**3GPP TSG-RAN WG3 Meeting #109-e *R3-205745***

**E-meeting, 17 – 27 August, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.423** | **CR** | **1513** | **rev** | **1** | **Current version:** | **16.2.0** |  |
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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 | **X** | Core Network |  |

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| ***Title:*** | Support for intended TDD configuration transfer for EN-DC | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_CLI\_RIM-Core | | | | |  | ***Date:*** | | | 2020-08-17 |
|  |  | | | |  | |  | | |  |
| ***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 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:*** | | CLI measurements can be configured for NR cells in all MR-DC options, including EN-DC (TS 37.340 CR#0182r1). Support for this is currently missing in X2AP. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Addition of Intended TDD DL-UL Configuration NR information to   * *Served NR Cell Information* IE (for signalling in direction en-gNB -> eNB); * *NR Neighbour Information* IE (for signalling in direction eNB -> en-gNB and eNB->eNB).   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 only has impact on X2 Setup, eNB Configuration Update, EN-DC X2 Setup, EN-DC Configuration Update. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Missing X2AP support for Rel-16 feature introduced in TS 37.340. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 8.3.3.2, 8.3.5.2, 8.7.1.2, 8.7.2.2, 9.2.98, 9.2.110, 9.3.4, 9.3.5, 9.3.7 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Rev. 1:  CR title update. Clarifications in procedural text and in 'Summary of change'. | | | | | | | | |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture Description".

[3] 3GPP TS 36.420: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 General Aspects and Principles".

[4] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[5] ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER) ".

[6] 3GPP TS 32.422: "Telecommunication Management; Subscriber and Equipment Trace; Trace Control and Configuration Management".

[7] 3GPP TS 32.421: "Telecommunication Management; Subscriber and Equipment Trace; Trace concepts and requirements".

[8] 3GPP TS 36.424: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 data transport".

[9] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRAN); Radio Resource Control (RRC) Protocol Specification".

[10] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

[11] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures ".

[12] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[13] 3GPP TS 23.203: "Policy and charging control architecture".

[14] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System; Stage 3".

[15] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA), Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; stage 2".

[16] 3GPP TS 36.104: "Base Station (BS) radio transmission and reception ".

[17] Void.

[18] 3GPP TS 33.401: "Security architecture".

[19] 3GPP TS 36.414: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport".

[20] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC)".

[21] 3GPP TS 36.422: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 signaling transport".

[22] 3GPP TS 36.314: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Layer 2 - Measurements".

[23] Void.

[24] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling"

[25] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT);Overall description; Stage 2".

[26] 3GPP TS 29.281: "General Packet Radio Service (GPRS); Tunnelling Protocol User Plane (GTPv1-U)".

[27] ITU-T Recommendation X.680 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[28] ITU-T Recommendation X.681 (2002-07): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".

[29] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".

[30] 3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".

[31] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specification".

[32] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Stage 2".

[33] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[34] 3GPP TS 38.401: "NG-RAN; Architecture description".

[35] IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[36] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[37] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[38] 3GPP TS 23.501: "System Architecture for the 5G System"

[39] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".

[40] 3GPP TS 36.322: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification".

[41] 3GPP TS 23.285: " Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[42] 3GPP TS 38.211: "NR; Physical channels and modulation".

[43] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[44] 3GPP TS 38.473: "NG-RAN; F1 application protocol (F1AP)".

[45] 3GPP TS 38.314: "NR; Layer 2 Measurements".

[46] 3GPP TS 38.211: "NR; Physical channels and modulation".

[47] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[48] 3GPP TS 38.472: "NG-RAN; F1 signalling transport"

[xx] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)"

### 8.3.3 X2 Setup

#### 8.3.3.1 General

The purpose of the X2 Setup procedure is to exchange application level configuration data needed for two eNBs to interoperate correctly over the X2 interface. This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also resets the X2 interface like a Reset procedure would do.

NOTE: Exchange of application level configuration data also applies between two eNBs in case the SN (i.e. the en-gNB) does not broadcast system information other than for radio frame timing and SFN, as specified in the TS 37.340 [32]. How to use this information when this option is used is not explicitly specified.

The procedure uses non UE-associated signalling.

#### 8.3.3.2 Successful Operation



Figure 8.3.3.2-1: X2 Setup, successful operation

An eNB1 initiates the procedure by sending the X2 SETUP REQUEST message to a candidate eNB2. The candidate eNB2 replies with the X2 SETUP RESPONSE message. The initiating eNB1 shall transfer the complete list of its served cells and, if available, a list of supported GU Group Ids to the candidate eNB2. The candidate eNB2 shall reply with the complete list of its served cells and shall include, if available, a list of supported GU Group Ids in the reply.

If a cell is switched off for energy savings reasons, it should be activated before initiating or responding to the X2 Setup procedure and shall still be included in the list of served cells.

The initiating eNB1 may include the *Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *Neighbour Information* IE in the X2 SETUP RESPONSE message. The *Neighbour Information* IE shall only include E-UTRAN cells that are direct neighbours of cells in the reporting eNB. A direct neighbour of one cell of a given eNB may be any cell belonging to an eNB that is a neighbour of that given eNB cell e.g. even if the cell has not been reported by a UE. The initiating eNB1 may include the *TAC* IE with the *Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *TAC* IE with the *Neighbour Information* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

The initiating eNB1 may include the *NR Neighbour Information* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *NR Neighbour Information* IE in the X2 SETUP RESPONSE message. The *NR Neighbour Information* IE shall only include NR cells capable of performing EN-DC with the corresponding served E-UTRA cell. The eNB receiving the *NR Neighbour Information* IE may use it according to TS 36.300 [15].

The initiating eNB1 may include the *Number of Antenna Ports* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *Number of Antenna Ports* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.331 [9].

