**3GPP TSG-RAN WG2 Meeting #117-e *R2-22xxxxx***

**Electronic, 21st Feb – 3rd Mar 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.331** | **CR** | **2811** | **rev** | **5** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | Introducing Enhancements to Integrated Access and Backhaul for NR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IAB\_enh-Core | | | | |  | ***Date:*** | | | 2022-02-14 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Include the enhancements to Integrated Access and Backhaul for NR in Rel-17. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The following agreements are addressed in this CR:  **From RAN2#113-bis:**   * LCG range to be extended for IAB-MT. Size of LCG and enhancements to BSR are FFS * SRB2 can be used for F1-C transport in CP/UP-separation scenario 1 (FFS other cases) * Split SRB2 can be used for F1-C transport in CP/UP-separation scenario 2 (FFS other cases)   **From RAN2#114:**   * NR DLInformationTransfer and ULInformationTransfer messages can be enhanced to transfer F1-C related packets in CP/UP separation. * A new IE named DedicatedInfoF1c can be defined to transfer F1-C related packets via NR RRC message.   **From RAN2#115:**   * The length of LCG to be extended to 8 bits (i.e., at most 256 LCGs)   **From RAN2#116:**   * Support of Extended BSR by an IAB-MT is an optional capability * Type-4: FFS whether “BH RLF recovery failure indication” or existing name “BH RLF indication” * The configuration of F1-C traffic on the indication of the the leg(s) used for transferring the F1-C traffic is configured to IAB-MT by a new field , e.g., f1c-TransferPath-r17 ENUMERATED {MCG, SCG, both}. * As long as the BH RLC CH for F1-C on the indicated Cell Group is configured (the CG is indicated by the field f1c-TransferPath-r17), IAB node can be aware of whether to use F1-C transferring over BH or F1-C transferring over RRC, i.e. F1-C-over-BAP is selected as long as BH RLC CH for F1-C on the indicated CG is configured. * ONLY SRB2 is used for F1-C transport in CP/UP-separation scenario 1. * ONLY split SRB2 is used for F1-C transport in CP/UP-separation scenario 2   **From RAN2#116bis-e:**   * The network is allowed to configure the primaryPath to SCG for the IAB-MT * For each topology, the BAP address is configured to the boundary node by the CU of that topology via RRC (may need to check different scenarios). * Define a new UE capability (1 bit) for ‘BH RLF detection indication and BH RLF recovery indication’ as optional UE capability for IAB-MT. * Define a new UE capability ‘f1c-OverNR-RRC’ as optional UE capability for IAB-MT. The parent IE of this UE capability is NRDC-Parameters under UE-NR-Capability. * Define a new UE capability for BAP header rewriting based inter-donor CU routing as optional UE capability for IAB-MT.   Introduce the new L1 configurations as indicated in the LS R2-2204012. | | | | | | | | |
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| ***Consequences if not approved:*** | | Rel-17 will not support the enhancements to Integrated Access and Backhaul. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2 References  5.7.1 DL information transfer  5.7.2 UL information transfer  6.2.2 DLInformationTransfer  6.2.2 ULInformationTransfer  6.3.2 CellGroupConfig  6.3.2 LogicalChannelConfig  6.3.3 MAC-parameters  6.3.4 Other information elements  6.4 RRC multiplicity and type constraint values | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 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 38.300: "NR; Overall description; Stage 2".

[3] 3GPP TS 38.321: "NR; Medium Access Control (MAC); Protocol specification".

[4] 3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".

[5] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) protocol specification".

[6] ITU-T Recommendation X.680 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation" (Same as the ISO/IEC International Standard 8824-1).

[7] ITU-T Recommendation X.681 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Information object specification" (Same as the ISO/IEC International Standard 8824-2).

[8] ITU-T Recommendation X.691 (08/2015) "Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).

[9] 3GPP TS 38.215: "NR; Physical layer measurements".

[10] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[11] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".

[12] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[13] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[14] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[15] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[16] 3GPP TS 38.211: "NR; Physical channels and modulation".

[17] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[18] ITU-T Recommendation X.683 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications" (Same as the ISO/IEC International Standard 8824-4).

[19] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[20] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[21] 3GPP TS 23.003: "Numbering, addressing and identification".

[22] 3GPP TS 36.101: "E-UTRA; User Equipment (UE) radio transmission and reception".

[23] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[24] 3GPP TS 37.324: "Service Data Adaptation Protocol (SDAP) specification".

[25] 3GPP TS 22.261: "Service requirements for the 5G System".

[26] 3GPP TS 38.306: "User Equipment (UE) radio access capabilities".

[27] 3GPP TS 36.304: "E-UTRA; User Equipment (UE) procedures in idle mode".

[28] ATIS 0700041: "WEA 3.0: Device-Based Geo-Fencing".

[29] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[30] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[31] 3GPP TS 36.211: "E-UTRA; Physical channels and modulation".

[32] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[33] 3GPP TS 36.104:"E-UTRA; Base Station (BS) radio transmission and reception".

[34] 3GPP TS 38.101-3 "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[35] 3GPP TS 38.423: "NG-RAN, Xn application protocol (XnAP)".

[36] 3GPP TS 38.473: "NG-RAN; F1 application protocol (F1AP)".

[37] 3GPP TS 36.423: "E-UTRA; X2 application protocol (X2AP)".

[38] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core network protocols; Stage 3".

[39] 3GPP TS 38.101-2 "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[40] 3GPP TS 36.133:"E-UTRA; Requirements for support of radio resource management".

[41] 3GPP TS 37.340: "E-UTRA and NR; Multi-connectivity; Stage 2".

[42] 3GPP TS 38.413: "NG-RAN, NG Application Protocol (NGAP)".

[43] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[44] 3GPP TR 36.816: "Evolved Universal Terrestrial Radio Access (E-UTRA); Study on signalling and procedure for interference avoidance for in-device coexistence ".

[45] 3GPP TS 25.331: "Universal Terrestrial Radio Access (UTRA); Radio Resource Control (RRC); Protocol specification".

[46] 3GPP TS 25.133: "Requirements for Support of Radio Resource Management (FDD)".

[47] 3GPP TS 38.340: "Backhaul Adaptation Protocol (BAP) specification"

[48] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".

[49] 3GPP TS 37.355: "LTE Positioning Protocol (LPP)".

[50] IEEE 802.11-2012, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.

[51] Bluetooth Special Interest Group: "Bluetooth Core Specification v5.0", December 2016.

[52] 3GPP TS 32.422: "Telecommunication management; Subsriber and equipment trace; Trace control and confiuration management".

[53] 3GPP TS 38.314: "NR; layer 2 measurements".

[54] Void.

[55] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[56] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[57] 3GPP TS 24.587: " Technical Specification Group Core Network and Terminals; Vehicle-to-Everything (V2X) services in 5G System (5GS)".

[58] Military Standard WGS84 Metric MIL-STD-2401 (11 January 1994): "Military Standard Department of Defence World Geodetic System (WGS)".

[59] 3GPP TS 38.101-4 "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance Requirements".

[60] 3GPP TS 33.536: "Technical Specification Group Services and System Aspects; Security aspects of 3GPP support for advanced Vehicle-to-Everything (V2X) services".

[61] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA), Evolved Universal Terrestrial Radio Access (E-UTRA) and New Radio (NR); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[62] 3GPP TS 36.306: "User Equipment (UE) radio access capabilities".

[63] 3GPP TS 38.174: "NR; Integrated Access and Backhaul (IAB) radio transmission and reception".

[X] 3GPP TS 38.472: “NG-RAN; F1 signalling transport”

NEXT CHANGE

#### 5.3.10.3 Detection of radio link failure

#### 5.3.10.3 Detection of radio link failure

The UE shall:

1> if any DAPS bearer is configured and T304 is running:

2> upon T310 expiry in source SpCell; or

2> upon random access problem indication from source MCG MAC; or

2> upon indication from source MCG RLC that the maximum number of retransmissions has been reached; or

2> upon consistent uplink LBT failure indication from source MCG MAC:

3> consider radio link failure to be detected for the source MCG i.e. source RLF;

3> suspend the transmission and reception of all DRBs in the source MCG;

3> reset MAC for the source MCG;

3> release the source connection.

1> else:

2> during a DAPS handover: the following only applies for the target PCell;

2> upon T310 expiry in PCell; or

2> upon T312 expiry in PCell; or

2> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or

2> upon indication from MCG RLC that the maximum number of retransmissions has been reached; or

2> if connected as an IAB-node, upon BH RLF indication received on BAP entity from the MCG; or

2> upon consistent uplink LBT failure indication from MCG MAC while T304 is not running:

3> if the indication is from MCG RLC and CA duplication is configured and activated for MCG, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

4> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

3> else:

4> consider radio link failure to be detected for the MCG, i.e. MCG RLF;

4> discard any segments of segmented RRC messages stored according to 5.7.6.3;

NOTE: Void.

4> if AS security has not been activated:

5> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'other';-

4> else if AS security has been activated but SRB2 and at least one DRB or, for IAB, SRB2, have not been setup:

5> store the radio link failure information in the *VarRLF-Report* as described in subclause 5.3.10.5;

5> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

4> else:

5> store the radio link failure information in the *VarRLF-Report* as described in subclause 5.3.10.5;

5> if T316 is configured; and

5> if SCG transmission is not suspended; and

5> if neither PSCell change nor PSCell addition is ongoing (i.e. timer T304 for the NR PSCell is not running in case of NR-DC or timer T307 of the E-UTRA PSCell is not running as specified in TS 36.331 [10], clause 5.3.10.10, in NE-DC):

6> initiate the MCG failure information procedure as specified in 5.7.3b to report MCG radio link failure.

5> else:

6> initiate the connection re-establishment procedure as specified in 5.3.7.

The UE shall:

1> upon T310 expiry in PSCell; or

1> upon T312 expiry in PSCell; or

1> upon random access problem indication from SCG MAC; or

1> upon indication from SCG RLC that the maximum number of retransmissions has been reached; or

1> if connected as an IAB-node, upon BH RLF indication received on BAP entity from the SCG; or

1> upon consistent uplink LBT failure indication from SCG MAC:

2> if the indication is from SCG RLC and CA duplication is configured and activated for SCG, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the SCG, i.e. SCG RLF;

3> if MCG transmission is not suspended:

4> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

3> else:

4> if the UE is in NR-DC:

5> initiate the connection re-establishment procedure as specified in 5.3.7;

4> else (the UE is in (NG)EN-DC):

5> initiate the connection re-establishment procedure as specified in TS 36.331 [10], clause 5.3.7;

#### 5.3.10.4 RLF cause determination

The UE shall set the *rlf-Cause* in the *VarRLF-Report* as follows:

1> if the UE declares radio link failure due to T310 expiry:

2> set the *rlf-Cause* as *t310-Expiry*;

1> else if the UE declares radio link failure due to the random access problem indication from MCG MAC:

2> if the random access procedure was initiated for beam failure recovery:

3> set the *rlf-Cause* as *beamFailureRecoveryFailure*;

2> else:

3> set the *rlf-Cause* as *randomAccessProblem*;

1> else if the UE declares radio link failure due to the reaching of maximum number of retransmissions from the MCG RLC:

2> set the *rlf-Cause* as *rlc-MaxNumRetx*;

1> else if the UE declares radio link failure due to consistent uplink LBT failures:

2> set the *rlf-Cause* as *lbtFailure*;

1> else if the IAB-MT declares radio link failure due to the reception of a BH RLF indication on BAP entity:

2> set the *rlf-Cause* as *bh-rlfRecoveryFailure*.

NEXT CHANGE

### 5.7.1 DL information transfer

#### 5.7.1.1 General



Figure 5.7.1.1-1: DL information transfer

The purpose of this procedure is to transfer NAS dedicated information from NG-RAN to a UE in RRC\_CONNECTED, or to transfer F1-C related information from IAB Donor-CU to IAB-DU via IAB-MT in RRC\_CONNECTED.

#### 5.7.1.2 Initiation

The network initiates the DL information transfer procedure whenever there is a need to transfer NAS dedicated information, or F1-C related information. The network initiates the DL information transfer procedure by sending the *DLInformationTransfer* message.

#### 5.7.1.3 Reception of the *DLInformationTransfer* by the UE

Upon receiving *DLInformationTransfer* message, the UE shall:

1> if *dedicatedNAS-Message* is included:

2> forward *dedicatedNAS-Message* to upper layers.

1> if *referenceTimeInfo* is included:

2> calculate the reference time based on the *time*, *referenceSFN* and *timeInfoType* if it is included;

2> calculate the uncertainty of the reference time based on the *uncertainty*, if *uncertainty* is included;

2> inform upper layers of the reference time and, if *uncertainty* is included, of the uncertainty.

Upon receiving *DLInformationTransfer* message, the IAB-MT shall:

1> if *dedicatedInfoF1c* is included:

2> forward *dedicatedInfoF1c* to the IAB-DU.

NEXT CHANGE

### 5.7.2 UL information transfer

#### 5.7.2.1 General



Figure 5.7.2.1-1: UL information transfer

The purpose of this procedure is to transfer NAS dedicated information from the UE to the network, or to transfer F1-C related information from IAB-DU to IAB Donor-CU via IAB-MT in RRC CONNECTED.

#### 5.7.2.2 Initiation

A UE in RRC\_CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer NAS dedicated information. The UE initiates the UL information transfer procedure by sending the ULInformationTransfer message. In addition, an IAB-MT in RRC CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer F1-C related information. When F1-C related information has to be transferred, the IAB-MT shall initiate the procedure only if SBR2 is established.

#### 5.7.2.3 Actions related to transmission of ULInformationTransfer message

The UE shall set the contents of the *ULInformationTransfer* message as follows:

1> if the upper layer provides NAS PDU:

2> set the *dedicatedNAS-Message* to include the information received from upper layers;

1> for the IAB-MT, if there is a need to transfer F1-C related information:

2>include the *dedicatedInfoF1c*;

1> submit the *ULInformationTransfer* message to lower layers for transmission, upon which the procedure ends.

#### 5.7.2.4 Failure to deliver *ULInformationTransfer* message

The UE shall:

1> if AS security is not started and radio link failure occurs before the successful delivery of *ULInformationTransfer* messages has been confirmed by lower layers; or

1> if PDCP re-establishment or release/addition (e.g due to key refresh upon PCell or PSCell change, or RRC connection re-establishment) occurs on an SRB on which *ULInformationTransfer* messages were submitted for transmission but successful delivery of these messages was not confirmed by lower layers:

2> inform upper layers about the possible failure to deliver the information contained in the concerned *ULInformationTransfer* messages, unless the messages only include *dedicatedInfoF1c*.

NEXT CHANGE

#### 5.7.3.3 Failure type determination for (NG)EN-DC

The UE shall set the SCG failure type as follows:

1> if the UE initiates transmission of the *SCGFailureInformationNR* message due to T310 expiry:

2> set the *failureType* as t310-Expiry;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to T312 expiry:

2> set the *failureType* as any valueand set the *failureType-v1610* as t312-Expiry;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide reconfiguration with sync failure information for an SCG:

2> set the *failureType* as *synchReconfigFailureSCG*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide random access problem indication from SCG MAC:

2> if the random access procedure was initiated for beam failure recovery:

3> set the *failureType* as *randomAccessProblem* and set the *failureType-v1610* as *beamFailureRecoveryFailure*;

2> else:

3> set the *failureType* as *randomAccessProblem*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide indication from SCG RLC that the maximum number of retransmissions has been reached:

2> set the *failureType* as *rlc-MaxNumRetx*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to SRB3 integrity check failure:

2> set the *failureType* as *srb3-IntegrityFailure*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to Reconfiguration failure of NR RRC reconfiguration message:

2> set the *failureType* as *scg-reconfigFailure*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to consistent uplink LBT failures:

2> set the *failureType* as any valueand set the *failureType-v1610* as *scg-lbtFailure*;

1> else if connected as an IAB-node and the *SCGFailureInformationNR* is initiated due to the reception of a BH RLF indication on BAP entity from the SCG:

2> set the *failureType* as any valueand set *failureType-v1610* as *bh-RLF*.

NEXT CHANGE

#### 5.7.3.5 Actions related to transmission of *SCGFailureInformation* message

The UE shall set the contents of the *SCGFailureInformation* message as follows:

1> if the UE initiates transmission of the *SCGFailureInformation* message due to T310 expiry:

2> set the *failureType* as *t310-Expiry*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message due to T312 expiry:

2> set the *failureType* as *other* and set the *failureType-v1610* as *t312-Expiry*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message to provide reconfiguration with sync failure information for an SCG:

2> set the *failureType* as *synchReconfigFailureSCG*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message to provide random access problem indication from SCG MAC:

2> if the random access procedure was initiated for beam failure recovery:

3> set the *failureType* as *other* and set the *failureType-v1610* as *beamFailureRecoveryFailure*;

2> else:

3> set the *failureTyp*e as *randomAccessProblem*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message to provide indication from SCG RLC that the maximum number of retransmissions has been reached:

2> set the *failureType* as *rlc-MaxNumRetx*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message due to SRB3 IP check failure:

2> set the *failureType* as *srb3-IntegrityFailure*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message due to Reconfiguration failure of NR RRC reconfiguration message:

2> set the *failureType* as *scg-reconfigFailure*;

1> else if the UE initiates transmission of the *SCGFailureInformation* message due to consistent uplink LBT failures:

2> set the *failureType* as *other* and set the *failureType-v1610* as *scg-lbtFailure*;

1> else if connected as an IAB-node and the *SCGFailureInformation* is initiated due to the reception of a BH RLF indication on BAP entity from the SCG:

2> set the *failureType* as *other* and set *failureType-v1610* as *bh-RLF*;

1> include and set *MeasResultSCG*-Failure in accordance with 5.7.3.4;

1> for each *MeasObjectNR* configured by a *MeasConfig* associated with the MCG, and for which measurement results are available:

2> include an entry in *measResultFreqList*;

2> if there is a *measId* configured with the *MeasObjectNR* and a *reportConfig* which has *rsType* set to *ssb*:

3> set *ssbFrequency* in *measResultFreqList* to the value indicated by *ssbFrequency* as included in the *MeasObjectNR*;

2> if there is a *measId* configured with the *MeasObjectNR* and a *reportConfig* which has *rsType* set to *csi-rs*:

3> set *refFreqCSI-RS* in *measResultFreqList* to the value indicated by *refFreqCSI-RS* as included in the associated measurement object;

2> if a serving cell is associated with the *MeasObjectNR*:

3> set *measResultServingCell* in *measResultFreqList* to include the available quantities of the concerned cell and in accordance with the performance requirements in TS 38.133 [14];

2> set the *measResultNeighCellList* in *measResultFreqList* to include the best measured cells, ordered such that the best cell is listed first, and based on measurements collected up to the moment the UE detected the failure, and set its fields as follows;

3> ordering the cells with sorting as follows:

4> based on SS/PBCH block if SS/PBCH block measurement results are available and otherwise based on CSI-RS;

4> using RSRP if RSRP measurement results are available, otherwise using RSRQ if RSRQ measurement results are available, otherwise using SINR;

3> for each neighbour cell included:

4> include the optional fields that are available.

NOTE 1: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Blacklisted cells are not required to be reported.

NOTE 2: Field *measResultSCG-Failure* is used to report available results for NR frequencies the UE is configured to measure by SCG RRC signalling.

1> if available, set the *locationInfo* as in 5.3.3.7.:

The UE shall submit the *SCGFailureInformation* message to lower layers for transmission.

