**3GPP TSG-RAN WG3 Meeting #110-e R3-207092**

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**Title:** (TP for SON BLCR for 38.423) Coverage and Capacity Optimization

**Source:** Huawei

**Agenda item:** 10.2.2

**Document Type:** Discussion and Approval

# 1. Introduction

This is a TP for 38.423

# Annex 1 – TP on 38.423

*Start of the change*

### 8.4.2 NG-RAN node Configuration Update

#### 8.4.2.1 General

The purpose of the NG-RAN node Configuration Update procedure is to update application level configuration data needed for two NG-RAN nodes to interoperate correctly over the Xn-C interface.

NOTE: Update of application level configuration data also applies between two NG-RAN nodes in case the SN (i.e. the gNB) does not broadcast system information other than for radio frame timing and SFN, as specified in the TS 37.340 [8]. How to use this information when this option is used is not explicitly specified.

The procedure uses non UE-associated signalling.

#### 8.4.2.2 Successful Operation



Figure 8.4.2.2-1: NG-RAN node Configuration Update, successful operation

The NG-RAN node1 initiates the procedure by sending the NG-RAN NODE CONFIGURATION UPDATE message to a peer NG-RAN node2.

If Supplementary Uplink is configured at the NG-RAN node1, the NG-RAN node1 shall include in the NG-RAN NODE CONFIGURATION UPDATE 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 Supplementary Uplink is configured at the NG-RAN node2, the NG-RAN node2 shall include in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message the *SUL Information* IE and the *Supported SUL band List* IE for each cell added in the *Served NR Cells* IE if any.

If the *TAI Support List* IE is included in the NG-RAN NODE CONFIGURATION UPDATE message, the receiving node shall replace the previously provided *TAI Support List* IE by the received *TAI Support List* IE.

If the *Cell Assistance Information NR* IE is present, the NG-RAN node2 shall, if supported, use it to generate the *Served NR Cells* IE and include the list in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message.

If the *Cell Assistance Information LTE* IE is present, the NG-RAN node2 shall, if supported, use it to generate the *Served LTE Cells* IE and include the list in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message.

If the *Partial List Indicator NR* IE is included in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message and set to "partial" the NG-RAN node1 shall, if supported, assume that the *Served NR Cells* IE in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message includes a partial list of NR cells.

If the *Partial List Indicator E-UTRA* IE is included in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message and set to "partial" the NG-RAN node1 shall, if supported, assume that the *Served E-UTRA Cells* IE in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message includes a partial list of NR cells.

If the *Cell and Capacity Assistance Information NR* IE is present in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message from the candidate NG-RAN node2, the NG-RAN node1 shall, if supported, store the collected information to be used for future NG-RAN node interface management.

If the *Cell and Capacity Assistance Information E-UTRA* IE is present in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message from the candidate NG-RAN node2, the NG-RAN node1 shall, if supported, store the collected information to be used for future NG-RAN node interface management.

Upon reception of the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall update the information for NG-RAN node1 as follows:

If case of network sharing with multiple cell ID broadcast with shared Xn-C signalling transport, as specified in TS 38.300 [9], the NG-RAN NODE CONFIGURATION UPDATE message and the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

**Update of Served Cell Information NR:**

- If *Served Cells NR To Add* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall add cell information according to the information in the *Served Cell Information* *NR* IE.

- If *Served Cells NR To Modify* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall modify information of cell indicated by *Old NR-CGI* IE according to the information in the *Served Cell Information* *NR* IE.

- When either served cell information or neighbour information of an existing served cell in NG-RAN node1 need to be updated, the whole list of neighbouring cells, if any, shall be contained in the *Neighbour Information NR* IE. The NG-RAN node2 shall overwrite the served cell information and the whole list of neighbour cell information for the affected served cell.

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

- If *Served Cells NR To Delete* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall delete information of cell indicated by *Old NR-CGI* IE.

- If the *Intended TDD DL-UL Configuration NR* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 should take this information into account for cross-link interference management and/or NR-DC power coordination with the NG-RAN node1. The NG-RAN node2 shall consider the received *Intended TDD DL-UL Configuration NR* IE content valid until reception of a new update of the IE for the same NG-RAN node2.

- If the *NR Cell PRACH Configuration* IE is contained in the *Served Cell Information NR* IE in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node receiving the IE may use this information for RACH optimisation.

**Update of Served Cell Information** **E-UTRA:**

- If *Served Cells* *E-UTRA To Add* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall add cell information according to the information in the *Served Cell Information* *E-UTRA* IE.