The initiating eNB1 may include the *PRACH Configuration* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *PRACH Configuration* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use this information for RACH optimisation.

The initiating eNB1 may include the *MBSFN Subframe Info* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *MBSFN Subframe Info* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.331 [9].

For each CSG cell or hybrid cell served by the initiating eNB1 the X2 SETUP REQUEST message shall contain the *CSG ID* IE. For each CSG cell or hybrid cell served by the candidate eNB2 the X2 SETUP RESPONSE message shall contain the *CSG ID* IE. The eNB receiving the IE shall take this information into account when further deciding whether X2 handover between the source cell and the target cell may be performed.

The initiating eNB1 may include the *MBMS Service Area Identity List* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *MBMS Service Area Identity List* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

For each cell served by the initiating eNB1 the X2 SETUP REQUEST message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. For each cell served by the candidate eNB2 the X2 SETUP RESPONSE message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. The eNB receiving the *MultibandInfoList* IE shall, if supported, take this information into account when further deciding whether subsequent mobility actions between the source cell and the target cell may be performed, and use this IE and the *FreqBandIndicatorPriority* IE, if received, as specified in TS 36.331 [9].

The initiating eNB1 may include the *LHN ID* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include *LHN ID* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it according to TS 36.300 [15].

The initiating eNB1 may include the *BandwidthReducedSI* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include *BandwidthReducedSI* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use it to determine a suitable target in case of subsequent outgoing mobility involving BL UEs or UEs requiring CE.

The initiating eNB1 may include the *NPRACH Configuration* IE in the X2 SETUP REQUEST message. The candidate eNB2 may also include the *NPRACH Configuration* IE in the X2 SETUP RESPONSE message. The eNB receiving the IE may use this information for RACH optimization.

**Interaction with the EN-DC Configuration Update procedure:**

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *NR Neighbour Information* IE in the X2 SETUP REQUEST message or in the X2 SETUP RESPONSE message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.**Interaction with the eNB Configuration Update procedure:**

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *NR Neighbour Information* IE in the X2 SETUP REQUEST message or in the X2 SETUP RESPONSE message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

#### 8.3.3.3 Unsuccessful Operation



Figure 8.3.3.3-1: X2 Setup, unsuccessful operation

If the candidate eNB2 cannot accept the setup it shall respond with an X2 SETUP FAILURE message with appropriate cause value.

If the X2 SETUP FAILURE message includes the *Time To Wait* IE the initiating eNB1 shall wait at least for the indicated time before reinitiating the X2 Setup procedure towards the same eNB2.

#### 8.3.3.4 Abnormal Conditions

If the first message received for a specific TNL association is not an X2 SETUP REQUEST, X2 SETUP RESPONSE, or X2 SETUP FAILURE message then this shall be treated as a logical error.

If the initiating eNB1 does not receive either X2 SETUP RESPONSE message or X2 SETUP FAILURE message, the eNB1 may reinitiate the X2 Setup procedure towards the same eNB, provided that the content of the new X2 SETUP REQUEST message is identical to the content of the previously unacknowledged X2 SETUP REQUEST message.

If the initiating eNB1 receives an X2 SETUP REQUEST message from the peer entity on the same X2 interface:

- In case the eNB1 answers with an X2 SETUP RESPONSE message and receives a subsequent X2 SETUP FAILURE message, the eNB1 shall consider the X2 interface as non operational and the procedure as unsuccessfully terminated according to sub clause 8.3.3.3.

- In case the eNB1 answers with an X2 SETUP FAILURE message and receives a subsequent X2 SETUP RESPONSE message, the eNB1 shall ignore the X2 SETUP RESPONSE message and consider the X2 interface as non operational.

### 8.3.5 eNB Configuration Update

#### 8.3.5.1 General

The purpose of the eNB Configuration Update procedure is to update application level configuration data needed for two eNBs to interoperate correctly over the X2 interface.

NOTE: Update of application level configuration data also applies between two eNBs in case the SN (i.e. the en-gNB) does not broadcast system information other than for radio frame timing and SFN, as specified in the TS 37.340 [32]. How to use this information when this option is used is not explicitly specified.

The procedure uses non UE-associated signalling.

#### 8.3.5.2 Successful Operation



Figure 8.3.5.2-1: eNB Configuration Update, successful operation

An eNB1 initiates the procedure by sending an ENB CONFIGURATION UPDATE message to a peer eNB2 . Such message shall include an appropriate set of up-to-date configuration data, including, but not limited to, the complete lists of added, modified and deleted served cells, that eNB1 has just taken into operational use.

Upon reception of an ENB CONFIGURATION UPDATE message, eNB2 shall update the information for eNB1 as follows:

**Update of Served Cell Information:**

- If *Served Cells To Add* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 shall add cell information according to the information in the *Served Cell Information* IE.

- If *Number of Antenna Ports* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB2 may use this information according to TS 36.331 [9].

- If the *PRACH Configuration* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, the eNB receiving the IE may use this information for RACH optimisation.

- If *Served Cells To Modify* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 shall modify information of cell indicated by *Old ECGI* IE according to the information in the *Served Cell Information* IE.

- If *MBSFN Subframe Info* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB2 may use this information according to TS 36.331 [9]. If a MBSFN subframe indicated in the *MBSFN Subframe Info* IE coincides with an ABS, the eNB2 shall consider that the subframe is designated as ABS by the sending eNB.

- If *BandwidthReducedSI* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, eNB2 may use this information to determine a suitable target in case of subsequent outgoing mobility involving BL UEs or UEs requiring CE.

When either served cell information or neighbour information of an existing served cell in eNB1 need to be updated, the whole list of neighbouring cells, if any, shall be contained in the *Neighbour Information* IE.