NEXT CHANGE

#### 5.7.3b.3 Failure type determination

The UE shall set the MCG failure type as follows:

1> if the UE initiates transmission of the *MCGFailureInformation* message due to T310 expiry:

2> set the *failureType* as *t310-Expiry*;

1> else if the UE initiates transmission of the *MCGFailureInformation* message due to T312 expiry:

2> set the *failureType* as *t312-Expiry*;

1> else if the UE initiates transmission of the *MCGFailureInformation* message to provide random access problem indication from MCG MAC:

2> if the random access procedure was initiated for beam failure recovery:

3> set the *failureType* as *beamFailureRecoveryFailure*;

2> else:

3> set the *failureType* as *randomAccessProblem*;

1> else if the UE initiates transmission of the *MCGFailureInformation* message to provide indication from MCG RLC that the maximum number of retransmissions has been reached:

2> set the *failureType* as *rlc-MaxNumRetx*:

1> else if the UE initiates transmission of the *MCGFailureInformation* message due to consistent uplink LBT failures on the MCG:

2> set the *failureType* as *lbt-Failure*;

1> else if connected as an IAB-node and the *MCGFailureInformation* message is initiated due to the reception of a BH RLF indication on BAP entity from the MCG:

2> set the *failureType* as *bh-RLF*.

NEXT CHANGE

### 6.2.2 Message definitions

<Text Omitted>

#### – *DLInformationTransfer*

The *DLInformationTransfer* message is used for the downlink transfer of NAS dedicated information,timing information for the 5G internal system clock, or IAB-DU specific F1-C related information.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet. If SRB2 is suspended, the network does not send this message until SRB2 is resumed. If only *dedicatedInfoF1c* is included, SRB2 is used).

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*DLInformationTransfer* message

-- ASN1START

-- TAG-DLINFORMATIONTRANSFER-START

DLInformationTransfer ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

dlInformationTransfer DLInformationTransfer-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

DLInformationTransfer-IEs ::= SEQUENCE {

dedicatedNAS-Message DedicatedNAS-Message OPTIONAL, -- Need N

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension DLInformationTransfer-v1610-IEs OPTIONAL

}

DLInformationTransfer-v1610-IEs ::= SEQUENCE {

referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL, -- Need R

nonCriticalExtension DLInformationTransfer-v17xy-IEs OPTIONAL

}

DLInformationTransfer-v17xy-IEs ::= SEQUENCE {

dedicatedInfoF1c-r17 DedicatedInfoF1c-r17 OPTIONAL, -- Need N

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-DLINFORMATIONTRANSFER-STOP

-- ASN1STOP

NEXT CHANGE

#### – *RRCReconfiguration*

The *RRCReconfiguration* message is the command to modify an RRC connection. It may convey information for measurement configuration, mobility control, radio resource configuration (including RBs, MAC main configuration and physical channel configuration) and AS security configuration.

Signalling radio bearer: SRB1 or SRB3

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*RRCReconfiguration message*

-- ASN1START

-- TAG-RRCRECONFIGURATION-START

RRCReconfiguration ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

rrcReconfiguration RRCReconfiguration-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

RRCReconfiguration-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig OPTIONAL, -- Need M

secondaryCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Cond SCG

measConfig MeasConfig OPTIONAL, -- Need M

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCReconfiguration-v1530-IEs OPTIONAL

}

RRCReconfiguration-v1530-IEs ::= SEQUENCE {

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig) OPTIONAL, -- Need M

fullConfig ENUMERATED {true} OPTIONAL, -- Cond FullConfig

dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message OPTIONAL, -- Cond nonHO

masterKeyUpdate MasterKeyUpdate OPTIONAL, -- Cond MasterKeyChange

dedicatedSIB1-Delivery OCTET STRING (CONTAINING SIB1) OPTIONAL, -- Need N

dedicatedSystemInformationDelivery OCTET STRING (CONTAINING SystemInformation) OPTIONAL, -- Need N

otherConfig OtherConfig OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1540-IEs OPTIONAL

}

RRCReconfiguration-v1540-IEs ::= SEQUENCE {

otherConfig-v1540 OtherConfig-v1540 OPTIONAL, -- Need M

nonCriticalExtension RRCReconfiguration-v1560-IEs OPTIONAL

}

RRCReconfiguration-v1560-IEs ::= SEQUENCE {

mrdc-SecondaryCellGroupConfig SetupRelease { MRDC-SecondaryCellGroupConfig } OPTIONAL, -- Need M

radioBearerConfig2 OCTET STRING (CONTAINING RadioBearerConfig) OPTIONAL, -- Need M

sk-Counter SK-Counter OPTIONAL, -- Need N

nonCriticalExtension RRCReconfiguration-v1610-IEs OPTIONAL

}

RRCReconfiguration-v1610-IEs ::= SEQUENCE {

otherConfig-v1610 OtherConfig-v1610 OPTIONAL, -- Need M

bap-Config-r16 SetupRelease { BAP-Config-r16 } OPTIONAL, -- Need M

iab-IP-AddressConfigurationList-r16 IAB-IP-AddressConfigurationList-r16 OPTIONAL, -- Need M

conditionalReconfiguration-r16 ConditionalReconfiguration-r16 OPTIONAL, -- Need M

daps-SourceRelease-r16 ENUMERATED{true} OPTIONAL, -- Need N

t316-r16 SetupRelease {T316-r16} OPTIONAL, -- Need M

needForGapsConfigNR-r16 SetupRelease {NeedForGapsConfigNR-r16} OPTIONAL, -- Need M

onDemandSIB-Request-r16 SetupRelease { OnDemandSIB-Request-r16 } OPTIONAL, -- Need M

dedicatedPosSysInfoDelivery-r16 OCTET STRING (CONTAINING PosSystemInformation-r16-IEs) OPTIONAL, -- Need N

sl-ConfigDedicatedNR-r16 SetupRelease {SL-ConfigDedicatedNR-r16} OPTIONAL, -- Need M

sl-ConfigDedicatedEUTRA-Info-r16 SetupRelease {SL-ConfigDedicatedEUTRA-Info-r16} OPTIONAL, -- Need M

targetCellSMTC-SCG-r16 SSB-MTC OPTIONAL, -- Need S

nonCriticalExtension SEQUENCE {} OPTIONAL

}

MRDC-SecondaryCellGroupConfig ::= SEQUENCE {

mrdc-ReleaseAndAdd ENUMERATED {true} OPTIONAL, -- Need N

mrdc-SecondaryCellGroup CHOICE {

nr-SCG OCTET STRING (CONTAINING RRCReconfiguration),

eutra-SCG OCTET STRING

}

}

BAP-Config-r16 ::= SEQUENCE {

bap-Address-r16 BIT STRING (SIZE (10)) OPTIONAL, -- Need M

defaultUL-BAP-RoutingID-r16 BAP-RoutingID-r16 OPTIONAL, -- Need M

defaultUL-BH-RLC-Channel-r16 BH-RLC-ChannelID-r16 OPTIONAL, -- Need M

flowControlFeedbackType-r16 ENUMERATED {perBH-RLC-Channel, perRoutingID, both} OPTIONAL, -- Need R

...

}

MasterKeyUpdate ::= SEQUENCE {

keySetChangeIndicator BOOLEAN,

nextHopChainingCount NextHopChainingCount,

nas-Container OCTET STRING OPTIONAL, -- Cond securityNASC

...

}

OnDemandSIB-Request-r16 ::= SEQUENCE {

onDemandSIB-RequestProhibitTimer-r16 ENUMERATED {s0, s0dot5, s1, s2, s5, s10, s20, s30}

}

T316-r16 ::= ENUMERATED {ms50, ms100, ms200, ms300, ms400, ms500, ms600, ms1000, ms1500, ms2000}

IAB-IP-AddressConfigurationList-r16 ::= SEQUENCE {

iab-IP-AddressToAddModList-r16 SEQUENCE (SIZE(1..maxIAB-IP-Address-r16)) OF IAB-IP-AddressConfiguration-r16 OPTIONAL, -- Need N

iab-IP-AddressToReleaseList-r16 SEQUENCE (SIZE(1..maxIAB-IP-Address-r16)) OF IAB-IP-AddressIndex-r16 OPTIONAL, -- Need N

...

}

IAB-IP-AddressConfiguration-r16 ::= SEQUENCE {

iab-IP-AddressIndex-r16 IAB-IP-AddressIndex-r16,

iab-IP-Address-r16 IAB-IP-Address-r16 OPTIONAL, -- Need M

iab-IP-Usage-r16 IAB-IP-Usage-r16 OPTIONAL, -- Need M

iab-donor-DU-BAP-Address-r16 BIT STRING (SIZE(10)) OPTIONAL, -- Need M

...

}

SL-ConfigDedicatedEUTRA-Info-r16 ::= SEQUENCE {

sl-ConfigDedicatedEUTRA-r16 OCTET STRING OPTIONAL, -- Need M

sl-TimeOffsetEUTRA-List-r16 SEQUENCE (SIZE (8)) OF SL-TimeOffsetEUTRA-r16 OPTIONAL -- Need M

}

SL-TimeOffsetEUTRA-r16 ::= ENUMERATED {ms0, ms0dot25, ms0dot5, ms0dot625, ms0dot75, ms1, ms1dot25, ms1dot5, ms1dot75,

ms2, ms2dot5, ms3, ms4, ms5, ms6, ms8, ms10, ms20}

-- TAG-RRCRECONFIGURATION-STOP

-- ASN1STOP

|  |
| --- |
| *RRCReconfiguration-IEs* field descriptions |
| ***bap-Config***  This field is used to configure the BAP entity for IAB nodes. |
| ***bap-Address***  Indicates the BAP address of an IAB-node. The BAP address of an IAB-node cannot be changed once configured to the BAP entity. |
| ***conditionalReconfiguration***  Configuration of candidate target SpCell(s) and execution condition(s) for conditional handover or conditional PSCell change. For conditional PSCell change, this field may only be present in an *RRCReconfiguration* message for intra-SN PSCell change. The network does not configure a UE with both conditional PCell change and conditional PSCell change simultaneously. The field is absent if any DAPS bearer is configured or if the *masterCellGroup* includes *ReconfigurationWithSync*. For conditional PSCell change, the field is absent if the *secondaryCellGroup* includes *ReconfigurationWithSync*. The *RRCReconfiguration* message contained in *DLInformationTransferMRDC* cannot contain the field *conditionalReconfiguration* for conditional PSCell change. |
| ***daps-SourceRelease***  Indicates to UE that the source cell part of DAPS operation is to be stopped and the source cell part of DAPS configuration is to be released. |
| ***dedicatedNAS-MessageList***  This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list. |
| ***dedicatedPosSysInfoDelivery***  This field is used to transfer *SIBPos* to the UE in RRC\_CONNECTED. |
| ***dedicatedSIB1-Delivery***  This field is used to transfer *SIB1* to the UE. The field has the same values as the corresponding configuration in *servingCellConfigCommon*. |
| ***dedicatedSystemInformationDelivery***  This field is used to transfer *SIB6*, *SIB7*, *SIB8* to the UE with an active BWP with no common serach space configured. For UEs in RRC\_CONNECTED, this field is used to transfer the SIBs requested on-demand. |
| ***defaultUL-BAP-RoutingID***  This field is used for IAB-node to configure the default uplink Routing ID, which is used by IAB-node during IAB-node bootstrapping*,* migration, IAB-MT RRC resume and IAB-MT RRC re-establishment for *F1-C* and *non-F1* traffic. The *defaultUL-BAP-RoutingID* can be (re-)configured when IAB-node IP address for *F1-C* related traffic changes. This field is mandatory only for IAB-node bootstrapping. |
| ***defaultUL-BH-RLC-Channel***  This field is used for IAB-nodes to configure the default uplink BH RLC channel*,* which is used by IAB-nodeduring IAB-node bootstrapping*,* migration, IAB-MT RRC resume and IAB-MT RRC re-establishment *for F1-C and non-F1 traffic*. The *defaultUL-BH-RLC-Channel* can be (re-)configured when IAB-node IP address for *F1-C* related traffic changes, and the new IP address is anchored at a different IAB-donor-DU. This field is mandatory for IAB-node bootstrapping. If the IAB-MT is operating in EN-DC, the default uplink BH RLC channel is referring to an RLC channel on the SCG; Otherwise, it is referring to an RLC channel on the MCG. |
| ***flowControlFeedbackType***  This field is only used for IAB-node that support hop-by-hop flow control to configure the type of flow control feedback. Value *perBH-RLC-Channel* indicates that the IAB-node shall provide flow control feedback per BH RLC channel, value *perRoutingID* indicates that the IAB-node shall provide flow control feedback per routing ID, and value *both* indicates that the IAB-node shall provide flow control feedback both per BH RLC channel and per routing ID. |
| ***fullConfig***  Indicates that the full configuration option is applicable for the *RRCReconfiguration* message for intra-system intra-RAT HO. For inter-RAT HO from E-UTRA to NR, *fullConfig* indicates whether or not delta signalling of SDAP/PDCP from source RAT is applicable. This field is absent if any DAPS bearer is configured or when the *RRCReconfiguration* message is transmitted on SRB3, and in an *RRCReconfiguration* message for SCG contained in another *RRCReconfiguration* message (or *RRCConnectionReconfiguration* message, see TS 36.331 [10]) transmitted on SRB1. |
| ***iab-IP-Address***  This field is used to provide the IP address information for IAB-node. |
| ***iab-IP-AddressIndex***  This field is used to identify a configuration of an IP address. |
| ***iab-IP-AddressToAddModList***  List of IP addresses allocated for IAB-node to be added and modified. |
| ***iab-IP-AddressToReleaseList***  List of IP address allocated for IAB-node to be released. |
| ***iab-IP-Usage***  This field is used to indicate the usage of the assigned IP address. If this field is not configured, the assigned IP address is used for all traffic. |
| ***iab-donor-DU-BAP-Address***  This field is used to indicate the BAP address of the IAB-donor-DU where the IP address is anchored. |
| ***keySetChangeIndicator***  Indicates whether UE shall derive a new KgNB. If *reconfigurationWithSync* is included, value *true* indicates that a KgNB key is derived from a KAMF key taken into use through the latest successful NAS SMC procedure, or N2 handover procedure with KAMF change, as described in TS 33.501 [11] for KgNB re-keying. Value *false* indicates that the new KgNB key is obtained from the current KgNB key or from the NH as described in TS 33.501 [11]. |
| ***masterCellGroup***  Configuration of master cell group. |
| ***mrdc-ReleaseAndAdd***  This field indicates that the current SCG configuration is released and a new SCG is added at the same time. |
| ***mrdc-SecondaryCellGroup***  Includes an RRC message for SCG configuration in NR-DC or NE-DC. For NR-DC (nr-SCG), *mrdc-SecondaryCellGroup* contains the *RRCReconfiguration* message as generated (entirely) by SN gNB. In this version of the specification, the RRC message can only include fields *secondaryCellGroup, otherConfig, conditionalReconfiguration,measConfig* and *bap-Config*.  For NE-DC (eutra-SCG), *mrdc-SecondaryCellGroup* includes the E-UTRA *RRCConnectionReconfiguration* message as specified in TS 36.331 [10]. In this version of the specification, the E-UTRA RRC message can only include the field *scg-Configuration*. |
| ***nas-Container***  This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although it affects activation of AS security after inter-system handover to NR. The content is defined in TS 24.501 [23]. |
| ***needForGapsConfigNR***  Configuration for the UE to report measurement gap requirement information of NR target bands in the *RRCReconfigurationComplete* and *RRCResumeComplete* message. |
| ***nextHopChainingCount***  Parameter NCC: See TS 33.501 [11] |
| ***onDemandSIB-Request***  If the field is present, the UE is allowed to request SIB(s) on-demand while in RRC\_CONNECTED according to clause 5.2.2.3.5. |
| ***onDemandSIB-RequestProhibitTimer***  Prohibit timer for requesting SIB(s) on-demand while in RRC\_CONNECTED according to clause 5.2.2.3.5. Value in seconds. Value s0 means prohibit timer is set to 0 seconds, value s0dot5 means prohibit timer is set to 0.5 seconds, value s1 means prohibit timer is set to 1 second and so on. |
| ***otherConfig***  Contains configuration related to other configurations. When configured for the SCG, only fields *drx-PreferenceConfig, maxBW-PreferenceConfig, maxCC-PreferenceConfig, maxMIMO-LayerPreferenceConfig*, *minSchedulingOffsetPreferenceConfig, btNameList, wlanNameList, sensorNameList* and *obtainCommonLocation* can be included. |
| ***radioBearerConfig***  Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. In EN-DC this field may only be present if the *RRCReconfiguration* is transmitted over SRB3. |
| ***radioBearerConfig2***  Configuration of Radio Bearers (DRBs, SRBs) including SDAP/PDCP. This field can only be used if the UE supports NR-DC or NE-DC. |
| ***secondaryCellGroup***  Configuration of secondary cell group ((NG)EN-DC or NR-DC). |
| ***sk-Counter***  A counter used upon initial configuration of S-KgNB or S-KeNB, as well as upon refresh of S-KgNB or S-KeNB. This field is always included either upon initial configuration of an NR SCG or upon configuration of the first RB with *keyToUse* set to *secondary*, whichever happens first. This field is absent if there is neither any NR SCG nor any RB with *keyToUse* set to *secondary*. |
| ***sl-ConfigDedicatedNR***  This field is used to provide the dedicated configurations for NR sidelink communication. |
| ***sl-ConfigDedicatedEUTRA-Info***  This field includes the E-UTRA *RRCConnectionReconfiguration* as specified in TS 36.331 [10]. In this version of the specification, the E-UTRA *RRCConnectionReconfiguration* can only includes sidelink related fields for V2X sidelink communication, i.e. *sl-V2X-ConfigDedicated*, *sl-V2X-SPS-Config*, *measConfig* and/or *otherConfig*. |
| ***sl-TimeOffsetEUTRA***  This field indicates the possible time offset to (de)activation of V2X sidelink transmission after receiving DCI format 3\_1 used for scheduling V2X sidelink communication. Value *ms0dpt75* corresponds to 0.75ms, *ms1* corresponds to 1ms and so on. The network includes this field only when *sl-ConfigDedicatedEUTRA* is configured. |
| ***targetCellSMTC-SCG***  The SSB periodicity/offset/duration configuration of target cell for NR PSCell addition and SN change. When UE receives this field, UE applies the configuration based on the timing reference of NR PCell for PSCell addition and PSCell change for the case of no reconfiguration with sync of MCG, and UE applies the configuration based on the timing reference of target NR PCell for the case of reconfiguration with sync of MCG. If both this field and the *smtc* in *secondaryCellGroup* -> *SpCellConfig* -> *reconfigurationWithSync* are absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |
| ***t316***  Indicates the value for timer T316 as described in clause 7.1. Value *ms50* corresponds to 50 ms, value *ms100* corresponds to 100 ms and so on. This field can be configured only if the UE is configured with split SRB1 or SRB3. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *nonHO* | The field is absent in case of reconfiguration with sync within NR or to NR; otherwise it is optionally present, need N. |
| *securityNASC* | This field is mandatory present in case of inter system handover. Otherwise the field is optionally present, need N. |
| *MasterKeyChange* | This field is mandatory present in case *masterCellGroup* includes *ReconfigurationWithSync* and *RadioBearerConfig* includes *SecurityConfig* with *SecurityAlgorithmConfig*, indicating a change of the AS security algorithms associated to the master key. If *ReconfigurationWithSync* is included for other cases, this field is optionally present, need N. Otherwise the field is absent. |
| *FullConfig* | The field is mandatory present in case of inter-system handover from E-UTRA/EPC to NR. It is optionally present, Need N, during reconfiguration with sync and also in first reconfiguration after reestablishment; or for intra-system handover from E-UTRA/5GC to NR. It is absent otherwise. |
| *SCG* | The field is mandatory present in:  - an *RRCReconfiguration* message contained in an *RRCResume* message (or in an *RRCConnectionResume* message, see TS 36.331 [10]),  - an *RRCReconfiguration* message contained in an *RRCConnectionReconfiguration* message, see TS 36.331 [10], which is contained in *DLInformationTransferMRDC* transmitted on SRB3 (as a response to *ULInformationTransferMRDC* including an *MCGFailureInformation*).  The field is optional present, Need M, in:  - an *RRCReconfiguration* message transmitted on SRB3,  - an *RRCReconfiguration* message contained in another *RRCReconfiguration* message (or in an *RRCConnectionReconfiguration* message, see TS 36.331 [10]) transmitted on SRB1  - an *RRCReconfiguration* message contained in another *RRCReconfiguration* message which is contained in *DLInformationTransferMRDC* transmitted on SRB3 (as a response to *ULInformationTransferMRDC* including an *MCGFailureInformation*)  Otherwise, the field is absent |

NEXT CHANGE

#### – *ULInformationTransfer*

The *ULInformationTransfer* message is used for the uplink transfer of NAS or non-3GPP dedicated information, or IAB-DU specific F1-C related information.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet). If SRB2 is suspended, the UE does not send this message until SRB2 is resumed. If only *dedicatedInfoF1c* is included, SRB2 is used.

