**3GPP TSG- Meeting # *R3-222968***

**21th Feb - 3rd Mar 2022**

**Online**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **0855** | **rev** | **4** | **Current version:** | **16.8.0** |  |
|  |
| *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)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | Support for UE Power Saving Enhancements |
|  |  |
| ***Source to WG:*** | ZTE, MediaTek, China Unicom, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, Samsung, Qualcomm Incorporated, CATT |
| ***Source to TSG:*** | RAN3 |
|  |  |
| ***Work item code:*** | NR\_UE\_pow\_sav\_enh-Core |  | ***Date:*** | 2022-2-21 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** |  |
|  | *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:*** | TSG RAN has agreed the UE Power Saving WI in RP-212630 with RAN3 impacts related to Paging subgrouping.  |
|  |  |
| ***Summary of change:*** | Introduce support for UE Power Saving:-Adding the PEIPS Assistance Information IE in the PAGING message. |
|  |  |
| ***Consequences if not approved:*** | Can not support UE paging subgrouping for UE power saving. |
|  |  |
| ***Clauses affected:*** | 8.7.1.2, 9.2.6.1, 9.3.1.18, 9.3.1.X(new), 9.3.1.Y(new), 9.4.4, 9.4.5, 9.4.7 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.413 CR 0725 TS 38.423 CR 0732TS 38.410 CR 0037TS 38.470 CR 0080 |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Rev 4: TP in R3-222772 agreed at RAN3#115-eRev 3: Change the Tdoc numberRev 2: Resubmit to RAN3#115-eRev 1: remove UE-ID based Subgrouping Support Indication; rename Paging Subgroup Information IE as PEIPS Assistance Information IE.Rev 0: R3-220899 |

<<<<<<<<<<<<<<<<<<<< START OF CHANGES >>>>>>>>>>>>>>>>>>>>

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply.
An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core Network

5QI 5G QoS Identifier

AMF Access and Mobility Management Function

ARP Antenna Reference Point

ARPI Additional RRM Policy Index

BH Backhaul

CAG Closed Access Group

CN Core Network

CG Cell Group

CGI Cell Global Identifier

CHO Conditional Handover

CP Control Plane

CPC Conditional PSCell Change

DAPS Dual Active Protocol Stack

DL Downlink

DL-PRS Downlink Positioning Reference Signal

EN-DC E-UTRA-NR Dual Connectivity

EPC Evolved Packet Core

IAB Integrated Access and Backhaul

IMEISV International Mobile station Equipment Identity and Software Version number

LMF Location Management Function

NID Network Identifier

NPN Non-Public Network

NSSAI Network Slice Selection Assistance Information

PEIPS Paging Early Indication with Paging Subgrouping

posSIB Positioning SIB

PNI-NPN Public Network Integrated NPN

RANAC RAN Area Code

RIM Remote Interference Management

RIM-RS RIM Reference Signal

RRC Radio Resource Control

RSRP Reference Signal Received Power

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SUL Supplementary Uplink

TAC Tracking Area Code

TAI Tracking Area Identity

TRP Transmission-Reception Point

UL-AoA Uplink Angle of Arrival

UL-RTOA Uplink Relative Time of Arrival

UL-SRS Uplink Sounding Reference Signal

Z-AoA Zenith Angles of Arrival

<<<<<<<<<<<<<<<<<<<<NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

8.7.1.2 Successful Operation

**Figure 8.7.1.2-1: Paging procedure. Successful operation.**

The gNB-CU initiates the procedure by sending a PAGING message.

The *Paging DRX* IE may be included in the PAGING message, and if present the gNB-DU may use it to determine the final paging cycle for the UE.

The *Paging Priority* IE may be included in the PAGING message, and if present the gNB-DU may use it according to TS 23.501 [21].

At the reception of the PAGING message, the gNB-DU shall perform paging of the UE in cells which belong to cells as indicated in the *Paging Cell List* IE.

The *Paging Origin* IE may be included in the PAGING message, and if present the gNB-DU shall transfer it to the UE.

The *PEIPS Assistance Information* IE may be included in the PAGING message, and if present the gNB-DU shall, if supported, use it for paging subgrouping of the UE, as specified in TS 38.300 [6].

The *UEID Subgrouping Support Indication* IE may be included in *UE Paging Capability* IE in the PAGING message, and if present the gNB-DU shall, if supported, use it for paging subgrouping of the UE, as specified in TS 38.300 [6].