If the *Deactivation Indication* IE is contained in *Served Cells To Modify* IE, it indicates that the concerned cell was switched off to lower energy consumption.

The eNB2 shall overwrite the served cell information and the whole list of neighbour cell information for the affected served cell.

- If *Served Cells To Delete* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 shall delete information of cell indicated by *Old ECGI* IE.

- If *MBMS Service Area Identity List* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, the eNB receiving the IE may use it according to TS 36.300 [15].

When the MBMS Service Area Identities of a cell in eNB1 need to be updated, the whole list of MBMS Service Area Identities of the affected cell shall be contained in the *Served Cell Information* IE.

- If the *NPRACH Configuration* IE is contained in the *Served Cell Information* IE in the ENB CONFIGURATION UPDATE message, the eNB receiving the IE may use this information for RACH optimization.

**Update of GU Group Id List:**

- If *GU Group Id To Add List* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 shall add the GU Group Id to its GU Group Id List.

- If *GU Group Id To Delete List* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 shall remove the GU Group Id from its GU Group Id List.

If *Neighbour Information* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 may use this information to update its neighbour cell relations, or use it for other functions, like PCI selection. The *Neighbour Information* IE shall only include E-UTRAN cells that are direct neighbours of cells in the reporting eNB. A direct neighbour of one cell of a given eNB may be any cell belonging to an eNB that is a neighbour of that given eNB cell e.g. even if that cell has not been reported by a UE. The *Neighbour Information* IE may contain the *TAC* IE of the included cells. The receiving eNB may use *TAC* IE, as described in TS 36.300 [15].

If the *NR Neighbour Information* IE is contained in the ENB CONFIGURATION UPDATE message, eNB2 may use this information to update its neighbour cell relations or use it for other functions. The *NR Neighbour Information* IE shall only include NR cells capable of performing EN-DC with the corresponding served E-UTRA cell. The eNB receiving the *NR Neighbour Information* IE may use it according to TS 36.300 [15].

After successful update of requested information, eNB2 shall reply with the ENB CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating eNB1 that the requested update of application data was performed successfully. In case the peer eNB2 receives an ENB CONFIGURATION UPDATE without any IE except for *Message Typ*eIE it shall reply with ENB CONFIGURATION UPDATE ACKNOWLEDGE message without performing any updates to the existing configuration.

The eNB1 may initiate a further eNB Configuration Update procedure only after a previous eNB Configuration Update procedure has been completed.

For each cell served by the initiating eNB1 the ENB CONFIGURATION UPDATE message may contain the *MultibandInfoList* IE and may also contain the *FreqBandIndicatorPriority* IE. The eNB receiving the *MultibandInfoList* IE shall, if supported, take this information into account when further deciding whether subsequent mobility actions between the source cell and the target cell may be performed, and use this IE and the *FreqBandIndicatorPriority* IE, if received, as specified in TS 36.331 [9].

If the *Coverage Modification List* IE is present, eNB2 may use the information in the *Cell Coverage State* IE to identify the cell deployment configuration enabled by eNB1 and for configuring the mobility towards the cell(s) indicated by the *ECGI* IE, as described in TS 36.300 [15]. If the *Cell Deployment Status Indicator* IE is present in the *Coverage Modification List* IE, the eNB2 shall consider the cell deployment configuration of the cell to be modified as the next planned configuration and shall remove any planned configuration stored for this cell. If the *Cell Deployment Status Indicator* IE is present and the *Cell Replacing Info* IE contains non-empty cell list, the eNB2 may use this list to avoid connection or re-establishment failures during the reconfiguration, e.g. consider the cells in the list as possible alternative handover targets. If the *Cell Deployment Status Indicator* IE is not present, the eNB2 shall consider the cell deployment configuration of cell to be modified as activated and replace any previous configuration for the cells indicated in the *Coverage Modification List* IE.

**Interaction with the eNB Configuration Update procedure:**

If an eNB2 which has not stored a *FreqBandIndicatorPriority* IE received from eNB1, but has signaled a *FreqBandIndicatorPriority* IE to eNB1 after the TNL association has become available, receives an ENB CONFIGURATION UPDATE message from eNB1 containing the *FreqBandIndicatorPriority* IE, the eNB2 shall initiate the eNB Configuration Update procedure towards eNB1 including the *FreqBandIndicatorPriority* IE.

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *NR Neighbour Information* IE in the ENB CONFIGURATION UPDATE message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

**Interaction with the EN-DC Configuration Update procedure:**

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *NR Neighbour Information* IE in the ENB CONFIGURATION UPDATE message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.

#### 8.3.5.3 Unsuccessful Operation



Figure 8.3.5.3-1: eNB Configuration Update, unsuccessful operation

If the eNB2 can not accept the update it shall respond with an ENB CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the ENB CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the eNB1 shall wait at least for the indicated time before reinitiating the eNB Configuration Update procedure towards the same eNB2. Both nodes shall continue to operate the X2 with their existing configuration data.

#### 8.3.5.4 Abnormal Conditions

If the eNB1 after initiating eNB Configuration Update procedure receives neither ENB CONFIGURATION UPDATE ACKNOWLEDGE message nor ENB CONFIGURATION UPDATE FAILURE message, the eNB1 may reinitiate the eNB Configuration Update procedure towards the same eNB2, provided that the content of the new ENB CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged ENB CONFIGURATION UPDATE message.

### 8.7.1 EN-DC X2 Setup

#### 8.7.1.1 General

The purpose of the EN-DC X2 Setup procedure is to exchange application level configuration data needed for eNB and en-gNB to interoperate correctly over the X2 interface. This procedure erases any existing application level configuration data in the two nodes and replaces it by the one received. This procedure also resets the X2 interface like a Reset procedure would do.

