "QOS\_GUARANTEED" event or "QOS\_NOT\_GUARANTEED" event with the currently applied individual QoS parameter set within the "appliedQosRef" attribute if received. When the NEF receives the notification of the TSCTSF event "SUCCESSFUL\_RESOURCES\_ALLOCATION", it shall notify the AF the event together with the currently applied individual QoS parameter set within the "appliedQosRef" attribute if received. If the NEF directly contacts the PCF while the NEF determined to invoke the TSCTSF when authorizing the update request, the NEF shall reject the request message by sending an HTTP response to the AF with a status code set to 403 Forbidden and may include the "INVALID\_SESSION\_UPDATE" error in the "cause" attribute of the "ProblemDetails" structure and indicate which parameters can not be served in current session in the "invalidParams" attribute of the "ProblemDetails" structure.

NOTE 3: The NEF can determine whether the TSCTSF needs to be involved based on the DNN/S-NSSAI for the AF session according to the SLA.

 When the NEF interfaces directly with the PCF, the NEF shall transfer the received QoS requirements to the PCF in the Npcf\_PolicyAuthorization service and subscribe to PCF event "QOS\_NOTIF" in the Npcf\_PolicyAuthorization service. When the NEF receives the notification of PCF event "QOS\_NOTIF", it shall notify the AF with "QOS\_GUARANTEED" event or with the "QOS\_NOT\_GUARANTEED" event and the currently applied QoS reference if received. When the NEF receives the notification of PCF event "SUCCESSFUL\_RESOURCES\_ALLOCATION", it shall notify the AF the event together with the currently applied QoS reference if received.

If the feature "AltQoSProfilesSupportReport" is supported, when the NEF receives the indication from the PCF or the TSCTSF about the support of alternative QoS profiles, the NEF shall notify the AF forwarding the received indication within the "altQosNotSuppInd" attribute.

- If the "eNB\_5G" feature is supported, the AF may additionally subscribe the event(s) "ACCESS\_TYPE\_CHANGE" and/or "PLMN\_CHG". If the NEF authorizes the AF request, the NEF shall subscribe the event(s) at the PCF by invoking the Npcf\_PolicyAuthorization service operation.

- if the ToSTC\_5G feature as defined in clause 5.14.4 of 3GPP TS 29.122 [4] is supported,

- in the HTTP POST request, the AF may include the "tosTC" attribute within the "flowInfo" attribute of the AsSessionWithQoSSubscription data type.

- in the HTTP PATCH request, the AF may include the "tosTC" attribute within the "flowInfo" attribute of the AsSessionWithQoSSubscriptionPatch data type.

- if the "XRM\_5G" feature is supported, the AF may include:

- the Multi-Modal Service ID within the "multiModalId" attribute.

- in order to support the Packet Delay Variation Monitoring , the AF shall include "pdvMonInfo" attribute. Within the PdvMonitoringInformation data structure, the AF shall include:

- one or more requested PDV Monitoring Parameter(s) within the "pdvReqMonParams"; and

- one or more report frequency within the "pdvRepFreqs" attribute; and

- when the "pdvRepFreqs" attribute includes the value "PERIODIC", the periodic time for reporting; and

- when the "pdvRepFreqs" attribute includes the value "EVENT\_TRIGGERED", the AF shall include:

- the Packet Delay Variation threshold for downlink with the "pdvRepThreshDl" attribute;

- the Packet Delay Variation threshold for uplink with the "pdvRepThreshUl" attribute; and/or

- the Packet Delay Variation threshold for round trip with the "pdvRepThreshRp" attribute;

- the minimum waiting time between subsequent reports within the "pdvWaitTime" attribute.

- when the NEF receives the packet delay variation event notification from the PCF as defined in 3GPP TS 29.514 [7], the NEF shall include the one or more received Packet Delay Variation monitoring reports within the "pdvMonReports" attribute and the "PACK\_DEL\_VAR" event. Within the PdvMonitoringReport data structure, the NEF shall include the received monitored Packet Delay Variation information, it shall be:

- one or two uplink PDVs within the "ulPdvs" attribute;

- one or two downlink PDVs within the "dlPdvs" attribute; and/or

- one or two round trip PDVs within the "rtPdvs" attribute.

NOTE 4: For multi-modal flows related to multiple UEs, multiple UE-specific AF requests are used, and the AF provided information to NEF is the same as single UE case.

 If the NEF receives the AF request with optional attributes namely "multiModalId", NEF shall store and forward the attributes to PCF to support the delivery of multi-modal services.

Editor’s Note: Feature name and granartulity is FFS

- The NEF may send the following error responses based on failed request responses received from the 5GC (TSCTSF, as specified in 3GPP TS 29.565 [50], or PCF, as specified in 3GPP TS 29.514 [7]):

a. If the NEF receives the indication that the 5GC failed in executing session binding, the NEF shall reject the HTTP POST request with an HTTP "500 Internal Server Error" response including the "cause" attribute set to "PDU\_SESSION\_NOT\_AVAILABLE".

b. If the service information provided in the body of the HTTP POST/PUT/PATCH request is rejected by the 5GC (e.g. the subscribed guaranteed bandwidth for a particular user is exceeded or the authorized data rate in that slice for a UE is exceeded), the NEF shall indicate in an HTTP "403 Forbidden" response message the cause for the rejection including the "cause" attribute set to "REQUESTED\_SERVICE\_NOT\_AUTHORIZED".

c. If the service information provided in the body of the HTTP POST/PUT/PATCH request is rejected due to a temporary condition in the network, the NEF may include in the "403 Forbidden" response the "cause" attribute set to "REQUESTED\_SERVICE\_TEMPORARILY\_NOT\_AUTHORIZED", as received. The NEF may also provide a received retry interval within the "Retry-After" HTTP header field. When the NF service consumer receives the retry interval within the "Retry-After" HTTP header field, the NF service consumer shall not send the same service information to the NEF again (for the same application session context) until the retry interval has elapsed. The "Retry-After" HTTP header is described in 3GPP TS 29.500 [4] clause 5.2.2.2.

 The NEF may additionally provide the acceptable bandwidth within the attribute "acceptableServInfo" included in the "ProblemDetailsAsSessionQos" data structure returned in the rejection response message.

d. When the request to provision sponsored data connectivity information provided in the body of the HTTP POST/PUT/PATCH request is rejected, the NEF shall reject the request with the received status and error cause, as follows:

1. HTTP "403 Forbidden" response message with the "cause" attribute set to "UNAUTHORIZED\_SPONSORED\_DATA\_CONNECTIVITY".

2. HTTP "403 Forbidden" response message with the "cause" attribute set to "REQUESTED\_SERVICE\_NOT\_AUTHORIZED".

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