The *Last Used Cell Indication* IE may be included in the *Paging Cell Item IEs* IE of the PAGING message, and if present the gNB-DU shall, if supported, consider the cell identified by the *NR CGI* IE as the last used cell of the paged UE, and use it as specified in TS 38.331 [8].

<<<<<<<<<<<<<<<<<<<<NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

9.2.6.1 PAGING

This message is sent by the gNB-CU and is used to request the gNB-DU to page UEs.

Direction: gNB-CU → gNB-DU

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** |
| Message Type | M |  | 9.3.1.1 |  | YES | ignore |
| UE Identity Index value | M |  | 9.3.1.39 |  | YES | reject |
| CHOICE Paging Identity  | M |  |  |  | YES | reject |
| >RAN UE Paging identity | M |  | 9.3.1.43 |  | - |  |
| >CN UE paging identity  | M |  | 9.3.1.44 |  | - |  |
| Paging DRX | O |  | 9.3.1.40 | It is defined as the minimum between the RAN UE Paging DRX and CN UE Paging DRX | YES | ignore |
| Paging Priority | O |  | 9.3.1.41 |  | YES | ignore |
| **Paging Cell List**  |  | *1* |  |  | YES | ignore |
| **>Paging Cell Item IEs** |  | *1 .. <maxnoofPagingCells>* |  |  | EACH | ignore |
| >>NR CGI | M |  | 9.3.1.12 |  | - |  |
| >> Last Used Cell Indication | O |  | ENUMERATED(true, …) |  |  |  |
| Paging Origin | O |  | 9.3.1.79 |  | YES | ignore |
| PEIPS Assistance Information | O |  | 9.3.1.X |  | YES | ignore |
| UE Paging Capability  | O |  | 9.3.1.Y |  | YES | Ignore |

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| maxnoofPagingCells | Maximum no. of paging cells, the maximum value is 512.  |

<<<<<<<<<<<<<<<<<<<<NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

#### 9.3.1.18 gNB-DU System Information

This IE contains the system information generated by the gNB-DU.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** |
| MIB message | M |  | OCTET STRING | MIB message, as defined in subclause 6.2.2 in TS 38.331 [8]. | - |  |
| SIB1 message | M |  | OCTET STRING | SIB1 message, as defined in subclause 6.2.2 in TS 38.331 [8]. | - |  |
| SIB12 message | O |  | OCTET STRING | SIB12, as defined in subclause 6.2.2 in TS 38.331 [8]. | YES | Ignore |
| SIB13 message | O |  | OCTET STRING | SIB13, as defined in subclause 6.3.1 in TS 38.331 [8]. | YES | Ignore |
| SIB14 message | O |  | OCTET STRING | SIB14, as defined in subclause 6.3.1 in TS 38.331 [8]. | YES | ignore |
| SIB10 message | O |  | OCTET STRING | SIB10, as defined in subclause 6.3.1 in TS 38.331 [8]. | YES | ignore |
| SIBx message | O |  | OCTET STRING | SIBx, as defined in subclause 6.3.1 in TS 38. 331 [8] | YES | ignore |

<<<<<<<<<<<<<<<<<<<< NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

#### 9.3.1.X PEIPS Assistance Information

This IE provides the information related to CN paging subgrouping for a particular UE, as specified in TS 38.304 [24].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CN Subgroup ID | M |  | INTEGER (0..7, …) |  |

<<<<<<<<<<<<<<<<<<<<NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

#### 9.3.1.Y UE Paging Capability

This IE provides the UE Paging Capability information needed for paging.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| UEID Subgrouping Support Indication | O |  | ENUMERATED(true,…) |  |

<<<<<<<<<<<<<<<<<<<< NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

### 9.4.4 PDU Definitions

-- ASN1START

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

--

-- PDU definitions for F1AP.

