**3GPP TSG-RAN WG3 Meeting #111-e *R3-211142***

**E-meeting, 25 Jan – 5 Feb 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.413** | **CR** | **0508** | **rev** | **3** | **Current version:** | 16.4.0 |  |
|  |
| *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 | **X** | Core Network | **X** |

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| ***Title:***  | Introducing QoS parameters update at Xn handover |
|  |  |
| ***Source to WG:*** | Huawei, Ericsson, ZTE, CATT, Samsung, Nokia, Nokia Shanghai Bell  |
| ***Source to TSG:*** | RAN3 |
|  |  |
| ***Work item code:*** | 5G\_URLLC, Vertical\_LAN, NR\_IIOT-Core |  | ***Date:*** | 2021-01-15 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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:*** | In section of 4.9.1.2.2 in 23.502 for Xn based inter NG-RAN handover without User Plane function re-allocation, it depicts that the SMF may provide in the PATH SWITCH REQUEST ACKNOWLEDGE message to the NG-RAN node via the AMF:* the updated CN PDB and,
* TSCAI Burst Arrival Time for traffic in **downlink** direction based on the updated CN PDB.

This is beneficial for the target NG-RAN node for early handling of the URLLC and TSC packets. In addition, if the NG-RAN node cannot successfully accept the updated values, it should notify the CN.  |
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| ***Summary of change:*** | 1. In the PATH SWITCH REQUEST ACKNOWLEDGE message, add the CN PDB and TSCAI downlink Arrival Time for each accepted QoS Flow.
2. When the new QoS values can not be successfully accepted, the existing old values are used; and the NG-RAN node uses thePDU SESSION RESOURCE NOTIFYto indicate that the updated parameters during Xn HO cannot be successfully accepted.

**Impact assessment towards the previous version of the specification (same release):**This CR has an isolated impact towards the previous version of the specification (same release).This CR has an impact on the Path Switch Request procedure and the PDU Session Resource Notify procedure.This CR has an impact under functional point of view. The impact can be considered isolated since it impacts path switch request and PDU session resource notify. |
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| ***Consequences if not approved:*** | Misalignment between stage 2 and stage 3 specifications.The CN can not be notified when the CN-PDB in the PATH SWITCH REQUEST AKNOWLEDGE message can not be successfully accepted.  |
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| ***Clauses affected:*** | 8.2.4, 8.4.4, 9.3.4.5, 9.3.4.9, 9.4.5, 9.4.7 |
|  |  |
|  | **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:*** | Rev0: R3-206444Rev1: R3-207089 Update the procedural texts, and correct the ASN.1Rev2: R3-210585 Adding notification to the CN when the CN-PDB can not be successfully accepted by the NG-RAN node.  Update based on the latest specification. Rev3: R3-211142 Update based on online discussions including update the IE type of Feedback Cause |

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| **Change Begins** |

### 8.2.4 PDU Session Resource Notify

#### 8.2.4.1 General

The purpose of the PDU Session Resource Notify procedure is to notify that the already established QoS flow(s) or PDU session(s) for a given UE are released or not fulfilled anymore or fulfilled again by the NG-RAN node for which notification control is requested. It is also used to notify that the updated QoS parameters during the Path Switch Request procedure are not successfully accepted by the NG-RAN node. The procedure uses UE-associated signalling.

#### 8.2.4.2 Successful Operation



Figure 8.2.4.2-1: PDU session resource notify

The NG-RAN node initiates the procedure by sending a PDU SESSION RESOURCE NOTIFY message.

The PDU SESSION RESOURCE NOTIFY message shall contain the information of PDU session resources or QoS flows which are released or not fulfilled anymore or fulfilled again by the NG-RAN node.

- For each PDU session for which some QoS flows are released or not fulfilled anymore or fulfilled again by the NG-RAN node, the *PDU Session Resource Notify Transfer* IE shall be included containing:

1. The list of QoS flows which are released by the NG-RAN node, if any, in the *QoS Flow Released List* IE.

2. The list of GBR QoS flows which are not fulfilled anymore or fulfilled again by the NG-RAN node, if any, in the *QoS Flow Notify List* IE together with the *Notification Cause* IE. For a QoS flow indicated as not fulfilled anymore the NG-RAN node may also indicate an alternative QoS parameters set which it can currently fulfil in the *Current QoS Parameters Set Index* IE.

3. The list of QoS flows for which the QoS parameters were updated but could not be successfully accepted by the NG-RAN node during the Path Switch Request procedure, if any, in the *QoS Flow Feedback List* IE together with a value it could offer.

