**3GPP TSG-RAN WG2 Meeting #109 *R2-20xxxxx***

Athens, Greece, 24 – 28 February 2020 (Revision of R2-1915388)

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| *CR-Form-v12.0* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **31** | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *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 | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | Support for Non-Public Networks | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia (Rapporteur) | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NG\_RAN\_PRN | | | | |  | ***Date:*** | | | 2019-11 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | 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 can be 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR introduces the support for Non-Public Networks in NG-RAN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Updates the draft CR input for #RAN108 (R2-1915388) based on the following agreement and working assumption of RAN2#108:   * NPN information is outside PLMN-IdentityInfoList as a new Rel-16 IE for NPN-only cell and PLMN+NPN cell (the total number of network IDs is still 12) * The new Rel-16 IE with a role similar to role of cellReservedForOtherUse for Rel-15 UEs is cell specific. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No RRC specification to support NPNs | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | TBA | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 Modified Subclause*

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**CEIL:** Mathematical function used to 'round up' i.e. to the nearest integer having a higher or equal value.

**Dedicated signalling:** Signalling sent on DCCH logical channel between the network and a single UE.

**Field:** The individual contents of an information element are referred to as fields.

**FLOOR:** Mathematical function used to 'round down' i.e. to the nearest integer having a lower or equal value.

**Information element:** A structural element containing single or multiple fields is referred as information element.

**NPN-only Cell**: A cell that is only available for NPNs’ subscriber. This is indicated by setting the *cellReservedForOtherUse* IE to true while the *npn-IdentityInfoList-r16* IE is present in *CellAccessRelatedInfo*.

**Primary Cell**: The MCG cell, operating on the primary frequency, in which the UE either performs the initial connection establishment procedure or initiates the connection re-establishment procedure.

**Primary SCG Cell**: For dual connectivity operation, the SCG cell in which the UE performs random access when performing the Reconfiguration with Sync procedure.

**Primary Timing Advance Group**: Timing Advance Group containing the SpCell.

**PUCCH SCell:** An SCell configured with PUCCH.

**PUSCH-Less SCell:** An SCell configured without PUSCH.

**RLC bearer configuration:** The lower layer part of the radio bearer configuration comprising the RLC and logical channel configurations.

**Secondary Cell**: For a UE configured with CA, a cell providing additional radio resources on top of Special Cell.

**Secondary Cell Group**: For a UE configured with dual connectivity, the subset of serving cells comprising of the PSCell and zero or more secondary cells.

**Serving Cell**: For a UE in RRC\_CONNECTED not configured with CA/DC there is only one serving cell comprising of the primary cell. For a UE in RRC\_CONNECTED configured with CA/ DC the term 'serving cells' is used to denote the set of cells comprising of the Special Cell(s) and all secondary cells.

**Special Cell:** For Dual Connectivity operation the term Special Cell refers to the PCell of the MCG or the PSCell of the SCG, otherwise the term Special Cell refers to the PCell.

**Split SRB**: In MR-DC, an SRB that supports transmission via MCG and SCG as well as duplication of RRC PDUs as defined in TS 37.340 [41].

**SSB Frequency**: Frequency referring to the position of resource element RE=#0 (subcarrier #0) of resource block RB#10 of the SS block.

**UE Inactive AS Context**: UE Inactive AS Context is stored when the connection is suspended and restored when the connection is resumed. It includes information as defined in clause 5.3.8.3.

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

ACK Acknowledgement

AM Acknowledged Mode

ARQ Automatic Repeat Request

AS Access Stratum

ASN.1 Abstract Syntax Notation One

BLER Block Error Rate

BWP Bandwidth Part

CA Carrier Aggregation

CAG Closed Access Group

CAG-ID Closed Access Group Identifier

CCCH Common Control Channel

CG Cell Group

CMAS Commercial Mobile Alert Service

CP Control Plane

C-RNTI Cell RNTI

CSI Channel State Information

DC Dual Connectivity

DCCH Dedicated Control Channel

DCI Downlink Control Information

DL Downlink

DL-SCH Downlink Shared Channel

DM-RS Demodulation Reference Signal

DRB (user) Data Radio Bearer

DRX Discontinuous Reception

DTCH Dedicated Traffic Channel

EN-DC E-UTRA NR Dual Connectivity with E-UTRA connected to EPC

EPC Evolved Packet Core

EPS Evolved Packet System

ETWS Earthquake and Tsunami Warning System

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRA/5GC E-UTRA connected to 5GC