- If *Served Cells E-UTRA To Modify* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall modify information of cell indicated by *Old ECGI* IE according to the information in the *Served Cell Information* *E-UTRA* IE.

- When either served cell information or neighbour information of an existing served cell in NG-RAN node1 need to be updated, the whole list of neighbouring cells, if any, shall be contained in the *Neighbour Information E-UTRA* IE. The NG-RAN node2 shall overwrite the served cell information and the whole list of neighbour cell information for the affected served cell.

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

- If the *Served Cells E-UTRA To Delete* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, NG-RAN node2 shall delete information of cell indicated by *Old ECGI* IE.

- If the *Protected E-UTRA Resource Indication* IE is included into the NG-RAN NODE CONFIGURATION UPDATE (inside the *Served Cell Information* *E-UTRA* IE), the receiving gNB should take this into account for cell-level resource coordination with the ng-eNB. The 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 ng-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 (contained in E-UTRA - NR CELL RESOURCE COORDINATION REQUEST messages), 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 *PRACH Configuration* IE is contained in the *Served Cell Information E-UTRA* IE in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node receiving the IE may use this information for RACH optimisation.

**Update of TNL addresses for SCTP associations:**

If the *TNL Association to Add List* IE is included in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 shall, if supported, use it to establish the TNL association(s) with the NG-RAN node1. The NG-RAN node2 shall report to the NG-RAN node1, in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message, the successful establishment of the TNL association(s) with the NG-RAN node1 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 NG-RAN NODE CONFIGURATION UPDATE message the NG-RAN node2 shall, if supported, initiate removal of the TNL association(s) indicated by the received Transport Layer information towards the NG-RAN node1.

If the *TNL Association to Update List* IE is included in the NG-RAN NODE CONFIGURATION UPDATE message the NG-RAN node2 shall, if supported, update the TNL association(s) indicated by the received Transport Layer information towards the NG-RAN node1.

**Update of AMF Region Information:**

- If *AMF Region Information To Add* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 shall add the AMF Regions to its AMF Region List.

- If *AMF Region Information To Delete* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 shall remove the AMF Regions from its AMF Region List.

If the *TNL Configuration Info* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 shall take this IE into account for IPSec establishment.

If the *TNL Configuration Info* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message, the NG-RAN node1 shall take this IE into account for IPSec establishment.

If the *CSI-RS Transmission Indication* IE is contained in the NG-RAN NODE CONFIGURATION UPDATE message, the NG-RAN node2 shall take this IE into account for neighbour cell’s CSI-RS measurement.

The NG-RAN NODE CONFIGURATION UPDATE message may contain for each cell served by NG-RAN node1 NPN related broadcast information. The NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message may contain for each cell served by NG-RAN node2 NPN related broadcast information.

Editor's Note: the details for the procedure text below is FFS

**Update of Cell Coverage:**

If the *Coverage Modification List* IE is present, the NG-RAN node2 may use the information in the *Cell Coverage State* IE to identify the cell deployment configuration enabled by the NG-RAN node1 and for configuring the mobility towards the cell(s) indicated by the *Global NG-RAN Cell Identity* IE, as described in TS 38.300 [9]. If the *Cell Deployment Status Indicator* IE is present in the *Coverage Modification List* IE, the NG-RAN node2 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 NG-RAN node2 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 NG-RAN node2 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.

#### 8.4.2.3 Unsuccessful Operation



Figure 8.4.2.3-1: NG-RAN node Configuration Update, unsuccessful operation

If the NG-RAN node2 cannot accept the update it shall respond with the NG-RAN NODE CONFIGURATION UPDATE FAILURE message and appropriate cause value.

If the NG-RAN NODE CONFIGURATION UPDATE FAILURE message includes the *Time To Wait* IE, the NG-RAN node1 shall wait at least for the indicated time before reinitiating the NG-RAN Node Configuration Update procedure towards the same NG-RAN node2. Both nodes shall continue to operate the Xn with their existing configuration data.

If case of network sharing with multiple cell ID broadcast with shared Xn-C signalling transport, as specified in TS 38.300 [9], the NG-RAN NODE CONFIGURATION UPDATE message and the NG-RAN NODE CONFIGURATION UPDATE FAILURE message shall include the *Interface Instance Indication* IE to identify the corresponding interface instance.

#### 8.4.2.4 Abnormal Conditions

 If the NG-RAN node1 after initiating NG-RAN node Configuration Update procedure receives neither NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE message nor NG-RAN NODE CONFIGURATION UPDATE FAILURE message, the NG-RAN node1 may reinitiate the NG-RAN node Configuration Update procedure towards the same NG-RAN node2, provided that the content of the new NG-RAN NODE CONFIGURATION UPDATE message is identical to the content of the previously unacknowledged NG-RAN NODE CONFIGURATION UPDATE message.