NOTE 1: If X2-C signalling transport is shared among multiple X2-C interface instances, one EN-DC X2 Setup procedure is issued per X2-C interface instance to be setup, i.e. several X2 Setup procedures may be issued via the same TNL association after that TNL association has become operational.

NOTE 2: Exchange of application level configuration data also applies between eNB and en-gNB in case the SN (i.e. the en-gNB) does not broadcast system information other than for radio frame timing and SFN, as specified in the TS 37.340 [32]. How to use this information when this option is used is not explicitly specified.

The procedure uses non UE-associated signalling.

#### 8.7.1.2 Successful Operation



Figure 8.7.1.2-1: eNB Initiated EN-DC X2 Setup, successful operation



Figure 8.7.1.2-2: en-gNB Initiated EN-DC X2 Setup, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 SETUP REQUEST message and the EN-DC X2 SETUP RESPONSE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance. In the current version of this specification an eNB shall not include the *Interface Instance Indication* IE in the *Initiating NodeType* IE in the EN-DC X2 SETUP REQUEST message.

**eNB initiated EN-DC X2 Setup:**

An eNB initiates the procedure by sending the EN-DC X2 SETUP REQUEST message to a candidate en-gNB. The candidate en-gNB replies with the EN-DC X2 SETUP RESPONSE message. The initiating eNB shall transfer the complete list of its served cells to the candidate en-gNB. The candidate en-gNB shall reply with the complete list of its served cells or if supported, a partial list of its served cells together with the *Partial List Indicator* IE, according to the received information in *Cell and Capacity Assistance Information* IE in EN-DC X2 SETUP REQUEST message. If Supplementary Uplink is configured at the candidate en-gNB, the candidate en-gNB shall include in the EN-DC X2 SETUP RESPONSE message the *SUL Information* IE and the *Supported SUL band List* IE for each served cell where supplementary uplink is configured.

If the EN-DC X2 SETUP REQUEST message contains the *Protected E-UTRA Resource Indication* IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received *Protected E-UTRA Resource Indication* IE content valid until reception of a new update of the IE for the same eNB.

The protected resource pattern indicated in the *Protected E-UTRA Resource Indication* IE is not valid in subframes indicated by the *Reserved Subframes* IE, as well as in the non-control region of the MBSFN subframes i.e. it is valid only in the control region therein. The size of the control region of MBSFN subframes is indicated in the *Protected E-UTRA Resource Indication* IE.

If the *Partial List Indicator* IE is set to “partial” in the EN-DC X2 SETUP RESPONSE message from the en-gNB, the eNB shall, if supported, assume that the en-gNB has included in the *List of Served Cells NR* IE a partial list of cells.

If the EN-DC X2 SETUP REQUEST message contains the *TNL Transport Layer Address info* IE, the receiving en-gNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the EN-DC X2 SETUP RESPONSE message contains the *TNL Transport Layer Address info* IE, the receiving eNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the *NR Cell PRACH Configuration* IE is included in the *Served NR Cell Information* IE contained in the EN-DC X2 SETUP RESPONSE message, the eNB may store the information.

If the *CSI-RS Transmision Indication* IE is contained in the EN-DC X2 SETUP REQUEST message, en-gNB may use this information for neighbour NR cell’s CSI-RS measurement.

If the *Intended TDD DL-UL Configuration NR* IE is contained in the *NR Neighbour Information* IE in the EN-DC X2 SETUP REQUEST message, en-gNB should take this information into account for cross-link interference management. The en-gNB shall consider the received *Intended TDD DL-UL Configuration NR* IE content valid until reception of an update of the IE for the same cell(s).

Interaction with the eNB Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC X2 SETUP RESPONSE message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

Interaction with the EN-DC Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC X2 SETUP RESPONSE message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.**en-gNB initiated EN-DC X2 Setup:**

An en-gNB initiates the procedure by sending the EN-DC X2 SETUP REQUEST message to a candidate eNB. The candidate eNB replies with the EN-DC X2 SETUP RESPONSE message. The initiating en-gNB shall transfer the complete list of its served cells or if supported, a partial list of its served cells together with the *Partial List Indicator* IE in the EN-DC X2 SETUP REQUEST message to the candidate eNB. The candidate eNB shall reply with the complete list of its served cells.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC X2 SETUP REQUEST message the *SUL Information* IE and the *Supported SUL band List* IE for each served cell where supplementary uplink is configured.

If the EN-DC X2 SETUP RESPONSE message contains the *Protected E-UTRA Resource Indication* IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received *Protected E-UTRA Resource Indication* IE content valid until reception of a new update of the IE for the same eNB.

If the *Partial List Indicator* IE is set to “partial” in the EN-DC X2 SETUP REQUEST message from the en-gNB, the eNB shall, if supported, assume that the en-gNB has included in the *List of Served Cells NR* IE a partial list of cells.

If the *Cell and Capacity Assistance Information* IE is present in the EN-DC X2 SETUP RESPONSE message from the eNB, the en-gNBshall, if supported, store the collected information to be used for future interface management.

If the EN-DC X2 SETUP REQUEST message contains the *TNL Transport Layer Address info* IE, the receiving eNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the EN-DC X2 SETUP RESPONSE message contains the *TNL Transport Layer Address info* IE, the receiving en-gNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the *NR Cell PRACH Configuration* IE is included in the *Served NR Cell Information* IE contained in the EN-DC X2 SETUP REQUEST message, the eNB may store the information.

If the *CSI-RS Transmision Indication* IE is contained in the EN-DC X2 SETUP REQUEST message, eNB should take it into account when forwarding neighbour NR cell’s CSI-RS configuration.