E-UTRA/EPC E-UTRA connected to EPC

E-UTRAN Evolved Universal Terrestrial Radio Access Network

FDD Frequency Division Duplex

FFS For Further Study

GERAN GSM/EDGE Radio Access Network

GNSS Global Navigation Satellite System

GSM Global System for Mobile Communications

HARQ Hybrid Automatic Repeat Request

IE Information element

IMSI International Mobile Subscriber Identity

kB Kilobyte (1000 bytes)

L1 Layer 1

L2 Layer 2

L3 Layer 3

MAC Medium Access Control

MCG Master Cell Group

MIB Master Information Block

MR-DC Multi-Radio Dual Connectivity

N/A Not Applicable

NE-DC NR E-UTRA Dual Connectivity

(NG)EN-DC E-UTRA NR Dual Connectivity (covering E-UTRA connected to EPC or 5GC)

NGEN-DC E-UTRA NR Dual Connectivity with E-UTRA connected to 5GC

NID Network Identifier

NPN Non-Public Network

NR-DC NR-NR Dual Connectivity

NR/5GC NR connected to 5GC

PCell Primary Cell

PDCP Packet Data Convergence Protocol

PDU Protocol Data Unit

PLMN Public Land Mobile Network

PNI-NPN Public Network Integrated Non-Public Network

PSCell Primary SCG Cell

PWS Public Warning System

QoS Quality of Service

RAN Radio Access Network

RAT Radio Access Technology

RLC Radio Link Control

RNA RAN-based Notification Area

RNTI Radio Network Temporary Identifier

ROHC Robust Header Compression

RRC Radio Resource Control

RS Reference Signal

SCell Secondary Cell

SCG Secondary Cell Group

SFN System Frame Number

SFTD SFN and Frame Timing Difference

SI System Information

SIB System Information Block

SNPN Stand-alone Non-Public Network

SpCell Special Cell

SRB Signalling Radio Bearer

SSB Synchronization Signal Block

TAG Timing Advance Group

TDD Time Division Duplex

TM Transparent Mode

UE User Equipment

UL Uplink

UM Unacknowledged Mode

UP User Plane

In the ASN.1, lower case may be used for some (parts) of the above abbreviations e.g. c-RNTI.

*Next Modified Subclause*

### 6.3.2 Radio resource control information elements

[…]

– *CellAccessRelatedInfo*

The IE *CellAccessRelatedInfo* indicates cell access related information for this cell.

***CellAccessRelatedInfo* information element**

-- ASN1START

-- TAG-CELLACCESSRELATEDINFO-START

CellAccessRelatedInfo ::= SEQUENCE {

plmn-IdentityList PLMN-IdentityInfoList,

cellReservedForOtherUse ENUMERATED {true} OPTIONAL, -- Need R

...,

[[

cellReservedForFutureUse-r16 ENUMERATED {true} OPTIONAL, -- Need R

npn-IdentityInfoList-r16 NPN-IdentityInfoList-r16 OPTIONAL -- Need R

]]

}

-- TAG-CELLACCESSRELATEDINFO-STOP

-- ASN1STOP

|  |
| --- |
| ***CellAccessRelatedInfo* field descriptions** |
| ***cellReservedForFutureUse***  Indicates whether the cell is reserved, as defined in 38.304 [20] for future use. The field is applicable to all PLMNs and NPNs. |
| ***cellReservedForOtherUse***  Indicates whether the cell is reserved, as defined in 38.304 [20]. The field is applicable to all PLMNs. |
| ***npn-IdentityInfoList***  The *npn-IdentityInfoList* is used to configure a set of *NPN-IdentityInfoList* elements. Each of those elements contains a list of one or more NPN Identities and additional information associated with those NPNs. The total number of PLMNs (identified by a PLMN identity in *plmn -IdentityList*), PNI-NPNs (identified by a PLMN identity and a CAG-ID), and SNPNs (identified by a PLMN identity and a NID) together in the *PLMN-IdentityInfoList* and *NPN-IdentityInfoList* does not exceed 12, except for the NPN-only cells. In case of NPN-only cells the PLMN-IdentityList contains a single element that does not count to the limit of 12. |
| ***plmn-IdentityList***  The *plmn-IdentityList* is used to configure a set of *PLMN-IdentityInfoList* elements. Each of those elements contains a list of one or more PLMN Identities and additional information associated with those PLMNs. The PLMN index is defined as *b1+b2+…+b(n-1)+i* for the PLMN included at the *n*-th entry of *PLMN-IdentityInfoList* and the *i*-th entry of its corresponding *PLMN-IdentityInfo*, where *b(j)* is the number of *PLMN-Identity* entries in each *PLMN-IdentityInfo*, respectively. |

Editor's Note: A definition of network indexing for NPNs is FFS.