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to network

*ULInformationTransfer message*

-- ASN1START

-- TAG-ULINFORMATIONTRANSFER-START

ULInformationTransfer ::= SEQUENCE {

criticalExtensions CHOICE {

ulInformationTransfer ULInformationTransfer-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

ULInformationTransfer-IEs ::= SEQUENCE {

dedicatedNAS-Message DedicatedNAS-Message OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension ULInformationTransfer-r17-IEs OPTIONAL

}

ULInformationTransfer-r17-IEs ::= SEQUENCE {

dedicatedInfoF1c-r17 DedicatedInfoF1c-r17 OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-ULINFORMATIONTRANSFER-STOP

-- ASN1STOP

NEXT CHANGE

### 6.3.2 Radio resource control information elements

<Text omitted>

#### – *AvailabilityCombinationsPerCell*

The IE *AvailabilityCombinationsPerCell* is used to configure the *AvailabilityCombinations* applicable for a cell of the IAB DU (see TS 38.213 [13], clause 14). Note that the IE *AvailabilityCombinationsPerCellIndex* can only be configured up to 511.

*AvailabilityCombinationsPerCell* information element

-- ASN1START

-- TAG-AVAILABILITYCOMBINATIONSPERCELL-START

AvailabilityCombinationsPerCell-r16 ::= SEQUENCE {

availabilityCombinationsPerCellIndex-r16 AvailabilityCombinationsPerCellIndex-r16,

iab-DU-CellIdentity-r16 CellIdentity,

positionInDCI-AI-r16 INTEGER(0..maxAI-DCI-PayloadSize-1-r16) OPTIONAL, -- Need M

availabilityCombinations-r16 SEQUENCE (SIZE (1..maxNrofAvailabilityCombinationsPerSet-r16)) OF AvailabilityCombination-r16,

... ,

[[

availabilityCombinationsRBGroups-r17 SEQUENCE (SIZE (1..maxNrofAvailabilityCombinationsPerSet-r16)) OF AvailabilityCombination-r17 OPTIONAL, -- Need M,

]]

}

AvailabilityCombinationsPerCellIndex-r16 ::= INTEGER(0..maxNrofDUCells-r16)

AvailabilityCombination-r16 ::= SEQUENCE {

availabilityCombinationId-r16 AvailabilityCombinationId-r16,

resourceAvailability-r16 SEQUENCE (SIZE (1..maxNrofResourceAvailabilityPerCombination-r16)) OF INTEGER (0..7)

}

AvailabilityCombinationId-r16 ::= INTEGER (0..maxNrofAvailabilityCombinationsPerSet-1-r16)

AvailabilityCombination-r17 ::= SEQUENCE {

availabilityCombinationId-r16 AvailabilityCombinationId-r16,

rbSetGroups-r17 SEQUENCE (SIZE (1..maxNrofRbSetGroups-r17)) OF RBSetGroup-r17 OPTIONAL, -- Need M

resourceAvailability-r16 SEQUENCE (SIZE (1..maxNrofResourceAvailabilityPerCombination-r16)) OF INTEGER (0..7) OPTIONAL, -- Need M

}

RbSetGroup-r17 ::= SEQUENCE {

resourceAvailability-r16 SEQUENCE (SIZE (1..maxNrofResourceAvailabilityPerCombination-r16)) OF INTEGER (0..7) OPTIONAL, -- Need M

rbSets-r17 SEQUENCE (SIZE (1..maxNrofRbSets-r17)) OF INTEGER (0..7) OPTIONAL, -- Need M

}

-- TAG-AVAILABILITYCOMBINATIONSPERCELL-STOP

-- ASN1STOP

|  |
| --- |
| *AvailabilityCombination field descriptions* |
| ***resourceAvailability***  Indicates the resource availability of soft symbols for a set of consecutive slots in the time domain. The meaning of this field is described in TS 38.213 [13], Table 14.3. If included in *RbSetGroup* within *AvailabilityCombination-r17*, it indicates the availability of soft resources for an RB set group. If included in *AvailabilityCombination-r17* when the *rbSetGroups* is not configured, it indicates the availability of soft resources in one or multiple slots for all RB sets of a DU cell. |
| ***availabilityCombinationId***  This ID is used in the DCI Format 2\_5 payload to dynamically select this *AvailabilityCombination*, see TS 38.213 [13], clause 14. |
| ***rbSets***  Indicates the RB sets configured for each RB set group. |
| ***rbSetGroups***  Indicates the RB set groups configured for the availability combination. Each group includes consecutive RB sets. |

|  |
| --- |
| *AvailabilityCombinationsPerCell* field descriptions |
| ***iab-DU-CellIdentity***  The ID of the IAB-DU cell for which the *availabilityCombinations* are applicable. |
| ***positionInDCI-AI***  The (starting) position (bit) of the *AvailabilityCombinationId* for the indicated IAB-DU cell (*iab-DU-CellIdentity*) within the DCI payload. |

<Text omitted>

#### – *CellGroupConfig*

The *CellGroupConfig* IE is used to configure a master cell group (MCG) or secondary cell group (SCG). A cell group comprises of one MAC entity, a set of logical channels with associated RLC entities and of a primary cell (SpCell) and one or more secondary cells (SCells).

*CellGroupConfig* information element

-- ASN1START

-- TAG-CELLGROUPCONFIG-START

-- Configuration of one Cell-Group:

CellGroupConfig ::= SEQUENCE {

cellGroupId CellGroupId,

rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLC-ID)) OF RLC-BearerConfig OPTIONAL, -- Need N

rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLC-ID)) OF LogicalChannelIdentity OPTIONAL, -- Need N

mac-CellGroupConfig MAC-CellGroupConfig OPTIONAL, -- Need M

physicalCellGroupConfig PhysicalCellGroupConfig OPTIONAL, -- Need M

spCellConfig SpCellConfig OPTIONAL, -- Need M

sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellConfig OPTIONAL, -- Need N

sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SCellIndex OPTIONAL, -- Need N

...,

[[

reportUplinkTxDirectCurrent ENUMERATED {true} OPTIONAL -- Cond BWP-Reconfig

]],

[[

bap-Address-r16 BIT STRING (SIZE (10)) OPTIONAL, -- Need M

bh-RLC-ChannelToAddModList-r16 SEQUENCE (SIZE(1..maxBH-RLC-ChannelID-r16)) OF BH-RLC-ChannelConfig-r16 OPTIONAL, -- Need N

bh-RLC-ChannelToReleaseList-r16 SEQUENCE (SIZE(1..maxBH-RLC-ChannelID-r16)) OF BH-RLC-ChannelID-r16 OPTIONAL, -- Need N

f1c-TransferPath-r16 ENUMERATED {lte, nr, both} OPTIONAL, -- Need M

simultaneousTCI-UpdateList1-r16 SEQUENCE (SIZE (1..maxNrofServingCellsTCI-r16)) OF ServCellIndex OPTIONAL, -- Need R

simultaneousTCI-UpdateList2-r16 SEQUENCE (SIZE (1..maxNrofServingCellsTCI-r16)) OF ServCellIndex OPTIONAL, -- Need R

simultaneousSpatial-UpdatedList1-r16 SEQUENCE (SIZE (1..maxNrofServingCellsTCI-r16)) OF ServCellIndex OPTIONAL, -- Need R

simultaneousSpatial-UpdatedList2-r16 SEQUENCE (SIZE (1..maxNrofServingCellsTCI-r16)) OF ServCellIndex OPTIONAL, -- Need R

uplinkTxSwitchingOption-r16 ENUMERATED {switchedUL, dualUL} OPTIONAL, -- Need R

uplinkTxSwitchingPowerBoosting-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]],

[[

reportUplinkTxDirectCurrentTwoCarrier-r16 ENUMERATED {true} OPTIONAL -- Need N

]],

[[

f1c-TransferPathNRDC-r17 ENUMERATED {mcg, scg, both} OPTIONAL -- Need M

]]

}

-- Serving cell specific MAC and PHY parameters for a SpCell:

SpCellConfig ::= SEQUENCE {

servCellIndex ServCellIndex OPTIONAL, -- Cond SCG

reconfigurationWithSync ReconfigurationWithSync OPTIONAL, -- Cond ReconfWithSync

rlf-TimersAndConstants SetupRelease { RLF-TimersAndConstants } OPTIONAL, -- Need M

rlmInSyncOutOfSyncThreshold ENUMERATED {n1} OPTIONAL, -- Need S

spCellConfigDedicated ServingCellConfig OPTIONAL, -- Need M

...

}

ReconfigurationWithSync ::= SEQUENCE {

spCellConfigCommon ServingCellConfigCommon OPTIONAL, -- Need M

newUE-Identity RNTI-Value,

t304 ENUMERATED {ms50, ms100, ms150, ms200, ms500, ms1000, ms2000, ms10000},

rach-ConfigDedicated CHOICE {

uplink RACH-ConfigDedicated,

supplementaryUplink RACH-ConfigDedicated

} OPTIONAL, -- Need N

...,

[[

smtc SSB-MTC OPTIONAL -- Need S

]],

[[

daps-UplinkPowerConfig-r16 DAPS-UplinkPowerConfig-r16 OPTIONAL -- Need N

]]

}

DAPS-UplinkPowerConfig-r16 ::= SEQUENCE {

p-DAPS-Source-r16 P-Max,

p-DAPS-Target-r16 P-Max,

uplinkPowerSharingDAPS-Mode-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic }

}

SCellConfig ::= SEQUENCE {

sCellIndex SCellIndex,

sCellConfigCommon ServingCellConfigCommon OPTIONAL, -- Cond SCellAdd

sCellConfigDedicated ServingCellConfig OPTIONAL, -- Cond SCellAddMod

...,

[[

smtc SSB-MTC OPTIONAL -- Need S

]],

[[

sCellState-r16 ENUMERATED {activated} OPTIONAL, -- Cond SCellAddSync

secondaryDRX-GroupConfig-r16 ENUMERATED {true} OPTIONAL -- Cond DRX-Config2

]]}

-- TAG-CELLGROUPCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *CellGroupConfig* field descriptions |
| ***bap-Address***  BAP address of the parent node in cell group. |
| ***bh-RLC-ChannelToAddModList***  Configuration of the backhaul RLC entities and the corresponding MAC Logical Channels to be added and modified. |
| ***bh-RLC-ChannelToReleaseList***  List of the backhaul RLC entities and the corresponding MAC Logical Channels to be released. |
| ***f1c-TransferPath***  The F1-C transfer path that an EN-DC IAB-MT should use for transferring F1-C packets to the IAB-donor-CU. If IAB-MT is configured with *lte*, IAB-MT can only use LTE leg for F1-C transfer. If IAB-MT is configured with *nr*, IAB-MT can only use NR leg for F1-C transfer. If IAB-MT is configured with *both*, it is up to IAB-MT to select an LTE leg or a NR leg for F1-C transfer. If the field is not configured, the IAB node uses the NR leg as the default one. |
| ***f1c-TransferPathNRDC***  The F1-C transfer path that an NR-DC IAB-MT should use for transferring F1-C packets to the IAB-donor-CU. If IAB-MT is configured with *mcg*, IAB-MT can only use the MCG for F1-C transfer. If IAB-MT is configured with *scg*, IAB-MT can only use the SCG for F1-C transfer. If IAB-MT is configured with *both*, it is up to IAB-MT to select the MCG or the SCG for F1-C transfer. |
| ***mac-CellGroupConfig***  MAC parameters applicable for the entire cell group. |
| ***rlc-BearerToAddModList***  Configuration of the MAC Logical Channel, the corresponding RLC entities and association with radio bearers. |
| ***reportUplinkTxDirectCurrent***  Enables reporting of uplink and supplementary uplink Direct Current location information upon BWP configuration and reconfiguration. This field is only present when the BWP configuration is modified or any serving cell is added or removed. This field is absent in the IE *CellGroupConfig* when provided as part of *RRCSetup* message. If UE is configured with SUL carrier, UE reports both UL and SUL Direct Current locations. |
| ***reportUplinkTxDirectCurrentTwoCarrier***  Enables reporting of uplink Direct Current location information when the UE is configured with uplink intra-band CA with two carriers. This field is absent in the IE *CellGroupConfig* when provided as part of *RRCSetup* message. |
| ***rlmInSyncOutOfSyncThreshold***  BLER threshold pair index for IS/OOS indication generation, see TS 38.133 [14], table 8.1.1-1. *n1* corresponds to the value 1. When the field is absent, the UE applies the value 0. Whenever this is reconfigured, UE resets N310 and N311, and stops T310, if running. Network does not include this field. |
| ***sCellState***  Indicates whether the SCell shall be considered to be in activated state upon SCell configuration. |
| ***sCellToAddModList***  List of secondary serving cells (SCells) to be added or modified. |
| ***sCellToReleaseList***  List of secondary serving cells (SCells) to be released. |
| ***secondaryDRX-GroupConfig***  The field is used to indicate whether the SCell belongs to the secondary DRX group. All serving cells in the secondary DRX group shall belong to one Frequency Range and all serving cells in the legacy DRX group shall belong to another Frequency Range. |
| ***simultaneousTCI-UpdateList1, simultaneousTCI-UpdateList2***  List of serving cells which can be updated simultaneously for TCI relation with a MAC CE. The *simultaneousTCI-UpdateList1* and *simultaneousTCI-UpdateList2* shall not contain same serving cells. Network should not configure serving cells that are configured with a BWP with two different values for the *coresetPoolIndex* in these lists. |
| ***simultaneousSpatial-UpdatedList1, simultaneousSpatial-UpdatedList2***  List of serving cells which can be updated simultaneously for spatial relation with a MAC CE. The *simultaneousSpatial-UpdatedList1* and *simultaneousSpatial-UpdatedList2* shall not contain same serving cells. Network should not configure serving cells that are configured with a BWP with two different values for the *coresetPoolIndex* in these lists. |
| ***spCellConfig***  Parameters for the SpCell of this cell group (PCell of MCG or PSCell of SCG). |
| ***uplinkTxSwitchingOption***  Indicates which option is configured for dynamic UL Tx switching for inter-band UL CA or (NG)EN-DC. The field is set to *switchedUL* if network configures option 1 as specified in TS 38.214 [19], or *dualUL* if network configures option 2 as specified in TS 38.214 [19]. Network always configures UE with a value for this field in inter-band UL CA case and (NG)EN-DC case where UE supports dynamic UL Tx switching. |
| ***uplinkTxSwitchingPowerBoosting***  Indicates whether the UE is allowed to enable 3dB boosting on the maximum output power for transmission on carrier2 under the operation state in which 2-port transmission can be supported on carrier2 for inter-band UL CA case with dynamic UL Tx switching as defined in TS 38.101-1 [15]. Network can only configure this field for dynamic UL Tx switching in inter-band UL CA case with power Class 3 as defined in TS 38.101-1 [15]. |

|  |
| --- |
| *DAPS-UplinkPowerConfig* field descriptions |
| ***p-DAPS-Source***  The maximum total transmit power to be used by the UE in the source cell group during DAPS handover. |
| ***p-DAPS-Target***  The maximum total transmit power to be used by the UE in the target cell group during DAPS handover. |
| ***uplinkPowerSharingDAPS-Mode***  Indicates the uplink power sharing mode that the UE uses in DAPS handover (see TS 38.213 [13]). |

|  |
| --- |
| *ReconfigurationWithSync* field descriptions |
| ***rach-ConfigDedicated***  Random access configuration to be used for the reconfiguration with sync (e.g. handover). The UE performs the RA according to these parameters in the *firstActiveUplinkBWP* (see *UplinkConfig*). |
| ***smtc***  The SSB periodicity/offset/duration configuration of target cell for NR PSCell change and NR PCell change. The network sets the *periodicityAndOffset* to indicate the same periodicity as *ssb-periodicityServingCell* in *spCellConfigCommon*.  For case of NR PCell change, the *smtc* is based on the timing reference of (source) PCell. For case of NR PSCell change, it is based on the timing reference of source PSCell.  If both this field and *targetCellSMTC-SCG* are absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |

|  |
| --- |
| *SCellConfig* field descriptions |
| ***smtc***  The SSB periodicity/offset/duration configuration of target cell for NR SCell addition. The network sets the *periodicityAndOffset* to indicate the same periodicity as *ssb-periodicityServingCell* in *sCellConfigCommon*. The *smtc* is based on the timing of the SpCell of associated cell group. In case of inter-RAT handover to NR, the timing reference is the NR PCell. In case of intra-NR PCell change (standalone NR) or NR PSCell change (EN-DC), the timing reference is the target SpCell. If the field is absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |

|  |
| --- |
| *SpCellConfig* field descriptions |
| ***reconfigurationWithSync***  Parameters for the synchronous reconfiguration to the target SpCell. |
| ***rlf-TimersAndConstants***  Timers and constants for detecting and triggering cell-level radio link failure. For the SCG, *rlf-TimersAndConstants* can only be set to *setup* and is always included at SCG addition. |
| ***servCellIndex***  Serving cell ID of a PSCell. The PCell of the Master Cell Group uses ID = 0. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *BWP-Reconfig* | The field is optionally present, Need N, if the BWPs are reconfigured or if serving cells are added or removed. Otherwise it is absent. |
| *DRX-Config2* | The field is optionally present, Need N, if *drx-ConfigSecondaryGroup* is configured. It is absent otherwise. |
| *ReconfWithSync* | The field is mandatory present in the *RRCReconfiguration* message:  - in each configured *CellGroupConfig* for which the SpCell changes,  - in the *masterCellGroup:*  - at change of AS security key derived from KgNB,  - in an *RRCReconfiguration* message contained in a *DLInformationTransferMRDC* message,  - in the *secondaryCellGroup* at:  - PSCell addition,  - SCG resume with NR-DC or (NG)EN-DC,  - update of required SI for PSCell,  - change of AS security key derived from S-KgNB in NR-DC while the UE is configured with at least one radio bearer with *keyToUse* set to *secondary* and that is not released by this *RRCReconfiguration* message,  - MN handover in (NG)EN-DC.  Otherwise, it is optionally present, need M. The field is absent in the *masterCellGroup* in *RRCResume* and *RRCSetup* messages and is absent in the *masterCellGroup* in *RRCReconfiguration* messages if source configuration is not released during DAPS handover. |
| *SCellAdd* | The field is mandatory present upon SCell addition; otherwise it is absent, Need M. |
| *SCellAddMod* | The field is mandatory present upon SCell addition; otherwise it is optionally present, need M. |
| *SCellAddSync* | The field is optionally present, Need N, in case of SCell addition, reconfiguration with sync, and resuming an RRC connection. It is absent otherwise. |
| *SCG* | The field is mandatory present in an *SpCellConfig* for the PSCell. It is absent otherwise. |

NOTE: In case of change of AS security key derived from S-KgNB/S-KeNB, if *reconfigurationWithSync* is not included in the *masterCellGroup*, the network releases all existing MCG RLC bearers associated with a radio bearer with *keyToUse* set to *secondary*. In case of change of AS security key derived from KgNB/KeNB, if *reconfigurationWithSync* is not included in the *secondaryCellGroup*, the network releases all existing SCG RLC bearers associated with a radio bearer with *keyToUse* set to *primary*.