If the *Intended TDD DL-UL Configuration NR* IE is contained in the *NR Neighbour Information* IE in the EN-DC X2 SETUP RESPONSE message, en-gNB should take this information into account for cross-link interference management. The en-gNB shall consider the received *Intended TDD DL-UL Configuration NR* IE content valid until reception of an update of the IE for the same cell(s).

Interaction with the eNB Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC X2 SETUP REQUEST message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

Interaction with the EN-DC Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC X2 SETUP REQUEST message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.

#### 8.7.1.3 Unsuccessful Operation



Figure 8.7.1.3-1: eNB Initiated EN-DC X2 Setup, unsuccessful operation



Figure 8.7.1.3-2: en-gNB Initiated EN-DC X2 Setup, unsuccessful operation

If the candidate receving node cannot accept the setup it shall respond with an EN-DC X2 SETUP FAILURE message with appropriate cause value.

If the *Message Oversize Notification* IE is included in the EN-DC X2 SETUP FAILURE, the initiating node shall, if supported, deduce that the failure is due to a too large EN-DC X2 SETUP REQUEST message and ensure that the total number of served cells in following EN-DC X2 SETUP REQUEST message is equal to or lower than the value of the *Message Oversize Notification* IE.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC X2 SETUP REQUEST message and the EN-DC X2 SETUP FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

#### 8.7.1.4 Abnormal Conditions

If the first message received for a specific TNL association is not an EN-DC X2 SETUP REQUEST, EN-DC X2 SETUP RESPONSE, or EN-DC X2 SETUP FAILURE message then this shall be treated as a logical error.

If the initiating node does not receive either EN-DC X2 SETUP RESPONSE message or EN-DC X2 SETUP FAILURE message, the initiating node may reinitiate the EN-DC X2 Setup procedure towards the same candidate node, provided that the content of the EN-DC X2 SETUP REQUEST message is identical to the content of the previously unacknowledged EN-DC X2 SETUP REQUEST message.

If the EN-DC X2 SETUP FAILURE message includes the *Time To Wait* IE the initiating node shall wait at least for the indicated time before reinitiating the EN-DC X2 Setup procedure towards the same peer node.

If the initiating node receives an EN-DC X2 SETUP REQUEST message from the peer entity on the same X2 interface:

- In case the initiating node answers with an EN-DC X2 SETUP RESPONSE message and receives a subsequent EN-DC X2 SETUP FAILURE message, the initiating node shall consider the X2 interface as non operational and the procedure as unsuccessfully terminated according to sub clause 8.7.1.3.

- In case the initiating node answers with an EN-DC X2 SETUP FAILURE message and receives a subsequent EN-DC X2 SETUP RESPONSE message, the initiating node shall ignore the EN-DC X2 SETUP RESPONSE message and consider the X2 interface as non operational.

### 8.7.2 EN-DC Configuration Update

#### 8.7.2.1 General

The purpose of the EN-DC Configuration Update procedure is to update application level configuration data needed for eNB and en-gNB to interoperate correctly over the X2 interface.

NOTE: Update of application level configuration data also applies between eNB and en-gNB in case the SN (i.e. the en-gNB) does not broadcast system information other than for radio frame timing and SFN, as specified in the TS 37.340 [32]. How to use this information when this option is used is not explicitly specified.

The procedure uses non UE-associated signalling.

#### 8.7.2.2 Successful Operation



Figure 8.7.2.2-1: eNB Initiated EN-DC Configuration Update, successful operation



Figure 8.7.2.2-2: en-gNB Initiated EN-DC Configuration Update, successful operation

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CONFIGURATION UPDATE message and the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

**eNB initiated EN-DC Configuration Update:**

An eNB initiates the procedure by sending an EN-DC CONFIGURATION UPDATE message to a peer en-gNB.

After successful update of requested information, en-gNB shall reply with the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating eNB that the requested update of application data was performed successfully.

If the *Cell Assistance Information* IE is present, the en-gNB shall, if supported, use it to generate the *List of Served NR Cells* IE and include the list in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message.

If the EN-DC CONFIGURATION UPDATE REQUEST message contains the Protected E-UTRA Resource Indication IE, the receiving en-gNB should take this into account for cell-level resource coordination with the eNB. The en-gNB shall consider the received Protected E-UTRA Resource Indication IE content valid until reception of a new update of the IE for the same eNB. The protected resource pattern indicated in the Protected E-UTRA Resource Indication IE is not valid in subframes indicated by the Reserved Subframes IE, as well as in the non-control region of the MBSFN subframes i.e. it is valid only in the control region therein. The size of the control region of MBSFN subframes is indicated in the Protected E-UTRA Resource Indication IE.

The eNB may initiate a further EN-DC Configuration Update procedure only after a previous EN-DC Configuration Update procedure has been completed.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message the *SUL Information* IE and the *Supported SUL band List* IE for each cell added in the Served NR Cells To Add IE and in the Served NR Cells To Modify IE.

If the EN-DC CONFIGURATION UPDATE message contains the *TNL Transport Layer Address info* IE, the receiving en-gNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message contains the *TNL Transport Layer Address info* IE, the receiving eNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the *NR Cell PRACH Configuration* IE is included in the *Served NR Cell Information* IE contained in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message, the eNB may update the information.

If the C*SI-RS Transmision Indication* IE is contained in the EN-DC CONFIGURATION UPDATE message, en-gNB may use this information for neighbour NR cell’s CSI-RS measurement.

If the *Intended TDD DL-UL Configuration NR* IE is contained in the *NR Neighbour Information* IE in the EN-DC CONFIGURATION UPDATE message, en-gNB should take this information into account for cross-link interference management. The en-gNB shall consider the received *Intended TDD DL-UL Configuration NR* IE content valid until reception of an update of the IE for the same cell(s).

Interaction with the eNB Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

Interaction with the EN-DC Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.