*Next Modified Subclause(new information elements in 6.3.2 )*

#### – *NPN-Identity*

The IE *NPN-Identity* includes either a list of CAG-IDs or a list of NIDs per PLMN Identity. Further information regarding how to set the IE is specified in TS 23.003 [21].

*NPN-Identity* information element

-- ASN1START

-- TAG-NPN-IDENTITY-START

NPN-Identity-r16 ::= CHOICE {

pni-npn-r16 SEQUENCE {

plmn-Identity-r16 PLMN-Identity,

cag-IdentityList-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF CAG-Identity-r16

},

snpn-r16 SEQUENCE {

plmn-Identity PLMN-Identity,

nid-List-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF NID-r16

}

}

CAG-Identity-r16 ::= BIT STRING (SIZE (32))

NID-r16 ::= BIT STRING (SIZE (52))

-- TAG-NPN-IDENTITY-STOP

-- ASN1STOP

|  |
| --- |
| *NPN-Identity* field descriptions |
| ***CAG-Identity***  A CAG-ID as specified in TS 23.003 [21]. The PLMN ID and a CAG ID in the *NPN-Identity* identifies a PNI-NPN. |
| ***cag-IdentityList***  The *cag-IdentityList* contains one or more *CAG-Identity*. |
| ***NID***  A NID as specified in TS 23.003 [21]. The PLMN ID and a NID in the *NPN-Identity* identifies a SNPN. |
| ***nid-List***  The *nid-List* contains one or more *NID*. |

Editor’s Note: The size of NID is to be checked based on CT4 agreements.

Editor's Note: The need for list of NIDs depends on the RAN sharing scenarios to be supported.

Editor's Note: It is FFS whether all CAG identities associated to the same PLMN identity shall be listed in the same *cag-IdentityList*.

*Next Modification (new information elements in 6.3.2 )*

#### – *NPN-IdentityInfoList*

The IE *NPN-IdentityInfoList* includes a list of NPN identity information.

*NPN-IdentityInfoList* information element

-- ASN1START

-- TAG-NPN-IDENTITYINFOLIST-START

NPN-IdentityInfoList-r16 ::= SEQUENCE (SIZE (1..maxNPN-r16)) OF NPN-IdentityInfo-r16

NPN-IdentityInfo-r16 ::= SEQUENCE {

npn-IdentityList-r16 SEQUENCE (SIZE (1..maxNPN-r16)) OF NPN-Identity-r16,

trackingAreaCode-r16 TrackingAreaCode,

ranac-r16 RAN-AreaCode OPTIONAL, -- Need R

cellIdentity-r16 CellIdentity,

cellReservedForOperatorUse-r16 ENUMERATED {reserved, notReserved},

...

}

-- TAG-NPN-IDENTITYINFOLIST-STOP

-- ASN1STOP

|  |
| --- |
| *NPN-IdentityInfoList* field descriptions |
| ***NPN-IdentityInfo***  The *NPN-IdentityInfo* contains one or more NPN identities and additional information associated with those NPNs. Only the same type of NPNs (either SNPNs or PNI-NPNs) can be listed in a *NPN-IdentityInfo* element. |
| ***npn-IdentityList***  The *npn-IdentityList* contains one or more NPN Identity elements. |
| ***trackingAreaCode***  Indicates the Tracking Area Code to which the cell indicated by cellIdentity field belongs. |
| ***ranac***  Indicates the RAN Area Code to which the cell indicated by cellIdentity field belongs. |
| ***trackingAreaCode***  Indicates Tracking Area Code to which the cell indicated by cellIdentity field belongs. |
| ***cellReservedForOperatorUse***  Indicates whether the cell is reserved for operator use (for the NPN(s) identified in the *npn-IdentyList*) as defined in TS 38.304 [20]. |

Editor's Note: Whether *trackingAreaCode* is optinal or mandatory depends on DC/CA support. This is FFS.

Editor's Note: The support of sharing logical cells is FFS.

*Next Modification (new definition in 6.4)*

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxNPN-r16 INTEGER ::= 12 -- Maximum number of NPNs broadcast and reported by UE at establishment

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP

-- ASN1STOP

*End of Modifications*