--

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

IMPORTS

<unchanged omitted>

 SCGIndicator,

 SpatialRelationPerSRSResource,

 PEIPSAssistanceInfo,

 UEPagingCapability

FROM F1AP-Containers

<unchanged omitted>

 id-SCGIndicator,

 id-SRSSpatialRelationPerSRSResource,

 id-PEIPSAssistanceInfo,

 id-UEPagingCapability,

 maxCellingNBDU,

 maxnoofCandidateSpCells,

 maxnoofDRBs,

 maxnoofErrors,

 maxnoofIndividualF1ConnectionsToReset,

 maxnoofPotentialSpCells,

 maxnoofSCells,

 maxnoofSRBs,

 maxnoofPagingCells,

 maxnoofTNLAssociations,

 maxCellineNB,

 maxnoofUEIDs,

 maxnoofBHRLCChannels,

 maxnoofRoutingEntries,

 maxnoofChildIABNodes,

 maxnoofServedCellsIAB,

 maxnoofTLAsIAB,

 maxnoofULUPTNLInformationforIAB,

 maxnoofUPTNLAddresses,

 maxnoofSLDRBs,

 maxnoofTRPInfoTypes,

 maxnoofTRPs

FROM F1AP-Constants;

<unchanged omitted>

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

--

-- Paging PROCEDURE

--

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

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

--

-- Paging

--

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

Paging ::= SEQUENCE {

 protocolIEs ProtocolIE-Container {{ PagingIEs}},

 ...

}

PagingIEs F1AP-PROTOCOL-IES ::= {

 { ID id-UEIdentityIndexValue CRITICALITY reject TYPE UEIdentityIndexValue PRESENCE mandatory }|

 { ID id-PagingIdentity CRITICALITY reject TYPE PagingIdentity PRESENCE mandatory }|

 { ID id-PagingDRX CRITICALITY ignore TYPE PagingDRX PRESENCE optional }|

 { ID id-PagingPriority CRITICALITY ignore TYPE PagingPriority PRESENCE optional }|

 { ID id-PagingCell-List CRITICALITY ignore TYPE PagingCell-list PRESENCE mandatory }|

 { ID id-PagingOrigin CRITICALITY ignore TYPE PagingOrigin PRESENCE optional }|

 { ID id-PEIPSAssistanceInfo CRITICALITY ignore TYPE PEIPSAssistanceInfo PRESENCE optional }

 { ID id-UEPagingCapability CRITICALITY ignore TYPE UEPagingCapability PRESENCE optional }

,

 ...

}

<unchanged omitted>

<<<<<<<<<<<<<<<<<<<< NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

### 9.4.5 Information Element Definitions

-- ASN1START

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

--

-- Information Element Definitions

--

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

<unchanged omitted>

 id-EstimatedArrivalProbability,

 id-TRPType,

 id-SRSSpatialRelationPerSRSResource,

 id-LastUsedCellIndication,

 id-SIBx-message,

 maxNRARFCN,

 maxnoofErrors,

 maxnoofBPLMNs,

<unchanged omitted>

-- C

<unchanged omitted>

CHOtrigger-IntraDU ::= ENUMERATED {

 cho-initiation,

 cho-replace,

 cho-cancel,

 ...

}

CNSubgroupID ::= INTEGER (0..7, ...)

CNUEPagingIdentity ::= CHOICE {

 fiveG-S-TMSI BIT STRING (SIZE(48)),

 choice-extension ProtocolIE-SingleContainer { { CNUEPagingIdentity-ExtIEs } }

}

CNUEPagingIdentity-ExtIEs F1AP-PROTOCOL-IES ::= {

 ...

}

-- G

<unchanged omitted>

GNB-DU-System-Information ::= SEQUENCE {

 mIB-message MIB-message,

 sIB1-message SIB1-message,

 iE-Extensions ProtocolExtensionContainer { { GNB-DU-System-Information-ExtIEs } } OPTIONAL,

 ...

}

GNB-DU-System-Information-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 { ID id-SIB12-message CRITICALITY ignore EXTENSION SIB12-message PRESENCE optional}|

 { ID id-SIB13-message CRITICALITY ignore EXTENSION SIB13-message PRESENCE optional}|

 { ID id-SIB14-message CRITICALITY ignore EXTENSION SIB14-message PRESENCE optional}|

 { ID id-SIB10-message CRITICALITY ignore EXTENSION SIB10-message PRESENCE optional}|

 { ID id-SIBx-message CRITICALITY ignore EXTENSION SIBx-message PRESENCE optional}

,

 ...

}

<unchanged omitted>

-- L

L139Info ::= SEQUENCE {

 msg1SCS ENUMERATED {scs15, scs30, scs60, scs120, ...},

 rootSequenceIndex INTEGER (0..137) OPTIONAL,

 iE-Extension ProtocolExtensionContainer { {L139Info-ExtIEs} } OPTIONAL,

 ...