<Text omitted>

#### – *LogicalChannelConfig*

The IE *LogicalChannelConfig* is used to configure the logical channel parameters.

*LogicalChannelConfig* information element

-- ASN1START

-- TAG-LOGICALCHANNELCONFIG-START

LogicalChannelConfig ::= SEQUENCE {

ul-SpecificParameters SEQUENCE {

priority INTEGER (1..16),

prioritisedBitRate ENUMERATED {kBps0, kBps8, kBps16, kBps32, kBps64, kBps128, kBps256, kBps512,

kBps1024, kBps2048, kBps4096, kBps8192, kBps16384, kBps32768, kBps65536, infinity},

bucketSizeDuration ENUMERATED {ms5, ms10, ms20, ms50, ms100, ms150, ms300, ms500, ms1000,

spare7, spare6, spare5, spare4, spare3,spare2, spare1},

allowedServingCells SEQUENCE (SIZE (1..maxNrofServingCells-1)) OF ServCellIndex

OPTIONAL, -- Cond PDCP-CADuplication

allowedSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SubcarrierSpacing OPTIONAL, -- Need R

maxPUSCH-Duration ENUMERATED {ms0p02, ms0p04, ms0p0625, ms0p125, ms0p25, ms0p5, spare2, spare1}

OPTIONAL, -- Need R

configuredGrantType1Allowed ENUMERATED {true} OPTIONAL, -- Need R

logicalChannelGroup INTEGER (0..maxLCG-ID) OPTIONAL, -- Need R

schedulingRequestID SchedulingRequestId OPTIONAL, -- Need R

logicalChannelSR-Mask BOOLEAN,

logicalChannelSR-DelayTimerApplied BOOLEAN,

...,

bitRateQueryProhibitTimer ENUMERATED {s0, s0dot4, s0dot8, s1dot6, s3, s6, s12, s30} OPTIONAL, -- Need R

[[

allowedCG-List-r16 SEQUENCE (SIZE (0.. maxNrofConfiguredGrantConfigMAC-1-r16)) OF ConfiguredGrantConfigIndexMAC-r16

OPTIONAL, -- Need S

allowedPHY-PriorityIndex-r16 ENUMERATED {p0, p1} OPTIONAL -- Need S

]],

[[

logicalChannelGroup-IABExt-r17 INTEGER (8..maxLCG-ID-IAB-r17) OPTIONAL -- Need R

]]

} OPTIONAL, -- Cond UL

...,

[[

channelAccessPriority-r16 INTEGER (1..4) OPTIONAL, -- Need R

bitRateMultiplier-r16 ENUMERATED {x40, x70, x100, x200} OPTIONAL -- Need R

]]

}

-- TAG-LOGICALCHANNELCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *LogicalChannelConfig* field descriptions |
| ***allowedCG-List***  This restriction applies only when the UL grant is a configured grant. If present, UL MAC SDUs from this logical channel can only be mapped to the indicated configured grant configuration. If the size of the sequence is zero, then UL MAC SDUs from this logical channel cannot be mapped to any configured grant configurations. If the field is not present, UL MAC SDUs from this logical channel can be mapped to any configured grant configurations. If the field configuredGrantType1Allowed is present, only those configured grant type 1 configuration indicated in this sequence are allowed for use by this logical channel; otherwise, this sequence shall not include any configured grant type 1 configuration. Corresponds to "allowedCG-List" as specified in TS 38.321 [3]. |
| ***allowedPHY-PriorityIndex***  This restriction applies only when the UL grant is a dynamic grant. If the field is present and the dynamic grant has a PHY-priority index, UL MAC SDUs from this logical channel can only be mapped to the dynamic grants indicating PHY-priority index equal to the values configured by this field. If the field is present and the dynamic grant does not have a PHY-priority index, UL MAC SDUs from this logical channel can only be mapped to this dynamic grant if the value of the field is *p0*, see TS 38.213 [13], clause 9. If the field is not present, UL MAC SDUs from this logical channel can be mapped to any dynamic grants. Corresponds to "allowedPHY-PriorityIndex" as specified in TS 38.321 [3]. |
| ***allowedSCS-List***  If present, UL MAC SDUs from this logical channel can only be mapped to the indicated numerology. Otherwise, UL MAC SDUs from this logical channel can be mapped to any configured numerology. Only the values 15/30/60 kHz (for FR1) and 60/120 kHz (for FR2) are applicable. Corresponds to 'allowedSCS-List' as specified in TS 38.321 [3]. |
| ***allowedServingCells***  If present, UL MAC SDUs from this logical channel can only be mapped to the serving cells indicated in this list. Otherwise, UL MAC SDUs from this logical channel can be mapped to any configured serving cell of this cell group. Corresponds to 'allowedServingCells' in TS 38.321 [3]. |
| ***bitRateMultiplier***  Bit rate multiplier for recommended bit rate MAC CE as specified in TS 38.321 [3]. Value *x40* indicates bit rate multiplier 40, value *x70* indicates bit rate multiplier 70 and so on. |
| ***bitRateQueryProhibitTimer***  The timer is used for bit rate recommendation query in TS 38.321 [3], in seconds. Value *s0* means 0 s, *s0dot4* means 0.4 s and so on. |
| ***bucketSizeDuration***  Value in ms. *ms5* corresponds to 5 ms, value *ms10* corresponds to 10 ms, and so on. |
| ***channelAccessPriority***  Indicates the Channel Access Priority Class (CAPC), as specified in TS 38.300 [2], to be used on uplink transmissions for operation with shared spectrum channel access. The network configures this field only for SRB2 and DRBs. |
| ***configuredGrantType1Allowed***  If present, or if the capability *lcp-Restriction* as specified in TS 38.306 [26] is not supported, UL MAC SDUs from this logical channel can be transmitted on a configured grant type 1. Otherwise, UL MAC SDUs from this logical channel cannot be transmitted on a configured grant type 1. Corresponds to 'configuredGrantType1Allowed' in TS 38.321 [3]. |
| ***logicalChannelGroup, logicalChannelGroup-IABExt***  ID of the logical channel group, as specified in TS 38.321 [3], which the logical channel belongs to. The *logicalChannelGroup-IABExt* is only applicable to the IAB-MT. When *logicalChannelGroup-IABExt* is configured, *logicalChannelGroup* shall be ignored. |
| ***logicalChannelSR-Mask***  Controls SR triggering when a configured uplink grant of *type1* or *type2* is configured. *true* indicates that SR masking is configured for this logical channel as specified in TS 38.321 [3]. |
| ***logicalChannelSR-DelayTimerApplied***  Indicates whether to apply the delay timer for SR transmission for this logical channel. Set to *false* if *logicalChannelSR-DelayTimer* is not included in *BSR-Config*. |
| ***maxPUSCH-Duration***  If present, UL MAC SDUs from this logical channel can only be transmitted using uplink grants that result in a PUSCH duration shorter than or equal to the duration indicated by this field. Otherwise, UL MAC SDUs from this logical channel can be transmitted using an uplink grant resulting in any PUSCH duration. Corresponds to "maxPUSCH-Duration" in TS 38.321 [3]. The PUSCH duration is calculated based on the same length of all symbols, and the shortest length applies if the symbol lengths are different. |
| ***priority***  Logical channel priority, as specified in TS 38.321 [3]. |
| ***prioritisedBitRate***  Value in kiloBytes/s. Value *kBps0* corresponds to 0 kiloBytes/s, value *kBps8* corresponds to 8 kiloBytes/s, value *kBps16* corresponds to 16 kiloBytes/s, and so on. For SRBs, the value can only be set to *infinity*. |
| ***schedulingRequestId***  If present, it indicates the scheduling request configuration applicable for this logical channel, as specified in TS 38.321 [3]. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *PDCP-CADuplication* | The field is mandatory present if the DRB/SRB associated with this logical channel is configured with PDCP CA duplication in UL in the cell group in which this IE is included (i.e. the PDCP entity is associated with multiple RLC entities belonging to this cell group). Otherwise the field is optionally present, need R. |
| *UL* | The field is mandatory present for a logical channel with uplink if it serves DRB. It is optionally present, Need R, for a logical channel with uplink if it serves an SRB. Otherwise it is absent. |

<Text omitted>

#### – *PDCP-Config*

The IE *PDCP-Config* is used to set the configurable PDCP parameters for signalling and data radio bearers.

*PDCP-Config* information element

-- ASN1START

-- TAG-PDCP-CONFIG-START

PDCP-Config ::= SEQUENCE {

drb SEQUENCE {

discardTimer ENUMERATED {ms10, ms20, ms30, ms40, ms50, ms60, ms75, ms100, ms150, ms200,

ms250, ms300, ms500, ms750, ms1500, infinity} OPTIONAL, -- Cond Setup

pdcp-SN-SizeUL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

pdcp-SN-SizeDL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

headerCompression CHOICE {

notUsed NULL,

rohc SEQUENCE {

maxCID INTEGER (1..16383) DEFAULT 15,

profiles SEQUENCE {

profile0x0001 BOOLEAN,

profile0x0002 BOOLEAN,

profile0x0003 BOOLEAN,

profile0x0004 BOOLEAN,

profile0x0006 BOOLEAN,

profile0x0101 BOOLEAN,

profile0x0102 BOOLEAN,

profile0x0103 BOOLEAN,

profile0x0104 BOOLEAN

},

drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

},

uplinkOnlyROHC SEQUENCE {

maxCID INTEGER (1..16383) DEFAULT 15,

profiles SEQUENCE {

profile0x0006 BOOLEAN

},

drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

},

...

},

integrityProtection ENUMERATED { enabled } OPTIONAL, -- Cond ConnectedTo5GC1

statusReportRequired ENUMERATED { true } OPTIONAL, -- Cond Rlc-AM-UM

outOfOrderDelivery ENUMERATED { true } OPTIONAL -- Need R

} OPTIONAL, -- Cond DRB

moreThanOneRLC SEQUENCE {

primaryPath SEQUENCE {

cellGroup CellGroupId OPTIONAL, -- Need R

logicalChannel LogicalChannelIdentity OPTIONAL -- Need R

},

ul-DataSplitThreshold UL-DataSplitThreshold OPTIONAL, -- Cond SplitBearer

pdcp-Duplication BOOLEAN OPTIONAL -- Need R

} OPTIONAL, -- Cond MoreThanOneRLC

t-Reordering ENUMERATED {

ms0, ms1, ms2, ms4, ms5, ms8, ms10, ms15, ms20, ms30, ms40,

ms50, ms60, ms80, ms100, ms120, ms140, ms160, ms180, ms200, ms220,

ms240, ms260, ms280, ms300, ms500, ms750, ms1000, ms1250,

ms1500, ms1750, ms2000, ms2250, ms2500, ms2750,

ms3000, spare28, spare27, spare26, spare25, spare24,

spare23, spare22, spare21, spare20,

spare19, spare18, spare17, spare16, spare15, spare14,

spare13, spare12, spare11, spare10, spare09,

spare08, spare07, spare06, spare05, spare04, spare03,

spare02, spare01 } OPTIONAL, -- Need S

...,

[[

cipheringDisabled ENUMERATED {true} OPTIONAL -- Cond ConnectedTo5GC

]],

[[

discardTimerExt-r16 SetupRelease { DiscardTimerExt-r16 } OPTIONAL, -- Cond DRB2

moreThanTwoRLC-DRB-r16 SEQUENCE {

splitSecondaryPath-r16 LogicalChannelIdentity OPTIONAL, -- Cond SplitBearer2

duplicationState-r16 SEQUENCE (SIZE (3)) OF BOOLEAN OPTIONAL -- Need S

} OPTIONAL, -- Cond MoreThanTwoRLC-DRB

ethernetHeaderCompression-r16 SetupRelease { EthernetHeaderCompression-r16 } OPTIONAL -- Need M

]]

}

EthernetHeaderCompression-r16 ::= SEQUENCE {

ehc-Common-r16 SEQUENCE {

ehc-CID-Length-r16 ENUMERATED { bits7, bits15 },

...

},

ehc-Downlink-r16 SEQUENCE {

drb-ContinueEHC-DL-r16 ENUMERATED { true } OPTIONAL, -- Need N

...

} OPTIONAL, -- Need M

ehc-Uplink-r16 SEQUENCE {

maxCID-EHC-UL-r16 INTEGER (1..32767),

drb-ContinueEHC-UL-r16 ENUMERATED { true } OPTIONAL, -- Need N

...

} OPTIONAL -- Need M

}

UL-DataSplitThreshold ::= ENUMERATED {

b0, b100, b200, b400, b800, b1600, b3200, b6400, b12800, b25600, b51200, b102400, b204800,

b409600, b819200, b1228800, b1638400, b2457600, b3276800, b4096000, b4915200, b5734400,

b6553600, infinity, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1}

DiscardTimerExt-r16 ::= ENUMERATED {ms0dot5, ms1, ms2, ms4, ms6, ms8, spare2, spare1}

-- TAG-PDCP-CONFIG-STOP

-- ASN1STOP

| *PDCP-Config* field descriptions |
| --- |
| ***cipheringDisabled***  If included, ciphering is disabled for this DRB regardless of which ciphering algorithm is configured for the SRB/DRBs. The field may only be included if the UE is connected to 5GC. Otherwise the field is absent. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***discardTimer***  Value in ms of *discardTimer* specified in TS 38.323 [5]. Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms and so on. The value for this field cannot be changed in case of reconfiguration with sync, if the bearer is configured as DAPS bearer. |
| ***discardTimerExt***  Value in ms of *discardTimer* specified in TS 38.323 [5]. Value *ms0dot5* corresponds to 0.5 ms, value *ms1* corresponds to 1ms and so on. If this field is present, the field *discardTimer* is ignored and *discardTimerExt* is used instead. |
| ***drb-ContinueROHC***  Indicates whether the PDCP entity continues or resets the ROHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. This field is configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. The network does not include the field if the bearer is configured as DAPS bearer. |
| ***duplicationState***  This field indicates the uplink PDCP duplication state for the associated RLC entities at the time of receiving this IE. If set to *true,* the PDCP duplication state is activated for the associated RLC entity. The index for the indication is determined by ascending order of logical channel ID of all RLC entities other than the primary RLC entityindicated by *primaryPath* in the order of MCG and SCG, as in clause 6.1.3.32 of TS 38.321 [3]. If the number of associated RLC entities other than the primary RLC entity is two, UE ignores the value in the largest index of this field. If the field is absent, the PDCP duplication states are deactivated for all associated RLC entities. |
| ***ethernetHeaderCompression***  This fields configures Ethernet Header Compression. This field can only be configured for a bi-directional DRB. The network reconfigures *ethernetHeaderCompression* only upon reconfiguration involving PDCP re-establishment and with neither *drb-ContinueEHC-DL* nor *drb-ContinueEHC-UL* configured. |
| ***headerCompression***  If rohc is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink. If *uplinkOnlyROHC* is configured, the UE shall apply the configured ROHC profile(s) in uplink (there is no header compression in downlink). ROHC can be configured for any bearer type. ROHC and EHC can be both configured simultaneously for a DRB. The network reconfigures *headerCompression* only upon reconfiguration involving PDCP re-establishment, and without any *drb-ContinueROHC*. Network configures *headerCompression* to *notUsed* when *outOfOrderDelivery* is configured. |
| ***integrityProtection***  Indicates whether or not integrity protection is configured for this radio bearer. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***maxCID***  Indicates the value of the MAX\_CID parameter as specified in TS 38.323 [5].  The total value of MAX\_CIDs across all bearers for the UE should be less than or equal to the value of *maxNumberROHC-ContextSessions* parameter as indicated by the UE. |
| ***moreThanOneRLC***  This field configures UL data transmission when more than one RLC entity is associated with the PDCP entity. This field is not present if the bearer is configured as DAPS bearer. |
| ***moreThanTwoRLC-DRB***  This field configures UL data transmission when more than two RLC entities are associated with the PDCP entity for DRBs. |
| ***outOfOrderDelivery***  Indicates whether or not *outOfOrderDelivery* specified in TS 38.323 [5] is configured. This field should be either always present or always absent, after the radio bearer is established. |
| ***pdcp-Duplication***  Indicates whether or not uplink duplication status at the time of receiving this IE is configured and activated as specified in TS 38.323 [5]. The presence of this field indicates that duplication is configured. PDCP duplication is not configured for CA packet duplication of LTE RLC bearer. The value of this field, when the field is present, indicates the state of the duplication at the time of receiving this IE. If set to *true*, duplication is activated. The value of this field is always *true*, when configured for a SRB. For PDCP entity with more than two associated RLC entities for UL transmission, this field is always present. If the field *moreThanTwoRLC-DRB* is present, the value of this field is ignored and the state of the duplication is indicated by *duplicationState*. For PDCP entity with more than two associated RLC entities, only NR RLC bearer is supported. |
| ***pdcp-SN-SizeDL***  PDCP sequence number size for downlink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. The value for this field cannot be changed in case of reconfiguration with sync, if the bearer is configured as DAPS bearer. |
| ***pdcp-SN-SizeUL***  PDCP sequence number size for uplink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. The value for this field cannot be changed in case of reconfiguration with sync, if the bearer is configured as DAPS bearer. |
| ***primaryPath***  Indicates the cell group ID and LCID of the primary RLC entity as specified in TS 38.323 [5], clause 5.2.1 for UL data transmission when more than one RLC entity is associated with the PDCP entity. In this version of the specification, only cell group ID corresponding to MCG is supported for SRBs, except for the SRB2 of the IAB-MT. The NW indicates *cellGroup* for split bearers using logical channels in different cell groups. The NW always indicates *logicalChannel* if CA based PDCP duplication is configured in the cell group indicated by *cellGroup* of this field. |
| ***splitSecondaryPath***  Indicates the LCID of the split secondary RLC entity as specified in TS 38.323 [5] for fallback to split bearer operation when UL data transmission with more than two RLC entities is associated with the PDCP entity. This RLC entity belongs to a cell group that is different from the cell group indicated by *cellGroup* in the field *primaryPath.* |
| ***statusReportRequired***  For AM DRBs and DAPS UM DRBs, indicates whether the DRB is configured to send a PDCP status report in the uplink, as specified in TS 38.323 [5]. For DAPS AM DRBs, it also indicates whether the DRB is configured to send a second PDCP status report in the uplink, as specified in TS 38.323 [5]. |
| ***t-Reordering***  Value in ms of t-Reordering specified in TS 38.323 [5]. Value *ms0* corresponds to 0 ms, value *ms20* corresponds to 20 ms, value *ms40* corresponds to 40 ms, and so on. When the field is absent the UE applies the value *infinity*. The value for this field cannot be changed in case of reconfiguration with sync, if the bearer is configured as DAPS bearer. |
| ***ul-DataSplitThreshold***  Parameter specified in TS 38.323 [5]. Value *b0* corresponds to 0 bytes, value *b100* corresponds to 100 bytes, value *b200* corresponds to 200 bytes, and so on. The network sets this field to *infinity* for UEs not supporting *splitDRB-withUL-Both-MCG-SCG*. If the field is absent when the split bearer is configured for the radio bearer first time, then the default value *infinity* is applied. |

|  |
| --- |
| *EthernetHeaderCompression field descriptions* |
| ***drb-ContinueEHC-DL***  Indicates whether the PDCP entity continues or resets the downlink EHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. The field is configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***drb-ContinueEHC-UL***  Indicates whether the PDCP entity continues or resets the uplink EHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. The field is configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***ehc-CID-Length***  Indicates the length of the CID field for EHC packet. The value *bits7* indicates the length is 7 bits, and the value *bits15* indicates the length is 15 bits. Once the field *ethernetHeaderCompression-r16* is configured for a DRB, the value of the field *ehc-CID-Length* for this DRB is not reconfigured to a different value. |
| ***ehc-Common***  Indicates the configurations that apply for both downlink and uplink. |
| ***ehc-Downlink***  Indicates the configurations that apply for only downlink. If the field is configured, then Ethernet header compression is configured for downlink. Otherwise, it is not configured for downlink. |
| ***ehc-Uplink***  Indicates the configurations that apply for only uplink. If the field is configured, then Ethernet header compression is configured for uplnik. Otherwise, it is not configured for uplink. |
| ***maxCID-EHC-UL***  Indicates the value of the MAX\_CID\_EHC\_UL parameter as specified in TS 38.323 [5]. The total value of MAX\_CID\_EHC\_UL across all bearers for the UE should be less than or equal to the value of *maxNumberEHC-Contexts* parameter as indicated by the UE. |

| Conditional presence | Explanation |
| --- | --- |
| *DRB* | This field is mandatory present when the corresponding DRB is being set up, absent for SRBs. Otherwise this field is optionally present, need M. |
| *DRB2* | This field is optionally present in case of DRB, need M. Otherwise, it is absent for SRBs. |
| *MoreThanOneRLC* | This field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than one associated logical channel and upon RRC reconfiguration with the association of additional logical channels to the PDCP entity.  The field is also mandatory present in case the field *moreThanTwoRLC-DRB* is included in *PDCP-Config*.  Upon RRC reconfiguration when a PDCP entity is associated with multiple logical channels, this field is optionally present need M. Otherwise, this field is absent. Need R. |
| *MoreThanTwoRLC-DRB* | For SRBs, this field is absent.  For DRBs, this field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than two associated logical channels and upon RRC reconfiguration with the association of one or more additional logical channel(s) to the PDCP entity so that the PDCP entity has more than two associated logical channels.  Upon RRC reconfiguration when a PDCP entity is associated with more than two logical channels, this field is optionally present, Need M. Otherwise, the field is absent, Need R. |
| *Rlc-AM-UM* | For RLC UM (if the UE supports DAPS handover) or RLC AM, the field is optionally present, need R. Otherwise, the field is absent. |
| *Setup* | The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need M. |
| *SplitBearer* | The field is absent for SRBs. Otherwise, the field is optional present, need M, in case of radio bearer with more than one associated RLC mapped to different cell groups. |
| *SplitBearer2* | The field is mandatory present, in case of a split bearer. Otherwise the field is absent. |
| *ConnectedTo5GC* | The field is optionally present, need R, if the UE is connected to 5GC. Otherwise the field is absent. |
| *ConnectedTo5GC1* | The field is optionally present, need R, if the UE is connected to NR/5GC. Otherwise the field is absent. |
| *Setup2* | This field is mandatory present in case for radio bearer setup for RLC-AM and RLC-UM. Otherwise, this field is absent, Need M. |