**en-gNB initiated EN-DC Configuration Update:**

An en-gNB initiates the procedure by sending an EN-DC CONFIGURATION UPDATE message to an eNB.

If Supplementary Uplink is configured at the en-gNB, the en-gNB shall include in the EN-DC CONFIGURATION UPDATE message the *SUL Information* IE and the *Supported SUL band List* IE for each served cell added in the Served NR Cells To Add IE and in the Served NR Cells To Modify IE.

If the Deactivation Indication IE is contained in the *Served NR Cells To Modify* IE, it indicates that the concerned NR cell was switched off to lower energy consumption, and is available for activation on request from the eNB, as described in TS 36.300 [15].

After successful update of requested information, eNB shall reply with the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message to inform the initiating en-gNB that the requested update of application data was performed successfully. In case the eNB receives an EN-DC CONFIGURATION UPDATE without any IE except for *Message Typ*eIE it shall reply with EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message without performing any updates to the existing configuration.

Upon reception of an EN-DC CONFIGURATION UPDATE message, eNB shall update the information for en-gNB as follows:

**Update of Served NR Cell Information:**

- If *Served NR Cells To Add* IE is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall add cell information according to the information in the *Served NR Cell Information* IE.

- If *Served NR Cells To Modify* IE is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall modify information of cell indicated by *Old NR-CGI* IE according to the information in the *Served NR Cell Information* IE.

- If *Served NR Cells To Delete* IE is contained in the EN-DC CONFIGURATION UPDATE message, eNB shall delete information of cell indicated by *Old NR-CGI* IE.

The en-gNB may initiate a further EN-DC Configuration Update procedure only after a previous EN-DC Configuration Update procedure has been completed.

If the EN-DC CONFIGURATION UPDATE message contains the *TNL Transport Layer Address info* IE, the receiving eNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message contains the *TNL Transport Layer Address info* IE, the receiving en-gNB shall, if supported, take this into account for IPSEC tunnel establishment.

If the *NR Cell PRACH Configuration* IE is included in the *Served NR Cell Information* IE contained in the EN-DC CONFIGURATION UPDATE message, the eNB may update the information.

If the *CSI-RS Transmision Indication* IE is contained in the EN-DC CONFIGURATION UPDATE message, eNB should take it into account when forwarding neighbour NR cell’s CSI-RS configuration.

**Update of SCTP associations:**

If the *TNL Association to Add List* IE is included in the EN-DC CONFIGURATION UPDATE message, the receiving eNB shall, if supported, use it to establish the TNL association(s) with the en-gNB. The eNB shall report to the en-gNB, in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message, the successful establishment of the TNL association(s) with the en-gNB as follows:

- A list of successfully established TNL associations shall be included in the *TNL Association Setup List* IE;

- A list of TNL associations that failed to be established shall be included in the *TNL Association Failed to Setup List* IE.

If the *TNL Association to Remove List* IE is included in the EN-DC CONFIGURATION UPDATE message, the receiving eNB shall, if supported, initiate removal of the TNL association(s) indicated by the received Transport Layer information towards the en-gNB.

If the *TNL Association to Update List* IE is included in the EN-DC CONFIGURATION UPDATE message the receiving eNB shall, if supported, update the TNL association(s) indicated by the received Transport Layer information towards the en-gNB.

If the *Intended TDD DL-UL Configuration NR* IE is contained in the *NR Neighbour Information* IE in the EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message, en-gNB should take this information into account for cross-link interference management. The en-gNB shall consider the received *Intended TDD DL-UL Configuration NR* IE content valid until reception of an update of the IE for the same cell(s).

Interaction with the eNB Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC CONFIGURATION UPDATE message to neighbouring eNBs by triggering the eNB Configuration Update procedure.

Interaction with the EN-DC Configuration Update procedure:

The receiving eNB may forward the *Intended TDD DL-UL Configuration NR* IE received in the *Served NR Cell Information* IE in the EN-DC CONFIGURATION UPDATE message to neighbouring en-gNBs by triggering the EN-DC Configuration Update procedure.

#### 8.7.2.3 Unsuccessful Operation



Figure 8.7.2.3-1: eNB Initiated EN-DC Configuration Update, unsuccessful operation



Figure 8.7.2.3-2: en-gNB Initiated EN-DC Configuration Update, unsuccessful operation

If the candidate receving node can not accept the update it shall respond with an EN-DC CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the EN-DC CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE the initiating node shall wait at least for the indicated time before reinitiating the EN-DC Configuration Update procedure towards the same peer node. Both nodes shall continue to operate the X2 with their existing configuration data.

If case of network sharing with multiple cell ID broadcast with shared X2-C signalling transport, as specified in TS 36.300 [15], the EN-DC CONFIGURATION UPDATE message and the EN-DC CONFIGURATION UPDATE FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

#### 8.7.2.4 Abnormal Conditions

If the initiating node after initiating EN-DC Configuration Update procedure receives neither EN-DC CONFIGURATION UPDATE ACKNOWLEDGE message nor EN-DC CONFIGURATION UPDATE FAILURE message, the initiating node may reinitiate the EN-DC Configuration Update procedure towards the same candidate receving node, provided that the content of the EN-DC CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged EN-DC CONFIGURATION UPDATE message.