- For each PDU session resource which is released by the NG-RAN node, the *PDU Session Resource Notify Released Transfer* IE shall be included containing the release cause in the *Cause* IE.

The NG-RAN node shall, if supported, report in the PDU SESSION RESOURCE NOTIFY message location information of the UE in the *User Location Information* IE.

Upon reception of the PDU SESSION RESOURCE NOTIFY message, the AMF shall, for each PDU session indicated in the *PDU Session ID* IE, transfer transparently the *PDU Session Resource Notify Transfer* IE or *PDU Session Resource Notify Released Transfer* IE to the SMF associated with the concerned PDU session. Upon reception of *PDU Session* *Resource Notify Transfer* IE, the SMF normally initiate the appropriate release or modify procedure on the core network side for the PDU session(s) or QoS flow(s) identified as not fulfilled anymore.

For each PDU session for which the *Secondary RAT Usage Information* IE is included in the *PDU Session Resource Notify Transfer* IE or the *PDU Session Resource Notify Released Transfer* IE, the SMF shall handle this information as specified in TS 23.502 [10].

If the *User Location Information* IE is included in the PDU SESSION RESOURCE NOTIFY message, the AMF shall handle this information as specified in TS 23.501 [9].

<Unchanged Text Omitted>

8.4.4 Path Switch Request

8.4.4.1 General

The purpose of the Path Switch Request procedure is to establish a UE associated signalling connection to the 5GC and, if applicable, to request the switch of the downlink termination point of the NG-U transport bearer towards a new termination point.

8.4.4.2 Successful Operation

**Figure 8.4.4.2-1: Path switch request: successful operation**

<Unchanged Text Omitted>

If the *Redundant UL NG-U UP TNL Information* IE is included within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall store this information and use it as the uplink termination point for the user plane data for the redundant transmission for this PDU session as specified in TS 23.501 [9].

If the *Additional Redundant NG-U* *UP TNL Information* IE is included within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall store this information and use the included *UL NG-U UP TNL Information* IE(s) as the uplink termination point(s) of the user plane data for this PDU session split in different tunnel.

If the *CN Packet Delay Budget Downlink* IE is included within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall, if supported, replace the previously provided CN Packet Delay Budget Downlink if any and use it as specified in TS 23.502 [10].

If the *CN Packet Delay Budget Uplink* IE is included within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall, if supported, replace the previously provided CN Packet Delay Budget Uplink if any and use it as specified in TS 23.502 [10].

If the *Burst Arrival Time Downlink* IE is included within the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, the NG-RAN node shall, if supported, replace the previously provided value if any and use it as specified in TS 23.502 [10].

<Unchanged Text Omitted>

**Interactions with RRC Inactive Transition Report procedure:**

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "single RRC connected state report" and the UE is in RRC\_CONNECTED state, the NG-RAN node shall, if supported, send one RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE.

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "single RRC connected state report" and the UE is in RRC\_INACTIVE state, the NG-RAN node shall, if supported, send to the AMF one RRC INACTIVE TRANSITION REPORT message plus one subsequent RRC INACTIVE TRANSITION REPORT message when the RRC state transitions to RRC\_CONNECTED state.

If the *RRC Inactive Transition Report Request* IE is included in the PATH SWITCH REQUEST ACKNOWLEDGE message and set to "subsequent state transition report", the NG-RAN node shall, if supported, send one RRC INACTIVE TRANSITION REPORT message to the AMF to report the RRC state of the UE and subsequent RRC INACTIVE TRANSITION REPORT messages to report the RRC state of the UE when the UE enters or leaves RRC\_INACTIVE state.

**Interactions with PDU Session Resource Notify procedure:**

If the QoS related parameters (e.g. the *CN Packet Delay Budget Downlink* or the *CN Packet Delay Budget Uplink* IE) are included in the *Path Switch Request Acknowledge Transfer* IE of the PATH SWITCH REQUEST ACKNOWLEDGE message, but can not be succesfully accepted by the NG-RAN node, the NG-RAN node should continue to use the old values received from the source NG-RAN node, if any. The NG-RAN node shall, if supported, send the PDU Session Resource Notify message to notify the AMF about values which it could support and the AMF may request instead.

<Unchanged Text Omitted>

#### 9.3.4.5 PDU Session Resource Notify Transfer

This IE is transparent to the AMF.