<Text omitted>

#### – *ServingCellConfig*

The IE *ServingCellConfig* is used to configure (add or modify) the UE with a serving cell, which may be the SpCell or an SCell of an MCG or SCG. The parameters herein are mostly UE specific but partly also cell specific (e.g. in additionally configured bandwidth parts). Reconfiguration between a PUCCH and PUCCHless SCell is only supported using an SCell release and add.

*ServingCellConfig* information element

-- ASN1START

-- TAG-SERVINGCELLCONFIG-START

ServingCellConfig ::= SEQUENCE {

tdd-UL-DL-ConfigurationDedicated TDD-UL-DL-ConfigDedicated OPTIONAL, -- Cond TDD

initialDownlinkBWP BWP-DownlinkDedicated OPTIONAL, -- Need M

downlinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink OPTIONAL, -- Need N

firstActiveDownlinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

bwp-InactivityTimer ENUMERATED {ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30,

ms40,ms50, ms60, ms80,ms100, ms200,ms300, ms500,

ms750, ms1280, ms1920, ms2560, spare10, spare9, spare8,

spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL, --Need R

defaultDownlinkBWP-Id BWP-Id OPTIONAL, -- Need S

uplinkConfig UplinkConfig OPTIONAL, -- Need M

supplementaryUplink UplinkConfig OPTIONAL, -- Need M

pdcch-ServingCellConfig SetupRelease { PDCCH-ServingCellConfig } OPTIONAL, -- Need M

pdsch-ServingCellConfig SetupRelease { PDSCH-ServingCellConfig } OPTIONAL, -- Need M

csi-MeasConfig SetupRelease { CSI-MeasConfig } OPTIONAL, -- Need M

sCellDeactivationTimer ENUMERATED {ms20, ms40, ms80, ms160, ms200, ms240,

ms320, ms400, ms480, ms520, ms640, ms720,

ms840, ms1280, spare2,spare1} OPTIONAL, -- Cond ServingCellWithoutPUCCH

crossCarrierSchedulingConfig CrossCarrierSchedulingConfig OPTIONAL, -- Need M

tag-Id TAG-Id,

dummy1 ENUMERATED {enabled} OPTIONAL, -- Need R

pathlossReferenceLinking ENUMERATED {spCell, sCell} OPTIONAL, -- Cond SCellOnly

servingCellMO MeasObjectId OPTIONAL, -- Cond MeasObject

...,

[[

lte-CRS-ToMatchAround SetupRelease { RateMatchPatternLTE-CRS } OPTIONAL, -- Need M

rateMatchPatternToAddModList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPattern OPTIONAL, -- Need N

rateMatchPatternToReleaseList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPatternId OPTIONAL, -- Need N

downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier OPTIONAL -- Need S

]],

[[

supplementaryUplinkRelease-r16 ENUMERATED {true} OPTIONAL, -- Need N

tdd-UL-DL-ConfigurationDedicated-IAB-MT-r16 TDD-UL-DL-ConfigDedicated-IAB-MT-r16 OPTIONAL, -- Cond TDD\_IAB

dormantBWP-Config-r16 SetupRelease { DormantBWP-Config-r16 } OPTIONAL, -- Need M

ca-SlotOffset-r16 CHOICE {

refSCS15kHz INTEGER (-2..2),

refSCS30KHz INTEGER (-5..5),

refSCS60KHz INTEGER (-10..10),

refSCS120KHz INTEGER (-20..20)

} OPTIONAL, -- Cond AsyncCA

dummy2 SetupRelease { DummyJ } OPTIONAL, -- Need M

intraCellGuardBandsDL-List-r16 SEQUENCE (SIZE (1..maxSCSs)) OF IntraCellGuardBandsPerSCS-r16 OPTIONAL, -- Need S

intraCellGuardBandsUL-List-r16 SEQUENCE (SIZE (1..maxSCSs)) OF IntraCellGuardBandsPerSCS-r16 OPTIONAL, -- Need S

csi-RS-ValidationWithDCI-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

lte-CRS-PatternList1-r16 SetupRelease { LTE-CRS-PatternList-r16 } OPTIONAL, -- Need M

lte-CRS-PatternList2-r16 SetupRelease { LTE-CRS-PatternList-r16 } OPTIONAL, -- Need M

crs-RateMatch-PerCORESETPoolIndex-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableTwoDefaultTCI-States-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultTCI-StatePerCoresetPoolIndex-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

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

cbg-TxDiffTBsProcessingType1-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

cbg-TxDiffTBsProcessingType2-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]],

[[

directionalCollisionHandling-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

channelAccessConfig-r16 SetupRelease { ChannelAccessConfig-r16 } OPTIONAL -- Need M

]]

}

UplinkConfig ::= SEQUENCE {

initialUplinkBWP BWP-UplinkDedicated OPTIONAL, -- Need M

uplinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink OPTIONAL, -- Need N

firstActiveUplinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

pusch-ServingCellConfig SetupRelease { PUSCH-ServingCellConfig } OPTIONAL, -- Need M

carrierSwitching SetupRelease { SRS-CarrierSwitching } OPTIONAL, -- Need M

...,

[[

powerBoostPi2BPSK BOOLEAN OPTIONAL, -- Need M

uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier OPTIONAL -- Need S

]],

[[

enablePL-RS-UpdateForPUSCH-SRS-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForPUSCH0-0-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForPUCCH-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForSRS-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

uplinkTxSwitching-r16 SetupRelease { UplinkTxSwitching-r16 } OPTIONAL, -- Need M

mpr-PowerBoost-FR2-r16 ENUMERATED {true} OPTIONAL -- Need R

]]

}

DummyJ ::= SEQUENCE {

maxEnergyDetectionThreshold-r16 INTEGER(-85..-52),

energyDetectionThresholdOffset-r16 INTEGER (-20..-13),

ul-toDL-COT-SharingED-Threshold-r16 INTEGER (-85..-52) OPTIONAL, -- Need R

absenceOfAnyOtherTechnology-r16 ENUMERATED {true} OPTIONAL -- Need R

}

ChannelAccessConfig-r16 ::= SEQUENCE {

energyDetectionConfig-r16 CHOICE {

maxEnergyDetectionThreshold-r16 INTEGER (-85..-52),

energyDetectionThresholdOffset-r16 INTEGER (-13..20)

} OPTIONAL, -- Need R

ul-toDL-COT-SharingED-Threshold-r16 INTEGER (-85..-52) OPTIONAL, -- Need R

absenceOfAnyOtherTechnology-r16 ENUMERATED {true} OPTIONAL -- Need R

}

IntraCellGuardBandsPerSCS-r16 ::= SEQUENCE {

guardBandSCS-r16 SubcarrierSpacing,

intraCellGuardBands-r16 SEQUENCE (SIZE (1..4)) OF GuardBand-r16

}

GuardBand-r16 ::= SEQUENCE {

startCRB-r16 INTEGER (0..274),

nrofCRBs-r16 INTEGER (0..15)

}

DormancyGroupID-r16 ::= INTEGER (0..4)

DormantBWP-Config-r16::= SEQUENCE {

dormantBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

withinActiveTimeConfig-r16 SetupRelease { WithinActiveTimeConfig-r16 } OPTIONAL, -- Need M

outsideActiveTimeConfig-r16 SetupRelease { OutsideActiveTimeConfig-r16 } OPTIONAL -- Need M

}

WithinActiveTimeConfig-r16 ::= SEQUENCE {

firstWithinActiveTimeBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

dormancyGroupWithinActiveTime-r16 DormancyGroupID-r16 OPTIONAL -- Need R

}

OutsideActiveTimeConfig-r16 ::= SEQUENCE {

firstOutsideActiveTimeBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

dormancyGroupOutsideActiveTime-r16 DormancyGroupID-r16 OPTIONAL -- Need R

}

UplinkTxSwitching-r16 ::= SEQUENCE {

uplinkTxSwitchingPeriodLocation-r16 BOOLEAN,

uplinkTxSwitchingCarrier-r16 ENUMERATED {carrier1, carrier2}

}

-- TAG-SERVINGCELLCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *ChannelAccessConfig* field descriptions |
| ***absenceOfAnyOtherTechnology***  Presence of this field indicates absence on a long term basis (e.g. by level of regulation) of any other technology sharing the carrier; absence of this field indicates the potential presence of any other technology sharing the carrier, as specified in TS 37.213 [48] clauses 4.2.1 and 4.2.3. |
| ***energyDetectionConfig***  Indicates whether to use the *maxEnergyDetectionThreshold* or the *energyDetectionThresholdOffset* (see TS 37.213 [48], clause 4.2.3)*.* |
| ***energyDetectionThresholdOffset***  Indicates the offset to the default maximum energy detection threshold value. Unit in dB. Value -13 corresponds to -13dB, value -12 corresponds to -12dB, and so on (i.e. in steps of 1dB) as specified in TS 37.213 [48], clause 4.2.3. |
| ***maxEnergyDetectionThreshold***  Indicates the absolute maximum energy detection threshold value. Unit in dBm. Value -85 corresponds to -85 dBm, value -84 corresponds to -84 dBm, and so on (i.e. in steps of 1dBm) as specified in TS 37.213 [48], clause 4.2.3. |
| ***ul-toDL-COT-SharingED-Threshold***  Maximum energy detection threshold that the UE should use to share channel occupancy with gNB for DL transmission as specified in TS 37.213 [48], clause 4.1.3 for downlink channel access and clause 4.2.3 for uplink channel access. |

|  |
| --- |
| *ServingCellConfig* field descriptions |
| ***bwp-InactivityTimer***  The duration in ms after which the UE falls back to the default Bandwidth Part (see TS 38.321 [3], clause 5.15). When the network releases the timer configuration, the UE stops the timer without switching to the default BWP. |
| ***ca-SlotOffset***  Slot offset between the primary cell (PCell/PSCell) and the SCell in unaligned frame boundary with slot alignment and partial SFN alignment inter-band CA. Based on this field, the UE determines the time offset of the SCell as specified in clause 4.5 of TS 38.211 [16]. The granularity of this field is determined by the reference SCS for the slot offset (i.e. the maximum of PCell/PSCell lowest SCS among all the configured SCSs in DL/UL *SCS-SpecificCarrierList* in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB* and this serving cell's lowest SCS among all the configured SCSs in DL/UL *SCS-SpecificCarrierList* in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*).  The Network configures at most single non-zero offset duration in ms (independent on SCS) among CCs in the unaligned CA configuration. If the field is absent, the UE applies the value of 0. The slot offset value can only be changed with SCell release and add. |
| ***cbg-TxDiffTBsProcessingType1, cbg-TxDiffTBsProcessingType2***  Indicates whether processing types 1 and 2 based CBG based operation is enabled according to Rel-16 UE capabilities. |
| ***channelAccessConfig***  List of parameters used for access procedures of operation with shared spectrum channel access (see TS 37.213 [48). |
| ***crossCarrierSchedulingConfig***  Indicates whether this serving cell is cross-carrier scheduled by another serving cell or whether it cross-carrier schedules another serving cell. |
| ***crs-RateMatch-PerCORESETPoolIndex***  Indicates how UE performs rate matching when both lte-CRS-PatternList1-r16 and lte-CRS-PatternList2-r16 are configured as specified in TS 38.214 [19], clause 5.1.4.2. |
| ***csi-RS-ValidationWithDCI***  Indicates how the UE performs periodic and semi-persistent CSI-RS reception in a slot. The presence of this field indicates that the UE uses DCI detection to validate whether to receive CSI-RS (see TS 38.213 [13], clause 11.1). |
| ***defaultDownlinkBWP-Id***  The initial bandwidth part is referred to by BWP-Id = 0. ID of the downlink bandwidth part to be used upon expiry of the BWP inactivity timer. This field is UE specific. When the field is absent the UE uses the initial BWP as default BWP. (see TS 38.213 [13], clause 12 and TS 38.321 [3], clause 5.15). |
| ***directionalCollisionHandling***  Indicates that this serving cell is using directional collision handling between a reference and other cell(s) for half-duplex operation in TDD CA with same SCS or in TDD NR-DC with same SCS within same cell group or cross different cell groups, as specified in TS 38.213 [13], clause 11.1. The half-duplex operation only applies within the same frequency range and cell group. The network only configures this field for TDD serving cells that are using the same SCS. |
| ***dormantBWP-Config***  The dormant BWP configuration for an SCell. This field can be configured only for a (non-PUCCH) SCell. |
| ***downlinkBWP-ToAddModList***  List of additional downlink bandwidth parts to be added or modified. (see TS 38.213 [13], clause 12). |
| ***downlinkBWP-ToReleaseList***  List of additional downlink bandwidth parts to be released. (see TS 38.213 [13], clause 12). |
| ***downlinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *DownlinkConfigCommon* / *DownlinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |
| ***dummy1, dummy 2***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***enableBeamSwitchTiming***  Indicates the aperiodic CSI-RS triggering with beam switching triggering behaviour as defined in clause 5.2.1.5.1 of TS 38.214 [19]. |
| ***enableDefaultTCI-StatePerCoresetPoolIndex***  Presence of this field indicates the UE shall follow the release 16 behavior of default TCI state per CORESETPoolindex when the UE is configured by higher layer parameter PDCCH-Config that contains two different values of CORESETPoolIndex in ControlResourceSet is enabled. |
| ***enableTwoDefaultTCI-States***  Presence of this field indicates the UE shall follow the release 16 behavior of two default TCI states for PDSCH when at least one TCI codepoint is mapped to two TCI states is enabled |
| ***firstActiveDownlinkBWP-Id***  If configured for an SpCell, this field contains the ID of the DL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the downlink bandwidth part to be used upon activation of an SCell. The initial bandwidth part is referred to by BWP-Id = 0.  Upon reconfiguration with *reconfigurationWithSync*, the network sets the *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* to the same value. |
| ***initialDownlinkBWP***  The dedicated (UE-specific) configuration for the initial downlink bandwidth-part (i.e. DL BWP#0). If any of the optional IEs are configured within this IE, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***intraCellGuardBandsDL-List, intraCellGuardBandsUL-List***  List of intra-cell guard bands in a serving cell for operation with shared spectrum channel access. If not configured, the guard bands are defined according to 38.101-1 [15], see TS 38.214 [19], clause 7. For operation in licensed spectrum, this field is absent, and no UE action is required. |
| ***lte-CRS-PatternList1***  A list of LTE CRS patterns around which the UE shall do rate matching for PDSCH. The LTE CRS patterns in this list shall be non-overlapping in frequency. The network does not configure this field and *lte-CRS-ToMatchAround* simultaneously. |
| ***lte-CRS-PatternList2***  A list of LTE CRS patterns around which the UE shall do rate matching for PDSCH scheduled with a DCI detected on a CORESET with CORESETPoolIndex configured with 1. This list is configured only if CORESETPoolIndex configured with 1. The first LTE CRS pattern in this list shall be fully overlapping in frequency with the first LTE CRS pattern in lte-CRS-PatternList1, The second LTE CRS pattern in this list shall be fully overlapping in frequency with the second LTE CRS pattern in lte-CRS-PatternList1, and so on. Network configures this field only if the field *lte-CRS-ToMatchAround* is not configured and there is at least one ControlResourceSet in one DL BWP of this serving cell with *coresetPoolIndex* set to 1. |
| ***lte-CRS-ToMatchAround***  Parameters to determine an LTE CRS pattern that the UE shall rate match around. |
| ***pathlossReferenceLinking***  Indicates whether UE shall apply as pathloss reference either the downlink of SpCell (PCell for MCG or PSCell for SCG) or of SCell that corresponds with this uplink (see TS 38.213 [13], clause 7). |
| ***pdsch-ServingCellConfig***  PDSCH related parameters that are not BWP-specific. |
| ***rateMatchPatternToAddModList***  Resources patterns which the UE should rate match PDSCH around. The UE rate matches around the union of all resources indicated in the rate match patterns. Rate match patterns defined here on cell level apply only to PDSCH of the same numerology. See TS 38.214 [19], clause 5.1.4.1. |
| ***sCellDeactivationTimer***  SCell deactivation timer in TS 38.321 [3]. If the field is absent, the UE applies the value infinity. |
| ***servingCellMO***  *measObjectId* of the *MeasObjectNR* in *MeasConfig* which is associated to the serving cell. For this *MeasObjectNR*, the following relationship applies between this MeasObjectNR and *frequencyInfoDL* in *ServingCellConfigCommon* of the serving cell: if *ssbFrequency* is configured, its value is the same as the *absoluteFrequencySSB* and if *csi-rs-ResourceConfigMobility* is configured, the value of its *subcarrierSpacing* is present in one entry of the *scs-SpecificCarrierList*, *csi-RS-CellListMobility* includes an entry corresponding to the serving cell (with *cellId* equal to *physCellId* in *ServingCellConfigCommon*) and the frequency range indicated by the *csi-rs-MeasurementBW* of the entry in *csi-RS-CellListMobility* is included in the frequency range indicated by in the entry of the *scs-SpecificCarrierList*. |
| ***supplementaryUplink***  Network may configure this field only when *supplementaryUplinkConfig* is configured in *ServingCellConfigCommon* or *supplementaryUplink* is configured in *ServingCellConfigCommonSIB*. |
| ***supplementaryUplinkRelease***  If this field is included, the UE shall release the uplink configuration configured by *supplementaryUplink*. The network only includes either *supplementaryUplinkRelease* or *supplementaryUplink* at a time. |
| ***tag-Id***  Timing Advance Group ID, as specified in TS 38.321 [3], which this cell belongs to. |
| ***tdd-UL-DL-ConfigurationDedicated-IAB-MT***  Resource configuration per IAB-MT D/U/F overrides all symbols (with a limitation that effectively only flexible symbols can be overwritten in Rel-16) per slot over the number of slots as provided by *TDD-UL-DL ConfigurationCommon*. |
| ***uplinkConfig***  Network may configure this field only when *uplinkConfigCommon* is configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*. Addition or release of this field can only be done upon SCell addition or release (respectively). |