### 9.2.98 NR Neighbour Information

This IE contains cell configuration information of NR cells that a neighbour node may need for the X2 AP interface.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** |
| **NR** **Neighbour Information** |  | *1 .. <maxnoofNRNeighbours>* |  |  | – |  |
| >**NR Neighbour Information Item** |  |  |  |  | – |  |
| >>NRPCI | M |  | INTEGER (0..1007) | NR Physical Cell ID | – |  |
| >>NR CGI | M |  | 9.2.111 |  | – |  |
| >>5GS-TAC | O |  | OCTET STRING (3) | Broadcast 5GS Tracking Area Code | – |  |
| >>Configured TAC | O |  | OCTET STRING (2) | This is the TAC configured in the en-gNB, different from the 5GS TAC broadcast in the NR cell and enables application of Roaming and Access Restrictions for EN-DC as specified in TS 37.340 [32]. | – |  |
| >>Measurement Timing Configuration | M |  | OCTET STRING | Contains the MeasurementTimingConfiguration inter-node message for the neighbour cell, as defined in TS 38.331 [31]. | – |  |
| >>CHOICE *NR-Neighbour-Mode-Info* | M |  |  |  | – |  |
| >>>*FDD* |  |  |  |  |  |  |
| >>>>**FDD Info** |  | *1* |  |  | – |  |
| >>>>>UL ARFCNFreqInfo | M |  | NR ARFCN Frequency Info  9.2.106 |  | – |  |
| >>>>>DL ARFCNFreqInfo | M |  | NR ARFCN Frequency Info  9.2.106 |  | – |  |
| >>>*TDD* |  |  |  |  |  |  |
| >>>>**TDD Info** |  | *1* |  |  | – |  |
| >>>>>ARFCNNRFreqInfo | M |  | NR ARFCN Frequency Info  9.2.106 |  | – |  |
| >>>>>Intended TDD DL-UL Configuration NR | O |  | OCTET STRING | Contains the *Intended TDD DL-UL Configuration NR* IE as defined in TS 38.423 [xx]. | YES | ignore |
| >CSI-RS Transmission Indication | O |  | ENUMERATED {activated, deactivated, ...} | This IE indicates the CSI-RS transmission status of the given cell. | YES | ignore |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofNRNeighbours | Maximum no. of neighbour NR cells associated to a given served cell. Value is 1024. |

### 9.2.110 Served NR Cell Information

This IE contains cell configuration information of an NR cell that a neighbour eNB may need for the X2 AP interface.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| NR-PCI | M |  | INTEGER (0..1007) | NR Physical Cell ID | – |  |
| Cell ID | M |  | NR CGI 9.2.111 |  | – |  |
| 5GS-TAC | O |  | OCTET STRING (3) | Broadcast 5GS Tracking Area Code | – |  |
| Configured TAC | O |  | OCTET STRING (2) | This is the TAC configured in the en-gNB, different from the 5GS TAC broadcast in the NR cell and enables application of Roaming and Access Restrictions for EN-DC as specified in TS 37.340 [32]. | – |  |
| **Served PLMNs** |  | *1..<maxnoofBPLMNs>* |  | Broadcast PLMNs in SIB1 associated to the NR Cell Identity in the *Cell ID* IE. If more than maxnoofBPLMNs are needed for NR, they are provided by the *Additional PLMNs* IE. | – |  |
| >PLMN Identity | M |  | 9.2.4 |  | – |  |
| CHOICE *NR-Mode-Info* | M |  |  |  | – |  |
| *>FDD* |  |  |  |  |  |  |
| **>>FDD Info** |  | *1* |  |  | – |  |
| >>>UL FreqInfo | M |  | NR Frequency Info  9.2.106 |  | – |  |
| >>>DL FreqInfo | M |  | NR Frequency Info  9.2.106 |  | – |  |
| >>>UL Transmission Bandwidth | M |  | NR Transmission Bandwidth  9.2.114 |  | – |  |
| >>>DL Transmission Bandwidth | M |  | NR Transmission Bandwidth  9.2.114 |  | – |  |
| >>>UL Carrier List | O |  | NR Carrier List  9.2.168 | If included, the *UL Transmission Bandwidth* IE shall be ignored. | YES | ignore |
| >>>DL Carrier List | O |  | NR Carrier List  9.2.168 | If included, the *DL Transmission Bandwidth* IE shall be ignored. | YES | ignore |
| *>TDD* |  |  |  |  |  |  |
| **>>TDD Info** |  | *1* |  |  | – |  |
| >>>NRFreqInfo | M |  | NR Frequency Info  9.2.106 |  | – |  |
| >>>Transmission Bandwidth | M |  | NR Transmission Bandwidth  9.2.114 |  | – |  |
| >>>TDD UL-DL Configuration Common NR | O |  | OCTET STRING | The *tdd-UL-DL-ConfigurationCommon* IE in TS 38.331 [31] | YES | ignore |
| >>>Carrier List | O |  | NR Carrier List  9.2.168 | If included, the *Transmission Bandwidth* IE shall be ignored. | YES | ignore |
| >>>Intended TDD DL-UL Configuration NR | O |  | OCTET STRING | Contains the *Intended TDD DL-UL Configuration NR* IE as defined in TS 38.423 [xx]. | YES | ignore |
| Measurement Timing Configuration | M |  | OCTET STRING | Contains the *MeasurementTimingConfiguration* inter-node message for the served cell, as defined in TS 38.331 [31]. | – |  |
| **Additional PLMNs** |  | *0..<maxnoofAdditionalPLMNs>* |  | Additional PLMNs in addition to the Served PLMNs | YES | reject |
| >PLMN Identity | M |  | 9.2.4 |  | – |  |
| **Broadcast PLMN Identity Info List NR** |  | *0..<maxnoofextBPLMNs>* |  | This IE corresponds to the *PLMN-IdentityInfoList* IE in *SIB1* as specified in TS 38.331 [31]. All PLMN Identities and associated information contained in the *PLMN-IdentityInfoList* IE are included and provided in the same order as broadcast in SIB1. | YES | ignore |
| **>Broadcast PLMNs** |  | *1..<maxnoofextBPLMNs>* |  | Broadcast PLMN IDs in SIB1 associated to the *NR Cell Identity* IE | – |  |
| >>PLMN Identity | M |  | 9.2.4 |  | – |  |
| >5GS-TAC | O |  | OCTET STRING (3) |  | – |  |
| >NR Cell Identity | M |  | BIT STRING (SIZE(36)) |  | – |  |
| SSB Positions In Burst | O |  | 9.2.169 |  | YES | ignore |
| NR Cell PRACH Configuration | O |  | OCTET STRING | Containing 9.3.1.139 NR Cell PRACH Configuration as of TS 38.473 [44]. | YES | ignore |
| CSI-RS Transmission Indication | O |  | ENUMERATED {activated, deactivated, ...} | This IE indicates the CSI-RS transmission status of the given cell. | YES | ignore |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofBPLMNs | Maximum no. of broadcast PLMN Ids. Value is 6. |
| maxnoofAdditionalPLMNs | Maximum no. additional PLMN Ids. Value is 6. |
| maxnoofextBPLMNs | Maximum no. of extended broadcast PLMN Ids. Value is 12. |
|  |  |