*Start of next change*

#### 9.1.3.4 NG-RAN NODE CONFIGURATION UPDATE

This message is sent by a NG-RAN node to a neighbouring NG-RAN node to transfer updated information for an Xn-C interface instance.

Direction: NG-RAN node1 🡪 NG-RAN node2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| Message Type | M |  | 9.2.3.1 |  | YES | reject |
| TAI Support List | O |  | 9.2.3.20 | List of supported TAs and associated characteristics. | GLOBAL | reject |
| CHOICE *Initiating NodeType* | M |  |  |  | YES | ignore |
| *>gNB* |  |  |  |  |  |  |
| >>Served Cells To Update NR | O |  | 9.2.2.15 |  | YES | ignore |
| >>Cell Assistance Information NR | O |  | 9.2.2.17 |  | YES | ignore |
| >>Cell Assistance Information E-UTRA | O |  | 9.2.2.43 |  | YES | ignore |
| *>ng-eNB* |  |  |  |  |  |  |
| >>Served Cells to Update E-UTRA | O |  | 9.2.2.16 |  | YES | ignore |
| >>Cell Assistance Information NR | O |  | 9.2.2.17 |  | YES | ignore |
| >>Cell Assistance Information E-UTRA | O |  | 9.2.2.43 |  | YES | ignore |
| **TNLA To Add List**  |  | *0..1* |  |  | YES | ignore |
| **>TNLA To Add Item** |  | *1..<maxnoofTNLAssociations>* |  |  | – |  |
| >>TNLA Transport Layer Information | M |  | CP Transport Layer Information9.2.3.31 | CP Transport Layer Information of NG-RAN node1 | – |  |
| >> TNL Association Usage | M |  | 9.2.3.84 |  | – |  |
| **TNLA To Update List**  |  | *0..1* |  |  | YES | ignore |
| **>TNLA To Update Item** |  | *1..<maxnoofTNLAssociations>* |  |  | – |  |
| >>TNLA Transport Layer Information | M |  | CP Transport Layer Information9.2.3.31 | CP Transport Layer Information of NG-RAN node1 | – |  |
| >> TNL Association Usage | O |  | 9.2.3.84 |  | – |  |
| **TNLA To Remove List**  |  | *0..1* |  |  | YES | ignore |
| **>TNLA To Remove Item** |  | *1..<maxnoofTNLAssociations>* |  |  | – |  |
| >>TNLA Transport Layer Information | M |  | CP Transport Layer Information9.2.3.31 | CP Transport Layer Information of NG-RAN node1 | – |  |
| Global NG-RAN Node ID | O |  | 9.2.2.3 |  | YES | reject |
| AMF Region Information To Add | O |  | AMF Region Information 9.2.3.83 | List of all added AMF Regions to which the NG-RAN node belongs. | YES | reject |
| AMF Region Information To Delete | O |  | AMF Region Information 9.2.3.83 | List of all deleted AMF Regions to which the NG-RAN node belongs. | YES | reject |
| Interface Instance Indication | O |  | 9.2.2.39 |  | YES | reject |
| TNL Configuration Info | O |  | 9.2.3.96 |  | YES | ignore |
| Coverage Modification List |  | *0 .. <maxnoofCellsinNG-RAN node>* |  | List of cells with modified coverage. | GLOBAL | reject |
| >Global NG-RAN Cell Identity | M |  | Global NG-RAN Cell Identity9.2.2.27 | NG-RAN Cell Global Identifier of the cell to be modified. | - |  |
| >Cell Coverage State | M |  | INTEGER (0..15, …) | Value '0' indicates that the cell is inactive. Other values Indicates that the cell is active and also indicates the coverage configuration of the concerned cell. | - |  |
| >Cell Deployment Status Indicator | O |  | ENUMERATED(pre-change-notification, ...) | Indicates the Cell Coverage State is planned to be used at the next reconfiguration. |  |  |
| >Cell Replacing Info | C-ifCellDeploymentStatusIndicatorPresent |  |  |  |  |  |
| >>Replacing Cells |  | *0 .. <maxnoofCellsinNG-RAN node>* |  |  |  |  |
| >>>Global NG-RAN Cell Identity |  |  | Global NG-RAN Cell Identity9.2.2.27 | NG-RAN Cell Global Identifier of a cell that may replace all or part of the coverage of the cell to be modified. |  |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofTNLAssociations | Maximum numbers of TNL Associations between the NG RAN nodes. Value is 32. |
| maxnoofCellsinNG-RAN node | Maximum no. cells that can be served by a NG-RAN node. Value is 16384. |

|  |  |
| --- | --- |
| **Condition** | **Explanation** |
| ifCellDeploymentStatusIndicatorPresent | This IE shall be present if the *Cell Deployment Status Indicator* IE is present. |

Editor's Note: The value range for the Cell Coverage State is FFS

#### 9.1.3.5 NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE

This message is sent by a neighbouring NG-RAN node to a peer node to acknowledge update of information for a TNL association.