|  |
| --- |
| *UplinkConfig* field descriptions |
| ***carrierSwitching***  Includes parameters for configuration of carrier based SRS switching (see TS 38.214 [19], clause 6.2.1.3. |
| ***enableDefaultBeamPL-ForPUSCH0-0, enableDefaultBeamPL-ForPUCCH, enableDefaultBeamPL-ForSRS***  When the parameter is present, UE derives the spatial relation and the corresponding pathloss reference Rs as specified in 38.213, clauses 7.1.1, 7.2.1, 7.3.1 and 9.2.2. The network only configures these parameters for FR2. |
| ***enablePL-RS-UpdateForPUSCH-SRS***  When this parameter is present, the Rel-16 feature of MAC CE based pathloss RS updates for PUSCH/SRS is enabled. Network only configures this parameter when the UE is configured with *sri-PUSCH-PowerControl*. If this field is not configured, network configures at most 4 pathloss RS resources for PUSCH/PUCCH/SRS transmissions per BWP, not including pathloss RS resources for SRS transmissions for positioning. (See TS 38.213 [13], clause 7). |
| ***firstActiveUplinkBWP-Id***  If configured for an SpCell, this field contains the ID of the UL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the uplink bandwidth part to be used upon activation of an SCell. The initial bandwidth part is referred to by BandiwdthPartId = 0. |
| ***initialUplinkBWP***  The dedicated (UE-specific) configuration for the initial uplink bandwidth-part (i.e. UL BWP#0). If any of the optional IEs are configured within this IE as part of the IE *uplinkConfig*, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***mpr-PowerBoost-FR2***  Indicates whether UE is allowed to boost uplink transmission power by suspending in-band emission (IBE) requirements as specified in TS 38.101-2 [39]. Network only configures this field for FR2 serving cells. |
| ***powerBoostPi2BPSK***  If this field is set to *true*, the UE determines the maximum output power for PUCCH/PUSCH transmissions that use pi/2 BPSK modulation according to TS 38.101-1 [15], clause 6.2.4. |
| ***pusch-ServingCellConfig***  PUSCH related parameters that are not BWP-specific. |
| ***uplinkBWP-ToAddModList***  The additional bandwidth parts for uplink to be added or modified. In case of TDD uplink- and downlink BWP with the same *bandwidthPartId* are considered as a BWP pair and must have the same center frequency. |
| ***uplinkBWP-ToReleaseList***  The additional bandwidth parts for uplink to be released. |
| ***uplinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *UplinkConfigCommon* / *UplinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |
| ***uplinkTxSwitchingPeriodLocation***  Indicates whether the location of UL Tx switching period is configured in this uplink carrier in case of inter-band UL CA, SUL, or (NG)EN-DC, as specified in TS 38.101-1 [15] and TS 38.101-3 [34]. In case of inter-band UL CA or SUL, network configures this field to TRUE for one of the uplink carriers involved in dynamic UL TX switching and configures this field in the other carrier to FALSE. In case of (NG)EN-DC, network always configures this field to TRUE for NR carrier (i.e. with (NG)EN-DC, the UL switching period always occurs on the NR carrier). |
| ***uplinkTxSwitchingCarrier***  Indicates that the configured carrier is carrier1 or carrier2 for dynamic uplink Tx switching, as defined in TS 38.101-1 [15] and TS 38.101-3 [34]. In case of inter-band UL CA or SUL, network configures one of the two uplink carriers involved in dynamic UL TX switching as carrier1 and the other as carrier2. In case of (NG)EN-DC, network always configures the NR carrier as carrier 2. |

|  |
| --- |
| *DormantBWP-Config* field descriptions |
| ***dormancyGroupWithinActiveTime***  This field contains the ID of an SCell group for Dormancy within active time, to which this SCell belongs. The use of the Dormancy within active time SCell groups is specified in TS 38.213 [13]. |
| ***dormancyGroupOutsideActiveTime***  This field contains the ID of an SCell group for Dormancy outside active time, to which this SCell belongs. The use of the Dormancy outside active time SCell groups is specified in TS 38.213 [13]. |
| ***dormantBWP-Id***  This field contains the ID of the downlink bandwidth part to be used as dormant BWP. If this field is configured, its value is different from *defaultDownlinkBWP-Id*, and at least one of the *withinActiveTimeConfig* and *outsideActiveTimeConfig* should be configured. |
| ***firstOutsideActiveTimeBWP-Id***  This field contains the ID of the downlink bandwidth part to be activated when receiving a DCI indication for SCell dormancy outside active time. |
| ***firstWithinActiveTimeBWP-Id***  This field contains the ID of the downlink bandwidth part to be activated when receiving a DCI indication for SCell dormancy within active time. |
| ***outsideActiveTimeConfig***  This field contains the configuration to be used for SCell dormancy outside active time, as specified in TS 38.213 [13]. The field can only be configured when the cell group the SCell belongs to is configured with *dcp-Config*. |
| ***withinActiveTimeConfig***  This field contains the configuration to be used for SCell dormancy within active time, as specified in TS 38.213 [13]. |

|  |
| --- |
| *GuardBand* field descriptions |
| ***startCRB***  Indicates the starting RB of the guard band. |
| ***nrofCRB***  Indicates the length of the guard band in RBs. When set to 0, zero-size guard band is used. |

NOTE 1: If the dedicated part of initial UL/DL BWP configuration is absent, the initial BWP can be used but with some limitations. For example, changing to another BWP requires *RRCReconfiguration* since DCI format 1\_0 doesn't support DCI-based switching.

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *AsyncCA* | This field is mandatory present for SCells whose slot offset between the SpCell is not 0. Otherwise it is absent, Need S. |
| *MeasObject* | This field is mandatory present for the SpCell if the UE has a *measConfig*, and it is optionally present, Need M, for SCells. |
| *SCellOnly* | This field is optionally present, Need R, for SCells. It is absent otherwise. |
| *ServingCellWithoutPUCCH* | This field is optionally present, Need S, for SCells except PUCCH SCells. It is absent otherwise. |
| *SyncAndCellAdd* | This field is mandatory present for a SpCell upon reconfiguration with *reconfigurationWithSync* and upon *RRCSetup*/*RRCResume*.  The field is optionally present for an SpCell, Need N, upon reconfiguration without *reconfigurationWithSync*.  The field is mandatory present for an SCell upon addition, and absent for SCell in other cases, Need M. |
| *TDD* | This field is optionally present, Need R, for TDD cells. It is absent otherwise. |
| *TDD\_IAB* | For IAB-MT, this field is optionally present, Need R, for TDD cells. It is absent otherwise. |

NEXT CHANGE

### 6.3.3 UE capability information elements

<Text omitted>

#### – *MAC-Parameters*

The IE *MAC-Parameters* is used to convey capabilities related to MAC.

*MAC-Parameters* information element

-- ASN1START

-- TAG-MAC-PARAMETERS-START

MAC-Parameters ::= SEQUENCE {

mac-ParametersCommon MAC-ParametersCommon OPTIONAL,

mac-ParametersXDD-Diff MAC-ParametersXDD-Diff OPTIONAL

}

MAC-Parameters-v1610 ::= SEQUENCE {

mac-ParametersFRX-Diff-r16 MAC-ParametersFRX-Diff-r16 OPTIONAL

}

MAC-ParametersCommon ::= SEQUENCE {

lcp-Restriction ENUMERATED {supported} OPTIONAL,

dummy ENUMERATED {supported} OPTIONAL,

lch-ToSCellRestriction ENUMERATED {supported} OPTIONAL,

...,

[[

recommendedBitRate ENUMERATED {supported} OPTIONAL,

recommendedBitRateQuery ENUMERATED {supported} OPTIONAL

]],

[[

recommendedBitRateMultiplier-r16 ENUMERATED {supported} OPTIONAL,

preEmptiveBSR-r16 ENUMERATED {supported} OPTIONAL,

autonomousTransmission-r16 ENUMERATED {supported} OPTIONAL,

lch-PriorityBasedPrioritization-r16 ENUMERATED {supported} OPTIONAL,

lch-ToConfiguredGrantMapping-r16 ENUMERATED {supported} OPTIONAL,

lch-ToGrantPriorityRestriction-r16 ENUMERATED {supported} OPTIONAL,

singlePHR-P-r16 ENUMERATED {supported} OPTIONAL,

ul-LBT-FailureDetectionRecovery-r16 ENUMERATED {supported} OPTIONAL,

-- R4 8-1: MPE

tdd-MPE-P-MPR-Reporting-r16 ENUMERATED {supported} OPTIONAL,

lcid-ExtensionIAB-r16 ENUMERATED {supported} OPTIONAL

]],

[[

spCell-BFR-CBRA-r16 ENUMERATED {supported} OPTIONAL

]],

[[

srs-ResourceId-Ext-r16 ENUMERATED {supported} OPTIONAL

]],

[[

lcg-ExtensionIAB-r17 ENUMERATED {supported} OPTIONAL

]]

}

MAC-ParametersFRX-Diff-r16 ::= SEQUENCE {

directMCG-SCellActivation-r16 ENUMERATED {supported} OPTIONAL,

directMCG-SCellActivationResume-r16 ENUMERATED {supported} OPTIONAL,

directSCG-SCellActivation-r16 ENUMERATED {supported} OPTIONAL,

directSCG-SCellActivationResume-r16 ENUMERATED {supported} OPTIONAL,

-- R1 19-1: DRX Adaptation

drx-Adaptation-r16 SEQUENCE {

non-SharedSpectrumChAccess-r16 MinTimeGap-r16 OPTIONAL,

sharedSpectrumChAccess-r16 MinTimeGap-r16 OPTIONAL

} OPTIONAL,

...

}

MAC-ParametersXDD-Diff ::= SEQUENCE {

skipUplinkTxDynamic ENUMERATED {supported} OPTIONAL,

logicalChannelSR-DelayTimer ENUMERATED {supported} OPTIONAL,

longDRX-Cycle ENUMERATED {supported} OPTIONAL,

shortDRX-Cycle ENUMERATED {supported} OPTIONAL,

multipleSR-Configurations ENUMERATED {supported} OPTIONAL,

multipleConfiguredGrants ENUMERATED {supported} OPTIONAL,

...,

[[

secondaryDRX-Group-r16 ENUMERATED {supported} OPTIONAL

]],

[[

enhancedSkipUplinkTxDynamic-r16 ENUMERATED {supported} OPTIONAL,

enhancedSkipUplinkTxConfigured-r16 ENUMERATED {supported} OPTIONAL

]]

}

MinTimeGap-r16 ::= SEQUENCE {

scs-15kHz-r16 ENUMERATED {sl1, sl3} OPTIONAL,

scs-30kHz-r16 ENUMERATED {sl1, sl6} OPTIONAL,

scs-60kHz-r16 ENUMERATED {sl1, sl12} OPTIONAL,

scs-120kHz-r16 ENUMERATED {sl2, sl24} OPTIONAL

}

-- TAG-MAC-PARAMETERS-STOP

-- ASN1STOP

NEXT CHANGE

#### – *NRDC-Parameters*

The IE *NRDC-Parameters* contains parameters specific to NR-DC, i.e., which are not applicable to NR SA.

*NRDC-Parameters* information element

-- ASN1START

-- TAG-NRDC-PARAMETERS-START

NRDC-Parameters ::= SEQUENCE {

measAndMobParametersNRDC MeasAndMobParametersMRDC OPTIONAL,

generalParametersNRDC GeneralParametersMRDC-XDD-Diff OPTIONAL,

fdd-Add-UE-NRDC-Capabilities UE-MRDC-CapabilityAddXDD-Mode OPTIONAL,

tdd-Add-UE-NRDC-Capabilities UE-MRDC-CapabilityAddXDD-Mode OPTIONAL,

fr1-Add-UE-NRDC-Capabilities UE-MRDC-CapabilityAddFRX-Mode OPTIONAL,

fr2-Add-UE-NRDC-Capabilities UE-MRDC-CapabilityAddFRX-Mode OPTIONAL,

dummy2 OCTET STRING OPTIONAL,

dummy SEQUENCE {} OPTIONAL

}

NRDC-Parameters-v1570 ::= SEQUENCE {

sfn-SyncNRDC ENUMERATED {supported} OPTIONAL

}

NRDC-Parameters-v15c0 ::= SEQUENCE {

pdcp-DuplicationSplitSRB ENUMERATED {supported} OPTIONAL,

pdcp-DuplicationSplitDRB ENUMERATED {supported} OPTIONAL

}

NRDC-Parameters-v1610 ::= SEQUENCE {

measAndMobParametersNRDC-v1610 MeasAndMobParametersMRDC-v1610 OPTIONAL

}

NRDC-Parameters-v17xy ::= SEQUENCE {

f1c-OverNR-RRC-r17 ENUMERATED {supported} OPTIONAL

}

-- TAG-NRDC-PARAMETERS-STOP

-- ASN1STOP

NEXT CHANGE

#### – *UE-NR-Capability*

The IE *UE-NR-Capability* is used to convey the NR UE Radio Access Capability Parameters, see TS 38.306 [26].

*UE-NR-Capability* information element

-- ASN1START

-- TAG-UE-NR-CAPABILITY-START

UE-NR-Capability ::= SEQUENCE {

accessStratumRelease AccessStratumRelease,

pdcp-Parameters PDCP-Parameters,

rlc-Parameters RLC-Parameters OPTIONAL,

mac-Parameters MAC-Parameters OPTIONAL,

phy-Parameters Phy-Parameters,

rf-Parameters RF-Parameters,

measAndMobParameters MeasAndMobParameters OPTIONAL,

fdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

tdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

fr1-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

featureSets FeatureSets OPTIONAL,

featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF FeatureSetCombination OPTIONAL,

lateNonCriticalExtension OCTET STRING (CONTAINING UE-NR-Capability-v15c0) OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1530 OPTIONAL

}

-- Regular non-critical extensions:

UE-NR-Capability-v1530 ::= SEQUENCE {

fdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

tdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

dummy ENUMERATED {supported} OPTIONAL,

interRAT-Parameters InterRAT-Parameters OPTIONAL,

inactiveState ENUMERATED {supported} OPTIONAL,

delayBudgetReporting ENUMERATED {supported} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1540 OPTIONAL

}

UE-NR-Capability-v1540 ::= SEQUENCE {

sdap-Parameters SDAP-Parameters OPTIONAL,

overheatingInd ENUMERATED {supported} OPTIONAL,

ims-Parameters IMS-Parameters OPTIONAL,

fr1-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

fr2-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

fr1-fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1550 OPTIONAL

}

UE-NR-Capability-v1550 ::= SEQUENCE {

reducedCP-Latency ENUMERATED {supported} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1560 OPTIONAL

}

UE-NR-Capability-v1560 ::= SEQUENCE {

nrdc-Parameters NRDC-Parameters OPTIONAL,

receivedFilters OCTET STRING (CONTAINING UECapabilityEnquiry-v1560-IEs) OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1570 OPTIONAL

}

UE-NR-Capability-v1570 ::= SEQUENCE {

nrdc-Parameters-v1570 NRDC-Parameters-v1570 OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1610 OPTIONAL

}

-- Late non-critical extensions:

UE-NR-Capability-v15c0 ::= SEQUENCE {

nrdc-Parameters-v15c0 NRDC-Parameters-v15c0 OPTIONAL,

partialFR2-FallbackRX-Req ENUMERATED {true} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v15g0 OPTIONAL

}

UE-NR-Capability-v15g0 ::= SEQUENCE {

rf-Parameters-v15g0 RF-Parameters-v15g0 OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- Regular non-critical extensions:

UE-NR-Capability-v1610 ::= SEQUENCE {

inDeviceCoexInd-r16 ENUMERATED {supported} OPTIONAL,

dl-DedicatedMessageSegmentation-r16 ENUMERATED {supported} OPTIONAL,

nrdc-Parameters-v1610 NRDC-Parameters-v1610 OPTIONAL,

powSav-Parameters-r16 PowSav-Parameters-r16 OPTIONAL,

fr1-Add-UE-NR-Capabilities-v1610 UE-NR-CapabilityAddFRX-Mode-v1610 OPTIONAL,

fr2-Add-UE-NR-Capabilities-v1610 UE-NR-CapabilityAddFRX-Mode-v1610 OPTIONAL,

bh-RLF-Indication-r16 ENUMERATED {supported} OPTIONAL,

directSN-AdditionFirstRRC-IAB-r16 ENUMERATED {supported} OPTIONAL,

bap-Parameters-r16 BAP-Parameters-r16 OPTIONAL,

referenceTimeProvision-r16 ENUMERATED {supported} OPTIONAL,

sidelinkParameters-r16 SidelinkParameters-r16 OPTIONAL,

highSpeedParameters-r16 HighSpeedParameters-r16 OPTIONAL,

mac-Parameters-v1610 MAC-Parameters-v1610 OPTIONAL,

mcgRLF-RecoveryViaSCG-r16 ENUMERATED {supported} OPTIONAL,

resumeWithStoredMCG-SCells-r16 ENUMERATED {supported} OPTIONAL,

resumeWithStoredSCG-r16 ENUMERATED {supported} OPTIONAL,

resumeWithSCG-Config-r16 ENUMERATED {supported} OPTIONAL,

ue-BasedPerfMeas-Parameters-r16 UE-BasedPerfMeas-Parameters-r16 OPTIONAL,

son-Parameters-r16 SON-Parameters-r16 OPTIONAL,

onDemandSIB-Connected-r16 ENUMERATED {supported} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1640 OPTIONAL

}

UE-NR-Capability-v1640 ::= SEQUENCE {

redirectAtResumeByNAS-r16 ENUMERATED {supported} OPTIONAL,

phy-ParametersSharedSpectrumChAccess-r16 Phy-ParametersSharedSpectrumChAccess-r16 OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1650 OPTIONAL

}

UE-NR-Capability-v1650 ::= SEQUENCE {

mpsPriorityIndication-r16 ENUMERATED {supported} OPTIONAL,

highSpeedParameters-v1650 HighSpeedParameters-v1650 OPTIONAL,

nonCriticalExtension UE-NR-Capability-v17xy OPTIONAL

}

UE-NR-Capability-v17xy ::= SEQUENCE {

nrdc-Parameters-v17xy NRDC-Parameters-v17xy OPTIONAL,

bap-Parameters-r17 BAP-Parameters-r17 OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

UE-NR-CapabilityAddXDD-Mode ::= SEQUENCE {

phy-ParametersXDD-Diff Phy-ParametersXDD-Diff OPTIONAL,

mac-ParametersXDD-Diff MAC-ParametersXDD-Diff OPTIONAL,

measAndMobParametersXDD-Diff MeasAndMobParametersXDD-Diff OPTIONAL

}

UE-NR-CapabilityAddXDD-Mode-v1530 ::= SEQUENCE {

eutra-ParametersXDD-Diff EUTRA-ParametersXDD-Diff

}

UE-NR-CapabilityAddFRX-Mode ::= SEQUENCE {

phy-ParametersFRX-Diff Phy-ParametersFRX-Diff OPTIONAL,

measAndMobParametersFRX-Diff MeasAndMobParametersFRX-Diff OPTIONAL

}

UE-NR-CapabilityAddFRX-Mode-v1540 ::= SEQUENCE {

ims-ParametersFRX-Diff IMS-ParametersFRX-Diff OPTIONAL

}

UE-NR-CapabilityAddFRX-Mode-v1610 ::= SEQUENCE {

powSav-ParametersFRX-Diff-r16 PowSav-ParametersFRX-Diff-r16 OPTIONAL,

mac-ParametersFRX-Diff-r16 MAC-ParametersFRX-Diff-r16 OPTIONAL

}

BAP-Parameters-r16 ::= SEQUENCE {

flowControlBH-RLC-ChannelBased-r16 ENUMERATED {supported} OPTIONAL,

flowControlRouting-ID-Based-r16 ENUMERATED {supported} OPTIONAL

}

BAP-Parameters-r17 ::= SEQUENCE {

bhRLF-DetectionRecoveryIndication-r17 ENUMERATED {supported} OPTIONAL,

bapHeaderRewriting-InterDonorCURouting-r17 ENUMERATED {supported} OPTIONAL,

}

-- TAG-UE-NR-CAPABILITY-STOP

-- ASN1STOP

|  |
| --- |
| *UE-NR-Capability* field descriptions |
| ***featureSetCombinations***  A list of *FeatureSetCombination:s* for *supportedBandCombinationList* in *UE-NR-Capability*. The *FeatureSetDownlink:s* and *FeatureSetUplink:s* referred to from these *FeatureSetCombination:s* are defined in the *featureSets* list in *UE-NR-Capability*. |

|  |
| --- |
| *UE-NR-Capability-v1540 field descriptions* |
| ***fr1-fr2-Add-UE-NR-Capabilities***  This instance of *UE-NR-CapabilityAddFRX-Mode* does not include any other fields than *csi-RS-IM-ReceptionForFeedback*/ *csi-RS-ProcFrameworkForSRS*/ *csi-ReportFramework*. |

NEXT CHANGE

### 6.3.4 Other information elements

<Text omitted>

#### – *DedicatedInfoF1c*

The IE *DedicatedInfoF1c* is used to transfer IAB-DU specific F1-C related information between the network and the IAB node. The carried information consists of F1AP message encapsulated in SCTP/IP or F1-C related (SCTP)/IP packet, see TS 38.472 [X]. The RRC layer is transparent for this information.