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| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| **QoS Flow Notify List** |  | *0..1* |  |  | - |  |
| **>QoS Flow Notify Item** |  | *1..<maxnoofQoSFlows>* |  |  | - |  |
| >>QoS Flow Identifier | M |  | 9.3.1.51 |  | - |  |
| >>Notification Cause | M |  | ENUMERATED (fullfilled, not fulfilled, …) |  | - |  |
| >>Current QoS Parameters Set Index | O |  | Alternative QoS Parameters Set Notify Index9.3.1.153 | Index to the currently fulfilled alternative QoS parameters set. Value 0 indicates that NG-RAN cannot even fulfil the lowest alternative parameters set. | YES | Ignore |
| QoS Flow Released List  | O |  | QoS Flow List with Cause9.3.1.13 |  | - |  |
| Secondary RAT Usage Information | O |  | 9.3.1.114 |  | YES | ignore |
| **QoS Flow Feedback List** |  | *0..1* |  |  | YES | ignore |
| **>QoS Flow Feedback Item** |  | *1..<maxnoofQoSFlows>* |  |  | - |  |
| >>QoS Flow Identifier | M |  | 9.3.1.51 |  | - |  |
| >>Update Feedback  | O |  | BIT STRING {CN PDB DL(0),CN PDB UL(1)}(SIZE(8, …)) | If a bit is set to "1", the respective parameter was not updated.If a bit is set to "0", the respective parameter was successfully updated. | - |  |
| >>CN Packet Delay Budget Downlink | O |  | Extended Packet Delay Budget9.3.1.135 | Indicates the packet delay budget downlink which NG-RAN can offer  | - |  |
| >> CN Packet Delay Budget Uplink | O |  | Extended Packet Delay Budget9.3.1.135 | Indicates the packet delay budget uplink which NG-RAN can offer | - |  |

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| Range bound | Explanation |
| maxnoofQoSFlows | Maximum no. of QoS flows allowed within one PDU session. Value is 64. |

<Unchanged Text Omitted>

#### 9.3.4.9 Path Switch Request Acknowledge Transfer

This IE is transparent to the AMF.

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| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| UL NG-U UP TNL Information | O |  | UP Transport Layer Information9.3.2.2 | UPF endpoint of the NG-U transport bearer corresponding to the *DL NG-U UP TNL Information* IE received in the *Path Switch Request Transfer* IE. | - |  |
| Security Indication | O |  | 9.3.1.27 |  | - |  |
| Additional NG-U UP TNL Information | O |  | UP Transport Layer Information Pair List9.3.2.11 | NG-RAN node endpoint of the NG-U transport bearer indicated in the *Path Switch Request Transfer* IE and the corresponding UPF endpoint for split PDU session. | YES | ignore |
| Redundant UL NG-U UP TNL Information  | O |  | UP Transport Layer Information9.3.2.2 | UPF endpoint of the NG-U transport bearer, for delivery of UL PDUs for the redundant transmission. | YES | ignore |
| Additional Redundant NG-U UP TNL Information | O |  | UP Transport Layer Information Pair List9.3.2.11 | NG-RAN node endpoint of the NG-U transport bearer for the redundant transmission indicated in the *Path Switch Request Transfer* IE and the corresponding UPF endpoint for split PDU session. | YES | ignore |
| **QoS Flow Parameters List** |  | *0..1* |  |  | YES | ignore |
| **>QoS Flow Parameters Item** |  | *1..<maxnoofQoSFlows>* |  |  | - |  |
| >>QoS Flow Identifier | M |  | 9.3.1.51 |  | - |  |
| >>Alternative QoS Parameters Set List | O |  | 9.3.1.151 | Indicates alternative sets of QoS parameters for the QoS flow. | - |  |
| >>CN Packet Delay Budget Downlink | O |  | Extended Packet Delay Budget9.3.1.135 | Core Network Packet Delay Budget is specified in TS 23.501 [9].This IE may be present in case of GBR QoS flows and is ignored otherwise. | YES | ignore |
| >>CN Packet Delay Budget Uplink | O |  | Extended Packet Delay Budget9.3.1.135 | Core Network Packet Delay Budget is specified in TS 23.501 [9].This IE may be present in case of GBR QoS flows and is ignored otherwise. | YES | ignore |
| >>Burst Arrival Time Downlink | O |  | Burst Arrival Time9.3.1.133 | Indicates the downlink Burst Arrival Time of the TSC QoS flow | YES | ignore |

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| Range bound | Explanation |
| maxnoofQoSFlows | Maximum no. of QoS flows allowed within one PDU session. Value is 64. |