### 9.3.4 PDU Definitions

-- ASN1START

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

--

-- PDU definitions for X2AP.

--

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

<<< skip unchanged ASN.1 >>>

NRCellPRACHConfig,

NBIoT-RLF-Report-Container, PrivacyIndicator,

UERadioCapabilityID,

CSI-RSTransmissionIndication,

IABNodeIndication,

F1CTrafficContainer,

IABInformation,

IntendedTDD-DL-ULConfiguration-NR

FROM X2AP-IEs

<<< skip unchanged ASN.1 >>>

id-UERadioCapabilityID,

id-CSI-RSTransmissionIndication,

id-DLCarrierList,

id-IABNodeIndication,

id-F1CTrafficContainer,

id-IABInformation,

id-IntendedTDD-DL-ULConfiguration-NR,

maxCellineNB,

maxnoofBearers,

maxnoofPDCP-SN,

maxFailedMeasObjects,

maxnoofCellIDforMDT,

maxnoofTAforMDT,

maxCellinengNB,

maxnoofCellIDforQMC,

maxnoofTAforQMC,

maxnoofPLMNforQMC,

maxnoofProtectedResourcePatterns,

maxnoNRcellsSpectrumSharingWithE-UTRA,

maxnoofNrCellBands,

maxnoofSSBAreas

FROM X2AP-Constants;

<<< skip unchanged ASN.1 >>>

TDD-InfoServedNRCell-Information ::= SEQUENCE {

nRFreqInfo NRFreqInfo,

nR-TxBW NR-TxBW,

iE-Extensions ProtocolExtensionContainer { {TDD-InfoServedNRCell-Information-ExtIEs} } OPTIONAL,

...

}

TDD-InfoServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {

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

{ ID id-CarrierList CRITICALITY ignore EXTENSION NRCarrierList PRESENCE optional}|

{ ID id-IntendedTDD-DL-ULConfiguration-NR CRITICALITY ignore EXTENSION IntendedTDD-DL-ULConfiguration-NR PRESENCE optional},

...

}

CellandCapacityAssistInfo::= SEQUENCE {

maximumCellListSize MaximumCellListSize OPTIONAL,

cellAssistanceInformation CellAssistanceInformation OPTIONAL,

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

...

}

### 9.3.5 Information Element definitions

-- ASN1START

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

--

-- Information Element Definitions

--

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

<<< skip unchanged ASN.1 >>>

id-NPRACHConfiguration,

id-MDTConfigurationNR,

id-CSI-RSTransmissionIndication,

id-QoS-Mapping-Information,

id-IntendedTDD-DL-ULConfiguration-NR,

maxnoofBearers,

maxCellineNB,

maxEARFCN,

maxEARFCNPlusOne,

newmaxEARFCN,

maxInterfaces,

<<< skip unchanged ASN.1 >>>

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

IntegrityProtectionAlgorithms ::= BIT STRING (SIZE (16, ...))

IntendedTDD-DL-ULConfiguration-NR ::= OCTET STRING

InterfaceInstanceIndication ::= INTEGER (0..255, ...)

InterfacesToTrace ::= BIT STRING (SIZE (8))

InvokeIndication ::= ENUMERATED{

abs-information,

...,

naics-information-start,

naics-information-stop

}

<<< skip unchanged ASN.1 >>>

TDD-InfoNeighbourServedNRCell-Information ::= SEQUENCE {

nRFreqInfo NRFreqInfo,

iE-Extensions ProtocolExtensionContainer { {TDD-InfoNeighbourServedNRCell-Information-ExtIEs} } OPTIONAL,

...

}

TDD-InfoNeighbourServedNRCell-Information-ExtIEs X2AP-PROTOCOL-EXTENSION ::= {

{ID id-IntendedTDD-DL-ULConfiguration-NR CRITICALITY ignore EXTENSION IntendedTDD-DL-ULConfiguration-NR PRESENCE optional},

...

}

TDDULDLConfigurationCommonNR ::= OCTET STRING

### 9.3.7 Constant definitions

-- ASN1START

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

--

-- Constant definitions

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

<<< skip unchanged ASN.1 >>>

id-CellToReport-ENDC-Item ProtocolIE-ID ::= 392

id-CellMeasurementResult-ENDC ProtocolIE-ID ::= 393

id-CellMeasurementResult-ENDC-Item ProtocolIE-ID ::= 394

id-IABNodeIndication ProtocolIE-ID ::= 395

id-QoS-Mapping-Information ProtocolIE-ID ::= 396

id-F1CTrafficContainer ProtocolIE-ID ::= 397

id-IABInformation ProtocolIE-ID ::= 398

id-IntendedTDD-DL-ULConfiguration-NR ProtocolIE-ID ::= xxx

END

-- ASN1STOP