*DedicatedInfoF1c* information element

-- ASN1START

-- TAG-DEDICATEDINFOF1C-START

DedicatedInfoF1c-r17 ::= OCTET STRING

-- TAG-DEDICATEDINFOF1C -STOP

-- ASN1STOP

NEXT CHANGE

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

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

maxAI-DCI-PayloadSize-r16 INTEGER ::= 128 --Maximum size of the DCI payload scrambled with ai-RNTI

maxAI-DCI-PayloadSize-1-r16 INTEGER ::= 127 --Maximum size of the DCI payload scrambled with ai-RNTI minus 1

maxBandComb INTEGER ::= 65536 -- Maximum number of DL band combinations

maxBandsUTRA-FDD-r16 INTEGER ::= 64 -- Maximum number of bands listed in UTRA-FDD UE caps

maxBH-RLC-ChannelID-r16 INTEGER ::= 65536 -- Maximum value of BH RLC Channel ID

maxBT-IdReport-r16 INTEGER ::= 32 -- Maximum number of Bluetooth IDs to report

maxBT-Name-r16 INTEGER ::= 4 -- Maximum number of Bluetooth name

maxCAG-Cell-r16 INTEGER ::= 16 -- Maximum number of NR CAG cell ranges in SIB3, SIB4

maxTwoPUCCH-Grp-ConfigList-r16 INTEGER ::= 32 -- Maximum number of supported configuration(s) of {primary PUCCH group

-- config, secondary PUCCH group config}

maxCBR-Config-r16 INTEGER ::= 8 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control

maxCBR-Config-1-r16 INTEGER ::= 7 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control minus 1

maxCBR-Level-r16 INTEGER ::= 16 -- Maximum number of CBR levels

maxCBR-Level-1-r16 INTEGER ::= 15 -- Maximum number of CBR levels minus 1

maxCellBlack INTEGER ::= 16 -- Maximum number of NR blacklisted cell ranges in SIB3, SIB4

maxCellGroupings-r16 INTEGER ::= 32 -- Maximum number of cell groupings for NR-DC

maxCellHistory-r16 INTEGER ::= 16 -- Maximum number of visited cells reported

maxCellInter INTEGER ::= 16 -- Maximum number of inter-Freq cells listed in SIB4

maxCellIntra INTEGER ::= 16 -- Maximum number of intra-Freq cells listed in SIB3

maxCellMeasEUTRA INTEGER ::= 32 -- Maximum number of cells in E-UTRAN

maxCellMeasIdle-r16 INTEGER ::= 8 -- Maximum number of cells per carrier for idle/inactive measurements

maxCellMeasUTRA-FDD-r16 INTEGER ::= 32 -- Maximum number of cells in FDD UTRAN

maxCellWhite INTEGER ::= 16 -- Maximum number of NR whitelisted cell ranges in SIB3, SIB4

maxEARFCN INTEGER ::= 262143 -- Maximum value of E-UTRA carrier frequency

maxEUTRA-CellBlack INTEGER ::= 16 -- Maximum number of E-UTRA blacklisted physical cell identity ranges

-- in SIB5

maxEUTRA-NS-Pmax INTEGER ::= 8 -- Maximum number of NS and P-Max values per band

maxLogMeasReport-r16 INTEGER ::= 520 -- Maximum number of entries for logged measurements

maxMultiBands INTEGER ::= 8 -- Maximum number of additional frequency bands that a cell belongs to

maxNARFCN INTEGER ::= 3279165 -- Maximum value of NR carrier frequency

maxNR-NS-Pmax INTEGER ::= 8 -- Maximum number of NS and P-Max values per band

maxFreqIdle-r16 INTEGER ::= 8 -- Maximum number of carrier frequencies for idle/inactive measurements

maxNrofServingCells INTEGER ::= 32 -- Max number of serving cells (SpCells + SCells)

maxNrofServingCells-1 INTEGER ::= 31 -- Max number of serving cells (SpCells + SCells) minus 1

maxNrofAggregatedCellsPerCellGroup INTEGER ::= 16

maxNrofAggregatedCellsPerCellGroupMinus4-r16 INTEGER ::= 12

maxNrofDUCells-r16 INTEGER ::= 512 -- Max number of cells configured on the collocated IAB-DU

maxNrofAvailabilityCombinationsPerSet-r16 INTEGER ::= 512 -- Max number of AvailabilityCombinationId used in the DCI format 2\_5

maxNrofAvailabilityCombinationsPerSet-1-r16 INTEGER ::= 511 -- Max number of AvailabilityCombinationId used in the DCI format 2\_5 minus 1

maxNrofSCells INTEGER ::= 31 -- Max number of secondary serving cells per cell group

maxNrofCellMeas INTEGER ::= 32 -- Maximum number of entries in each of the cell lists in a measurement object

maxNrofCG-SL-r16 INTEGER ::= 8 -- Max number of sidelink configured grant

maxNrofCG-SL-1-r16 INTEGER ::= 7 -- Max number of sidelink configured grant minus 1

maxNrofSS-BlocksToAverage INTEGER ::= 16 -- Max number for the (max) number of SS blocks to average to determine cell measurement

maxNrofCondCells-r16 INTEGER ::= 8 -- Max number of conditional candidate SpCells

maxNrofCSI-RS-ResourcesToAverage INTEGER ::= 16 -- Max number for the (max) number of CSI-RS to average to determine cell measurement

maxNrofDL-Allocations INTEGER ::= 16 -- Maximum number of PDSCH time domain resource allocations

maxNrofSR-ConfigPerCellGroup INTEGER ::= 8 -- Maximum number of SR configurations per cell group

maxLCG-ID INTEGER ::= 7 -- Maximum value of LCG ID

maxLCG-ID-IAB-r17 INTEGER ::= 255 -- Maximum value of LCG ID for IAB-MT

maxLC-ID INTEGER ::= 32 -- Maximum value of Logical Channel ID

maxLC-ID-Iab-r16 INTEGER ::= 65855 -- Maximum value of BH Logical Channel ID extension

maxLTE-CRS-Patterns-r16 INTEGER ::= 3 -- Maximum number of additional LTE CRS rate matching patterns

maxNrofTAGs INTEGER ::= 4 -- Maximum number of Timing Advance Groups

maxNrofTAGs-1 INTEGER ::= 3 -- Maximum number of Timing Advance Groups minus 1

maxNrofBWPs INTEGER ::= 4 -- Maximum number of BWPs per serving cell

maxNrofCombIDC INTEGER ::= 128 -- Maximum number of reported MR-DC combinations for IDC

maxNrofSymbols-1 INTEGER ::= 13 -- Maximum index identifying a symbol within a slot (14 symbols, indexed from 0..13)

maxNrofSlots INTEGER ::= 320 -- Maximum number of slots in a 10 ms period

maxNrofSlots-1 INTEGER ::= 319 -- Maximum number of slots in a 10 ms period minus 1

maxNrofPhysicalResourceBlocks INTEGER ::= 275 -- Maximum number of PRBs

maxNrofPhysicalResourceBlocks-1 INTEGER ::= 274 -- Maximum number of PRBs minus 1

maxNrofPhysicalResourceBlocksPlus1 INTEGER ::= 276 -- Maximum number of PRBs plus 1

maxNrofControlResourceSets INTEGER ::= 12 -- Max number of CoReSets configurable on a serving cell

maxNrofControlResourceSets-1 INTEGER ::= 11 -- Max number of CoReSets configurable on a serving cell minus 1

maxNrofControlResourceSets-1-r16 INTEGER ::= 15 -- Max number of CoReSets configurable on a serving cell extended in minus 1

maxNrofCoresetPools-r16 INTEGER ::= 2 -- Maximum number of CORESET pools

maxCoReSetDuration INTEGER ::= 3 -- Max number of OFDM symbols in a control resource set

maxNrofSearchSpaces-1 INTEGER ::= 39 -- Max number of Search Spaces minus 1

maxSFI-DCI-PayloadSize INTEGER ::= 128 -- Max number payload of a DCI scrambled with SFI-RNTI

maxSFI-DCI-PayloadSize-1 INTEGER ::= 127 -- Max number payload of a DCI scrambled with SFI-RNTI minus 1

maxIAB-IP-Address-r16 INTEGER ::= 32 -- Max number of assigned IP addresses

maxINT-DCI-PayloadSize INTEGER ::= 126 -- Max number payload of a DCI scrambled with INT-RNTI

maxINT-DCI-PayloadSize-1 INTEGER ::= 125 -- Max number payload of a DCI scrambled with INT-RNTI minus 1

maxNrofRateMatchPatterns INTEGER ::= 4 -- Max number of rate matching patterns that may be configured

maxNrofRateMatchPatterns-1 INTEGER ::= 3 -- Max number of rate matching patterns that may be configured minus 1

maxNrofRateMatchPatternsPerGroup INTEGER ::= 8 -- Max number of rate matching patterns that may be configured in one group

maxNrofCSI-ReportConfigurations INTEGER ::= 48 -- Maximum number of report configurations

maxNrofCSI-ReportConfigurations-1 INTEGER ::= 47 -- Maximum number of report configurations minus 1

maxNrofCSI-ResourceConfigurations INTEGER ::= 112 -- Maximum number of resource configurations

maxNrofCSI-ResourceConfigurations-1 INTEGER ::= 111 -- Maximum number of resource configurations minus 1

maxNrofAP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrOfCSI-AperiodicTriggers INTEGER ::= 128 -- Maximum number of triggers for aperiodic CSI reporting

maxNrofReportConfigPerAperiodicTrigger INTEGER ::= 16 -- Maximum number of report configurations per trigger state for aperiodic reporting

maxNrofNZP-CSI-RS-Resources INTEGER ::= 192 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources

maxNrofNZP-CSI-RS-Resources-1 INTEGER ::= 191 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources minus 1

maxNrofNZP-CSI-RS-ResourcesPerSet INTEGER ::= 64 -- Maximum number of NZP CSI-RS resources per resource set

maxNrofNZP-CSI-RS-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-RS resource sets per cell

maxNrofNZP-CSI-RS-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-RS resource sets per cell minus 1

maxNrofNZP-CSI-RS-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of resource sets per resource configuration

maxNrofNZP-CSI-RS-ResourcesPerConfig INTEGER ::= 128 -- Maximum number of resources per resource configuration

maxNrofZP-CSI-RS-Resources INTEGER ::= 32 -- Maximum number of Zero-Power (ZP) CSI-RS resources

maxNrofZP-CSI-RS-Resources-1 INTEGER ::= 31 -- Maximum number of Zero-Power (ZP) CSI-RS resources minus 1

maxNrofZP-CSI-RS-ResourceSets-1 INTEGER ::= 15

maxNrofZP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrofZP-CSI-RS-ResourceSets INTEGER ::= 16

maxNrofCSI-IM-Resources INTEGER ::= 32 -- Maximum number of CSI-IM resources

maxNrofCSI-IM-Resources-1 INTEGER ::= 31 -- Maximum number of CSI-IM resources minus 1

maxNrofCSI-IM-ResourcesPerSet INTEGER ::= 8 -- Maximum number of CSI-IM resources per set

maxNrofCSI-IM-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-IM resource sets per cell

maxNrofCSI-IM-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-IM resource sets per cell minus 1

maxNrofCSI-IM-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of CSI IM resource sets per resource configuration

maxNrofCSI-SSB-ResourcePerSet INTEGER ::= 64 -- Maximum number of SSB resources in a resource set

maxNrofCSI-SSB-ResourceSets INTEGER ::= 64 -- Maximum number of CSI SSB resource sets per cell

maxNrofCSI-SSB-ResourceSets-1 INTEGER ::= 63 -- Maximum number of CSI SSB resource sets per cell minus 1

maxNrofCSI-SSB-ResourceSetsPerConfig INTEGER ::= 1 -- Maximum number of CSI SSB resource sets per resource configuration

maxNrofFailureDetectionResources INTEGER ::= 10 -- Maximum number of failure detection resources

maxNrofFailureDetectionResources-1 INTEGER ::= 9 -- Maximum number of failure detection resources minus 1

maxNrofFreqSL-r16 INTEGER ::= 8 -- Maximum number of carrier frequency for NR sidelink communication

maxNrofSL-BWPs-r16 INTEGER ::= 4 -- Maximum number of BWP for NR sidelink communication

maxFreqSL-EUTRA-r16 INTEGER ::= 8 -- Maximum number of EUTRA anchor carrier frequency for NR sidelink communication

maxNrofSL-MeasId-r16 INTEGER ::= 64 -- Maximum number of sidelink measurement identity (RSRP) per destination

maxNrofSL-ObjectId-r16 INTEGER ::= 64 -- Maximum number of sidelink measurement objects (RSRP) per destination

maxNrofSL-ReportConfigId-r16 INTEGER ::= 64 -- Maximum number of sidelink measurement reporting configuration(RSRP) per destination

maxNrofSL-PoolToMeasureNR-r16 INTEGER ::= 8 -- Maximum number of resource pool for NR sidelink measurement to measure for

-- each measurement object (for CBR)

maxFreqSL-NR-r16 INTEGER ::= 8 -- Maximum number of NR anchor carrier frequency for NR sidelink communication

maxNrofSL-QFIs-r16 INTEGER ::= 2048 -- Maximum number of QoS flow for NR sidelink communication per UE

maxNrofSL-QFIsPerDest-r16 INTEGER ::= 64 -- Maximum number of QoS flow per destination for NR sidelink communication

maxNrofObjectId INTEGER ::= 64 -- Maximum number of measurement objects

maxNrofPageRec INTEGER ::= 32 -- Maximum number of page records

maxNrofPCI-Ranges INTEGER ::= 8 -- Maximum number of PCI ranges

maxPLMN INTEGER ::= 12 -- Maximum number of PLMNs broadcast and reported by UE at establishment

maxNrofCSI-RS-ResourcesRRM INTEGER ::= 96 -- Maximum number of CSI-RS resources per cell for an RRM measurement object

maxNrofCSI-RS-ResourcesRRM-1 INTEGER ::= 95 -- Maximum number of CSI-RS resources per cell for an RRM measurement object minus 1

maxNrofMeasId INTEGER ::= 64 -- Maximum number of configured measurements

maxNrofQuantityConfig INTEGER ::= 2 -- Maximum number of quantity configurations

maxNrofCSI-RS-CellsRRM INTEGER ::= 96 -- Maximum number of cells with CSI-RS resources for an RRM measurement object

maxNrofSL-Dest-r16 INTEGER ::= 32 -- Maximum number of destination for NR sidelink communication

maxNrofSL-Dest-1-r16 INTEGER ::= 31 -- Highest index of destination for NR sidelink communication

maxNrofSLRB-r16 INTEGER ::= 512 -- Maximum number of radio bearer for NR sidelink communication per UE

maxSL-LCID-r16 INTEGER ::= 512 -- Maximum number of RLC bearer for NR sidelink communication per UE

maxSL-SyncConfig-r16 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations

maxNrofRXPool-r16 INTEGER ::= 16 -- Maximum number of Rx resource pool for NR sidelink communication

maxNrofTXPool-r16 INTEGER ::= 8 -- Maximum number of Tx resource pool for NR sidelink communication

maxNrofPoolID-r16 INTEGER ::= 16 -- Maximum index of resource pool for NR sidelink communication

maxNrofSRS-PathlossReferenceRS-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for SRS power control.

maxNrofSRS-PathlossReferenceRS-1-r16 INTEGER ::= 63 -- Maximum number of RSs used as pathloss reference for SRS power control minus 1.

maxNrofSRS-ResourceSets INTEGER ::= 16 -- Maximum number of SRS resource sets in a BWP.

maxNrofSRS-ResourceSets-1 INTEGER ::= 15 -- Maximum number of SRS resource sets in a BWP minus 1.

maxNrofSRS-PosResourceSets-r16 INTEGER ::= 16 -- Maximum number of SRS Positioning resource sets in a BWP.

maxNrofSRS-PosResourceSets-1-r16 INTEGER ::= 15 -- Maximum number of SRS Positioning resource sets in a BWP minus 1.

maxNrofSRS-Resources INTEGER ::= 64 -- Maximum number of SRS resources.

maxNrofSRS-Resources-1 INTEGER ::= 63 -- Maximum number of SRS resources minus 1.

maxNrofSRS-PosResources-r16 INTEGER ::= 64 -- Maximum number of SRS Positioning resources.

maxNrofSRS-PosResources-1-r16 INTEGER ::= 63 -- Maximum number of SRS Positioning resources in an SRS Positioning

-- resource set minus 1.

maxNrofSRS-ResourcesPerSet INTEGER ::= 16 -- Maximum number of SRS resources in an SRS resource set

maxNrofSRS-TriggerStates-1 INTEGER ::= 3 -- Maximum number of SRS trigger states minus 1, i.e., the largest code point.

maxNrofSRS-TriggerStates-2 INTEGER ::= 2 -- Maximum number of SRS trigger states minus 2.

maxRAT-CapabilityContainers INTEGER ::= 8 -- Maximum number of interworking RAT containers (incl NR and MRDC)

maxSimultaneousBands INTEGER ::= 32 -- Maximum number of simultaneously aggregated bands

maxULTxSwitchingBandPairs INTEGER ::= 32 -- Maximum number of band pairs supporting dynamic UL Tx switching in a band combination

maxNrofSlotFormatCombinationsPerSet INTEGER ::= 512 -- Maximum number of Slot Format Combinations in a SF-Set.