}

L139Info-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

L839Info ::= SEQUENCE {

 rootSequenceIndex INTEGER (0..837),

 restrictedSetConfig ENUMERATED {unrestrictedSet, restrictedSetTypeA,

 restrictedSetTypeB, ...},

 iE-Extension ProtocolExtensionContainer { {L839Info-ExtIEs} } OPTIONAL,

 ...

}

L839Info-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

LastUsedCellIndication ::= ENUMERATED {true, ...}

LCID ::= INTEGER (1..32, ...)

<unchanged omitted>

-- P

<unchanged omitted>

PagingCell-Item ::= SEQUENCE {

 nRCGI NRCGI ,

 iE-Extensions ProtocolExtensionContainer { { PagingCell-ItemExtIEs } } OPTIONAL

}

PagingCell-ItemExtIEs F1AP-PROTOCOL-EXTENSION ::= {

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

...

}

PagingDRX ::= ENUMERATED {

 v32,

 v64,

 v128,

 v256,

 ...

}

PagingIdentity ::= CHOICE {

 rANUEPagingIdentity RANUEPagingIdentity,

 cNUEPagingIdentity CNUEPagingIdentity,

 choice-extension ProtocolIE-SingleContainer { { PagingIdentity-ExtIEs } }

}

PagingIdentity-ExtIEs F1AP-PROTOCOL-IES::= {

 ...

}

PagingOrigin ::= ENUMERATED { non-3gpp, ...}

PagingPriority ::= ENUMERATED { priolevel1, priolevel2, priolevel3, priolevel4, priolevel5, priolevel6, priolevel7, priolevel8,...}

PEIPSAssistanceInfo ::= SEQUENCE {

 cNSubgroupID CNSubgroupID,

 iE-Extensions ProtocolExtensionContainer { { PEIPSAssistanceInfo-ExtIEs } } OPTIONAL

}

PEIPSAssistanceInfo-ItemExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

<unchanged omitted>

-- S

<unchanged omitted>

SIB12-message ::= OCTET STRING

SIB13-message ::= OCTET STRING

SIB14-message ::= OCTET STRING

SIBx-message ::= OCTET STRING

SItype ::= INTEGER (1..32, ...)

<unchanged omitted>

-- U

<unchanged omitted>

UE-CapabilityRAT-ContainerList::= OCTET STRING

UEContextNotRetrievable ::= ENUMERATED {true, ...}

UEIdentityIndexValue ::= CHOICE {

 indexLength10 BIT STRING (SIZE (10)),

 choice-extension ProtocolIE-SingleContainer { {UEIdentityIndexValueChoice-ExtIEs} }

}

UEIdentityIndexValueChoice-ExtIEs F1AP-PROTOCOL-IES ::= {

 ...

}

UEPagingCapability ::= SEQUENCE {

 uEIDSubgroupingSupportIndication ENUMERATED {true, ...} OPTIONAL,

 iE-Extension ProtocolExtensionContainer { { UEPagingCapability-ExtIEs} } OPTIONAL,

 ...

}

UEPagingCapability-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

<<<<<<<<<<<<<<<<<<<< NEXT OF CHANGES >>>>>>>>>>>>>>>>>>>>

### 9.4.7 Constant Definitions

-- ASN1START

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

--

-- Constant definitions

--

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

<unchanged omitted>

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

--

-- IEs

--

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

<unchanged omitted>

id-SFN-Offset ProtocolIE-ID ::= 429

id-TransmissionStopIndicator ProtocolIE-ID ::= 430

id-SrsFrequency ProtocolIE-ID ::= 431

id-SCGIndicator ProtocolIE-ID ::= 432

id-EstimatedArrivalProbability ProtocolIE-ID ::= 433

id-TRPType ProtocolIE-ID ::= 434

id-SRSSpatialRelationPerSRSResource ProtocolIE-ID ::= 435

id-PEIPSAssistanceInfo ProtocolIE-ID ::= xxx

id-UEPagingCapability ProtocolIE-ID ::= yyy

id-LastUsedCellIndication ProtocolIE-ID ::= zzz

id-SIBx-message ProtocolIE-ID ::= mmm

<unchanged omitted>

<<<<<<<<<<<<<<<<<<<< END OF CHANGES >>>>>>>>>>>>>>>>>>>>