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| **Next Change** |

### 9.4.5 Information Element Definitions

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-- Information Element Definitions

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NGAP-IEs {

itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)

ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

<Unchanged Text Omitted>

 id-UserLocationInformationTWIF,

 id-UserLocationInformationW-AGF,

 id-QosFlowFeedbackList,

 id-BurstArrivalTimeDownlink,

<Unchanged Text Omitted>

PDUSessionResourceNotifyTransfer ::= SEQUENCE {

 qosFlowNotifyList QosFlowNotifyList OPTIONAL,

 qosFlowReleasedList QosFlowListWithCause OPTIONAL,

 iE-Extensions ProtocolExtensionContainer { {PDUSessionResourceNotifyTransfer-ExtIEs} } OPTIONAL,

 ...

}

PDUSessionResourceNotifyTransfer-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

 { ID id-SecondaryRATUsageInformation CRITICALITY ignore EXTENSION SecondaryRATUsageInformation PRESENCE optional }|

 { ID id-QosFlowFeedbackList CRITICALITY ignore EXTENSION QosFlowFeedbackList PRESENCE optional },

 ...

}

<Unchanged Text Omitted>

QosFlowAddOrModifyResponseList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowAddOrModifyResponseItem

QosFlowAddOrModifyResponseItem ::= SEQUENCE {

 qosFlowIdentifier QosFlowIdentifier,

 iE-Extensions ProtocolExtensionContainer { {QosFlowAddOrModifyResponseItem-ExtIEs} } OPTIONAL,

 ...

}

QosFlowAddOrModifyResponseItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

 { ID id-CurrentQoSParaSetIndex CRITICALITY ignore EXTENSION AlternativeQoSParaSetIndex PRESENCE optional },

 ...

}

QosFlowFeedbackList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowFeedbackItem

QosFlowFeedbackItem ::= SEQUENCE {

 qosFlowIdentifier QosFlowIdentifier,

 updateFeedback UpdateFeedback,

 cNpacketDelayBudgetDL ExtendedPacketDelayBudget OPTIONAL,

 cNpacketDelayBudgetUL ExtendedPacketDelayBudget OPTIONAL,

 iE-Extensions ProtocolExtensionContainer { {QosFlowFeedbackItem-ExtIEs} } OPTIONAL,

 ...

}

QosFlowFeedbackItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

 ...

}

<Unchanged Text Omitted>

QosFlowParametersList ::= SEQUENCE (SIZE(1..maxnoofQosFlows)) OF QosFlowParametersItem

QosFlowParametersItem ::= SEQUENCE {

 qosFlowIdentifier QosFlowIdentifier,

 alternativeQoSParaSetList AlternativeQoSParaSetList OPTIONAL,

 iE-Extensions ProtocolExtensionContainer { {QosFlowParametersItem-ExtIEs} } OPTIONAL,

 ...

}

QosFlowParametersItem-ExtIEs NGAP-PROTOCOL-EXTENSION ::= {

 { ID id-CNPacketDelayBudgetDL CRITICALITY ignore EXTENSION ExtendedPacketDelayBudget PRESENCE optional }|

 { ID id-CNPacketDelayBudgetUL CRITICALITY ignore EXTENSION ExtendedPacketDelayBudget PRESENCE optional }|

 { ID id-BurstArrivalTimeDownlink CRITICALITY ignore EXTENSION BurstArrivalTime PRESENCE optional },

 ...

}

<Unchanged Text Omitted>

ULForwarding ::= ENUMERATED {

 ul-forwarding-proposed,

 ...

}

UpdateFeedback ::= BIT STRING (SIZE(8, ...))

UPTransportLayerInformation ::= CHOICE {

 gTPTunnel GTPTunnel,

 choice-Extensions ProtocolIE-SingleContainer { {UPTransportLayerInformation-ExtIEs} }

}

UPTransportLayerInformation-ExtIEs NGAP-PROTOCOL-IES ::= {

 ...

}

<Unchanged Text Omitted>

### 9.4.7 Constant Definitions

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-- Constant definitions

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-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

NGAP-Constants {

itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)

ngran-Access (22) modules (3) ngap (1) version1 (1) ngap-Constants (4) }

<Unchanged Text Omitted>

 id-QosFlowParametersList ProtocolIE-ID ::= 277

 id-QosFlowFeedbackList ProtocolIE-ID ::= aaa

 id-BurstArrivalTimeDownlink ProtocolIE-ID ::= bbb

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| **Change Ends** |