Direction: NG-RAN node2 🡪 NG-RAN node1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| Message Type | M |  | 9.2.3.1 |  | YES | reject |
| CHOICE Responding NodeType | M |  |  |  | YES | ignore |
| >*ng-eNB* |  |  |  |  |  |  |
| >*gNB* |  |  |  |  |  |  |
| **>>Served NR Cells** |  | *0 .. < maxnoofCellsinNG-RANnode>* |  | Complete or limited list of cells served by a gNB, if requested by an NG-RAN node. | – |  |
| >>>Served Cell Information NR | M |  | 9.2.2.11 |  | – |  |
| >>>Neighbour Information NR | O |  | 9.2.2.13 | NR neighbours. | – |  |
| >>>Neighbour Information E-UTRA | O |  | 9.2.2.14 | E-UTRA neighbours | – |  |
| >>Partial List Indicator NR | O |  | Partial List Indicator9.2.2.46 | Value “partial” indicates that a partial list of cells is included in the *Served NR Cells* IE  | YES | ignore |
| >>Cell and Capacity Assistance Information NR | O |  | 9.2.2.41 | Contains NR cell related assistance information. | YES | ignore |
| **TNLA Setup List**  |  | *0..1* |  |  | YES | ignore |
| **>TNLA Setup Item** |  | *1..<maxnoofTNLAssociations>* |  |  | – |  |
| >>TNLA Transport Layer Address | M |  | CP Transport Layer Information9.2.3.31 | CP Transport Layer Information as received from NG-RAN node1 | – |  |
| **TNLA Failed to Setup Lis** |  | *0..1* |  |  | YES | ignore |
| **>TNLA Failed To Setup Item** |  | *1..<maxnoofTNLAssociations>* |  |  | – |  |
| >>TNLA Transport Layer Address | M |  | CP Transport Layer Information9.2.3.31 | CP Transport Layer Information as received from NG-RAN node1 | – |  |
| >>Cause | M |  | 9.2.3.2 |  | – |  |
| Criticality Diagnostics | O |  | 9.2.3.3 |  | YES | ignore |
| Interface Instance Indication | O |  | 9.2.2.39 |  | YES | reject |
| TNL Configuration Info | O |  | 9.2.3.96 |  | YES | ignore |
| Coverage Modification List |  | *0 .. <maxnoofCellsinNG-RAN node>* |  | List of cells with modified coverage. | GLOBAL | reject |
| >Global NG-RAN Cell Identity | M |  | Global NG-RAN Cell Identity9.2.2.27 | NG-RAN Cell Global Identifier of the cell to be modified. | - |  |
| >Cell Coverage State | M |  | INTEGER (0..15, …) | Value '0' indicates that the cell is inactive. Other values Indicates that the cell is active and also indicates the coverage configuration of the concerned cell. | - |  |
| >Cell Deployment Status Indicator | O |  | ENUMERATED(pre-change-notification, ...) | Indicates the Cell Coverage State is planned to be used at the next reconfiguration. |  |  |
| >Cell Replacing Info | C-ifCellDeploymentStatusIndicatorPresent |  |  |  |  |  |
| >>Replacing Cells |  | *0 .. <maxnoofCellsinNG-RAN node>* |  |  |  |  |
| >>>Global NG-RAN Cell Identity |  |  | Global NG-RAN Cell Identity9.2.2.27 | NG-RAN Cell Global Identifier of a cell that may replace all or part of the coverage of the cell to be modified. |  |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofCellsinNGRANnode | Maximum no. cells that can be served by an NG-RAN node.Value is 16384. |
| maxnoofTNLAssociations | Maximum numbers of TNL Associations between NG-RAN nodes. Value is 32. |

|  |  |
| --- | --- |
| **Condition** | **Explanation** |
| ifCellDeploymentStatusIndicatorPresent | This IE shall be present if the *Cell Deployment Status Indicator* IE is present. |

 Editor's Note: it is FFS whether there is CCO information is included in this message. The value range for the Cell Coverage State is FFS

*End of the change*