maxNrofSlotFormatCombinationsPerSet-1 INTEGER ::= 511 -- Maximum number of Slot Format Combinations in a SF-Set minus 1.

maxNrofTrafficPattern-r16 INTEGER ::= 8 -- Maximum number of Traffic Pattern for NR sidelink communication.

maxNrofPUCCH-Resources INTEGER ::= 128

maxNrofPUCCH-Resources-1 INTEGER ::= 127

maxNrofPUCCH-ResourceSets INTEGER ::= 4 -- Maximum number of PUCCH Resource Sets

maxNrofPUCCH-ResourceSets-1 INTEGER ::= 3 -- Maximum number of PUCCH Resource Sets minus 1.

maxNrofPUCCH-ResourcesPerSet INTEGER ::= 32 -- Maximum number of PUCCH Resources per PUCCH-ResourceSet

maxNrofPUCCH-P0-PerSet INTEGER ::= 8 -- Maximum number of P0-pucch present in a p0-pucch set

maxNrofPUCCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUCCH power control.

maxNrofPUCCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUCCH power control minus 1.

maxNrofPUCCH-PathlossReferenceRSs-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for PUCCH power control extended.

maxNrofPUCCH-PathlossReferenceRSs-1-r16 INTEGER ::= 63 -- Maximum number of RSs used as pathloss reference for PUCCH power control

-- minus 1 extended.

maxNrofPUCCH-PathlossReferenceRSsDiff-r16 INTEGER ::= 60 -- Difference between the extended maximum and the non-extended maximum

maxNrofPUCCH-ResourceGroups-r16 INTEGER ::= 4 -- Maximum number of PUCCH resources groups.

maxNrofPUCCH-ResourcesPerGroup-r16 INTEGER ::= 128 -- Maximum number of PUCCH resources in a PUCCH group.

maxNrofMultiplePUSCHs-r16 INTEGER ::= 8 -- Maximum number of multiple PUSCHs in PUSCH TDRA list

maxNrofP0-PUSCH-AlphaSets INTEGER ::= 30 -- Maximum number of P0-pusch-alpha-sets (see TS 38.213 [13], clause 7.1)

maxNrofP0-PUSCH-AlphaSets-1 INTEGER ::= 29 -- Maximum number of P0-pusch-alpha-sets minus 1 (see TS 38.213 [13], clause 7.1)

maxNrofPUSCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUSCH power control.

maxNrofPUSCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUSCH power control minus 1.

maxNrofPUSCH-PathlossReferenceRSs-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for PUSCH power control extended

maxNrofPUSCH-PathlossReferenceRSs-1-r16 INTEGER ::= 63 -- Maximum number of RSs used as pathloss reference for PUSCH power control

-- extended minus 1

maxNrofPUSCH-PathlossReferenceRSsDiff-r16 INTEGER ::= 60 -- Difference between maxNrofPUSCH-PathlossReferenceRSs-r16 and

-- maxNrofPUSCH-PathlossReferenceRSs

maxNrofNAICS-Entries INTEGER ::= 8 -- Maximum number of supported NAICS capability set

maxBands INTEGER ::= 1024 -- Maximum number of supported bands in UE capability.

maxBandsMRDC INTEGER ::= 1280

maxBandsEUTRA INTEGER ::= 256

maxCellReport INTEGER ::= 8

maxDRB INTEGER ::= 29 -- Maximum number of DRBs (that can be added in DRB-ToAddModList).

maxFreq INTEGER ::= 8 -- Max number of frequencies.

maxFreqLayers INTEGER ::= 4 -- Max number of frequency layers.

maxFreqIDC-r16 INTEGER ::= 128 -- Max number of frequencies for IDC indication.

maxCombIDC-r16 INTEGER ::= 128 -- Max number of reported UL CA for IDC indication.

maxFreqIDC-MRDC INTEGER ::= 32 -- Maximum number of candidate NR frequencies for MR-DC IDC indication

maxNrofCandidateBeams INTEGER ::= 16 -- Max number of PRACH-ResourceDedicatedBFR in BFR config.

maxNrofCandidateBeams-r16 INTEGER ::= 64 -- Max number of candidate beam resources in BFR config.

maxNrofCandidateBeamsExt-r16 INTEGER ::= 48 -- Max number of PRACH-ResourceDedicatedBFR in the CandidateBeamRSListExt

maxNrofPCIsPerSMTC INTEGER ::= 64 -- Maximum number of PCIs per SMTC.

maxNrofQFIs INTEGER ::= 64

maxNrofResourceAvailabilityPerCombination-r16 INTEGER ::= 256

maxNrOfSemiPersistentPUSCH-Triggers INTEGER ::= 64 -- Maximum number of triggers for semi persistent reporting on PUSCH

maxNrofSR-Resources INTEGER ::= 8 -- Maximum number of SR resources per BWP in a cell.

maxNrofSlotFormatsPerCombination INTEGER ::= 256

maxNrofSpatialRelationInfos INTEGER ::= 8

maxNrofSpatialRelationInfos-plus-1 INTEGER ::= 9

maxNrofSpatialRelationInfos-r16 INTEGER ::= 64

maxNrofSpatialRelationInfosDiff-r16 INTEGER ::= 56 -- Difference between maxNrofSpatialRelationInfos-r16 and maxNrofSpatialRelationInfos

maxNrofIndexesToReport INTEGER ::= 32

maxNrofIndexesToReport2 INTEGER ::= 64

maxNrofSSBs-r16 INTEGER ::= 64 -- Maximum number of SSB resources in a resource set.

maxNrofSSBs-1 INTEGER ::= 63 -- Maximum number of SSB resources in a resource set minus 1.

maxNrofS-NSSAI INTEGER ::= 8 -- Maximum number of S-NSSAI.

maxNrofTCI-StatesPDCCH INTEGER ::= 64

maxNrofTCI-States INTEGER ::= 128 -- Maximum number of TCI states.

maxNrofTCI-States-1 INTEGER ::= 127 -- Maximum number of TCI states minus 1.

maxNrofUL-Allocations INTEGER ::= 16 -- Maximum number of PUSCH time domain resource allocations.

maxQFI INTEGER ::= 63

maxRA-CSIRS-Resources INTEGER ::= 96

maxRA-OccasionsPerCSIRS INTEGER ::= 64 -- Maximum number of RA occasions for one CSI-RS

maxRA-Occasions-1 INTEGER ::= 511 -- Maximum number of RA occasions in the system

maxRA-SSB-Resources INTEGER ::= 64

maxSCSs INTEGER ::= 5

maxSecondaryCellGroups INTEGER ::= 3

maxNrofServingCellsEUTRA INTEGER ::= 32

maxMBSFN-Allocations INTEGER ::= 8

maxNrofMultiBands INTEGER ::= 8

maxCellSFTD INTEGER ::= 3 -- Maximum number of cells for SFTD reporting

maxReportConfigId INTEGER ::= 64

maxNrofCodebooks INTEGER ::= 16 -- Maximum number of codebooks supported by the UE

maxNrofCSI-RS-ResourcesExt-r16 INTEGER ::= 16 -- Maximum number of codebook resources supported by the UE for eType2/Codebook combo

maxNrofCSI-RS-Resources INTEGER ::= 7 -- Maximum number of codebook resources supported by the UE

maxNrofCSI-RS-ResourcesAlt-r16 INTEGER ::= 512 -- Maximum number of alternative codebook resources supported by the UE

maxNrofCSI-RS-ResourcesAlt-1-r16 INTEGER ::= 511 -- Maximum number of alternative codebook resources supported by the UE minus 1

maxNrofSRI-PUSCH-Mappings INTEGER ::= 16

maxNrofSRI-PUSCH-Mappings-1 INTEGER ::= 15

maxSIB INTEGER::= 32 -- Maximum number of SIBs

maxSI-Message INTEGER::= 32 -- Maximum number of SI messages

maxPO-perPF INTEGER ::= 4 -- Maximum number of paging occasion per paging frame

maxAccessCat-1 INTEGER ::= 63 -- Maximum number of Access Categories minus 1

maxBarringInfoSet INTEGER ::= 8 -- Maximum number of access control parameter sets

maxCellEUTRA INTEGER ::= 8 -- Maximum number of E-UTRA cells in SIB list

maxEUTRA-Carrier INTEGER ::= 8 -- Maximum number of E-UTRA carriers in SIB list

maxPLMNIdentities INTEGER ::= 8 -- Maximum number of PLMN identities in RAN area configurations

maxDownlinkFeatureSets INTEGER ::= 1024 -- (for NR DL) Total number of FeatureSets (size of the pool)

maxUplinkFeatureSets INTEGER ::= 1024 -- (for NR UL) Total number of FeatureSets (size of the pool)

maxEUTRA-DL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxEUTRA-UL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxFeatureSetsPerBand INTEGER ::= 128 -- (for NR) The number of feature sets associated with one band.

maxPerCC-FeatureSets INTEGER ::= 1024 -- (for NR) Total number of CC-specific FeatureSets (size of the pool)

maxFeatureSetCombinations INTEGER ::= 1024 -- (for MR-DC/NR)Total number of Feature set combinations (size of the pool)

maxInterRAT-RSTD-Freq INTEGER ::= 3

maxHRNN-Len-r16 INTEGER ::= 48 -- Maximum length of HRNNs

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

maxNrOfMinSchedulingOffsetValues-r16 INTEGER ::= 2 -- Maximum number of min. scheduling offset (K0/K2) configurations

maxK0-SchedulingOffset-r16 INTEGER ::= 16 -- Maximum number of slots configured as min. scheduling offset (K0)

maxK2-SchedulingOffset-r16 INTEGER ::= 16 -- Maximum number of slots configured as min. scheduling offset (K2)

maxDCI-2-6-Size-r16 INTEGER ::= 140 -- Maximum size of DCI format 2-6

maxDCI-2-6-Size-1-r16 INTEGER ::= 139 -- Maximum DCI format 2-6 size minus 1

maxNrofUL-Allocations-r16 INTEGER ::= 64 -- Maximum number of PUSCH time domain resource allocations

maxNrofP0-PUSCH-Set-r16 INTEGER ::= 2 -- Maximum number of P0 PUSCH set(s)

maxOnDemandSIB-r16 INTEGER ::= 8 -- Maximum number of SIB(s) that can be requested on-demand

maxOnDemandPosSIB-r16 INTEGER ::= 32 -- Maximum number of posSIB(s) that can be requested on-demand

maxCI-DCI-PayloadSize-r16 INTEGER ::= 126 -- Maximum number of the DCI size for CI

maxCI-DCI-PayloadSize-1-r16 INTEGER ::= 125 -- Maximum number of the DCI size for CI minus 1

maxWLAN-Id-Report-r16 INTEGER ::= 32 -- Maximum number of WLAN IDs to report

maxWLAN-Name-r16 INTEGER ::= 4 -- Maximum number of WLAN name

maxRAReport-r16 INTEGER ::= 8 -- Maximum number of RA procedures information to be included in the RA report

maxTxConfig-r16 INTEGER ::= 64 -- Maximum number of sidelink transmission parameters configurations

maxTxConfig-1-r16 INTEGER ::= 63 -- Maximum number of sidelink transmission parameters configurations minus 1

maxPSSCH-TxConfig-r16 INTEGER ::= 16 -- Maximum number of PSSCH TX configurations

maxNrofCLI-RSSI-Resources-r16 INTEGER ::= 64 -- Maximum number of CLI-RSSI resources for UE

maxNrofCLI-RSSI-Resources-1-r16 INTEGER ::= 63 -- Maximum number of CLI-RSSI resources for UE minus 1

maxNrofCLI-SRS-Resources-r16 INTEGER ::= 32 -- Maximum number of SRS resources for CLI measurement for UE

maxCLI-Report-r16 INTEGER ::= 8

maxNrofConfiguredGrantConfig-r16 INTEGER ::= 12 -- Maximum number of configured grant configurations per BWP

maxNrofConfiguredGrantConfig-1-r16 INTEGER ::= 11 -- Maximum number of configured grant configurations per BWP minus 1

maxNrofCG-Type2DeactivationState INTEGER ::= 16 -- Maximum number of deactivation state for type 2 configured grants per BWP

maxNrofConfiguredGrantConfigMAC-1-r16 INTEGER ::= 31 -- Maximum number of configured grant configurations per MAC entity minus 1

maxNrofSPS-Config-r16 INTEGER ::= 8 -- Maximum number of SPS configurations per BWP

maxNrofSPS-Config-1-r16 INTEGER ::= 7 -- Maximum number of SPS configurations per BWP minus 1

maxNrofSPS-DeactivationState INTEGER ::= 16 -- Maximum number of deactivation state for SPS per BWP

maxNrofDormancyGroups INTEGER ::= 5 --

maxNrofPUCCH-ResourceGroups-1-r16 INTEGER ::= 3 --

maxNrofServingCellsTCI-r16 INTEGER ::= 32 -- Maximum number of serving cells in simultaneousTCI-UpdateList

maxNrofTxDC-TwoCarrier-r16 INTEGER ::= 64 -- Maximum number of UL Tx DC locations reported by the UE for 2CC uplink CA

maxNrofRbSetGroups-r17 INTEGER ::= FFS -- Maximum number of RB set groups

maxNrofRbSets-r17 INTEGER ::= FFS -- Maximum number of RB sets

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

-- ASN1STOP

END OF CHANGE

# Annex – RAN2 agreements up to RAN2#115e

Highlighted in yellow the agreements with direct impact in the specification.

## 1 RAN2#112

### 1.1 Enhancements to improve topology-wide fairness multi-hop latency and congestion mitigation

* Consider enhancements to topology adaptation that improve:

Robustness, e.g., to rapid shadowing,

service-interruption,

load balancing among different IAB-nodes, IAB-donor-DUs and IAB-donor-CUs, and

reduction in signaling load.

* RAN2 to discuss enhancements to RLF indication/handling with the focus on the reduction of service interruption after BH RLF.
* CHO and potential IAB-specific enhancements of CHO is on the table.
* DAPS and potential IAB-specific enhancements of DAPS is not precluded for now (but as there is no PDCP it is not clear how to support DAPS).
* For message bundling, RAN2 at least wait for more progress to be made in RAN3 on topology adaptation procedures.
* RAN2 to discuss local rerouting, including the benefits over central route determination, and on how topology-wide objectives can beaddressed.

### 1.2 Topology adaptation enhancements

* Consider enhancements to topology adaptation that improve:

Robustness, e.g., to rapid shadowing,

service-interruption,

load balancing among different IAB-nodes, IAB-donor-DUs and IAB-donor-CUs, and

reduction in signaling load.

* RAN2 to discuss enhancements to RLF indication/handling with the focus on the reduction of service interruption after BH RLF.
* CHO and potential IAB-specific enhancements of CHO is on the table.
* DAPS and potential IAB-specific enhancements of DAPS is not precluded for now (but as there is no PDCP it is not clear how to support DAPS).
* For message bundling, RAN2 at least wait for more progress to be made in RAN3 on topology adaptation procedures.
* RAN2 to discuss local rerouting, including the benefits over central route determination, and on how topology-wide objectives can beaddressed.

## 2 RAN2#113

### 2.1 Enhancements to improve topology-wide fairness multi-hop latency and congestion mitigation

* RAN2 will not further discuss ways of evaluating success of any fairness mechanisms that may be introduced, beyond the already agreed definition of topology-wide fairness and its variants.
* Chair: On the agreed issues below, the agreement doesn’t mean that we have agreed that there need to be a solution for it in R17. Furthermore, liberal interpretation of the text is ok.
* ISSUES: eIAB work on topology-wide fairness will focus on the following issues

IF-1: The scheduler of an IAB node does not have all the information needed (e.g. link quality across multiple hops) to make appropriate upstream or downstream scheduling decisions which take into account the overall route link quality (such as e.g. using downstream link quality measurements to adjust the scheduling weights so as to achieve proportional fairness for different bearers/RLC channels across multiple child-IAB nodes)

IF-2: Congestion conditions on BH RLC channels carrying UE bearers with same or similar QoS requirements can be unbalanced and some channels may even be congested, thereby leading to some users experiencing longer latency and violating fairness requirement.

IF-4: IAB node cannot give more resource to those BH RLC CHs that aggregate more bearers and/or carry bearers with higher load per bearer (i.e. IAB node cannot give more resource to those BH RLC CHs with higher aggregate load)

* ISSUES: In the first instance, eIAB work on multi-hop latency will focus on the following issues:

IL-1: IAB node cannot help ensure that overall or remaining PDB is met for a packet (e.g. by prioritizing bearers with higher number of hops), as it does not have a latency reference for the packets being scheduled, resulting in packets with the same QoS requirement ending up with different latency

IL-2: IAB node may need to report joint buffer status for LCHs which have rather differing QoS requirements, due to the current (Rel-16) limit on the number of LCGs

IL-3: Buffer size calculation for pre-emptive BSR may differ for nodes of different vendors as it is left to implementation in Rel-16

IL-5: The CU is unable to put bearers with lower PDB on routes with less congestion risk (higher resource efficiency) or which are RLF-free

IL-6: The CU is unable to configure routing based on actual (real-time) latency per BH RLC channel

* R2 has concluded that there is sufficient interest among companies to address the following two issues:

IC-1: Long-term downstream congestion on a single link cannot be alleviated using existing Rel-16 DL HbH flow control mechanisms, without having to rely on dropping packets

IC-7: CU (not having knowledge of local congestion conditions) cannot update the routing path that is experiencing congestion.

* Both IC-1 and CI-7 are related to RAN3. RAN3 seems to also work on this, so to what extent R2 shall work on this is currently not clear.

### 2.2 Topology adaptation enhancements

* RAN2 to discuss CHO and start with intra-donor CHO until RAN3 has made progress on inter-donor IAB-node migration.
* R2 confirm the intention Rel-16 CHO is / can be used for IAB-MT (FFS whether any modification is needed).
* R2 assumes that Rel-16 specification is the baseline for the configuration of default route, IP address(es) and target path for intra-donor CHO.
* RAN2 to support type-2/3 RLF indication (FFS specified behavior(s) TS impact, FFS details).
* Type-2 RLF indication may be used to trigger local rerouting
* Type-2 RLF indication may be used to trigger deactivation of IAB-supported in SIB
* Type-2 RLF indication may be used to trigger deactivation or reduction of SR and/or BSR transmissions
* Local rerouting can be triggered by indication of hop-by-hop flow control. Further details, e.g., on trigger information, trigger conditions, role of CU configuration, are FFS.
* RAN2 considers inter-donor-DU local rerouting to be in scope

## 3 RAN2#113-bis

### 3.1 Enhancements to improve topology-wide fairness multi-hop latency and congestion mitigation

* LCG range to be extended for IAB-MT. Size of LCG and enhancements to BSR are FFS

### 3.2 Topology adaptation enhancements

**CHO:**

* The use cases for IAB-MT CHO should be migration and RLF recovery.
* RAN2 should have a common solution for intra-CU/intra-DU CHO and intra-CU/inter-DU CHO.
* condEventA3 and condEventA5 are applicable to IAB-MT
* FFS if other CHO execution condition is needed (e.g. whether type 2 RLF indication can be used as trigger)

**CP/UP separation:**

* SRB2 can be used for F1-C transport in CP/UP-separation scenario 1 (FFS other cases)
* Split SRB2 can be used for F1-C transport in CP/UP-separation scenario 2 (FFS other cases)

## 4 RAN2#114-e

### 4.1 Enhancements to improve topology-wide fairness multi-hop latency and congestion mitigation

No agreements on this topic

### 4.2 Topology adaptation enhancements

* RAN2 preference is to support inter-topology routing via BAP header rewriting based on BAP routing ID option 4
* Assume that the IAB-donor will configure (alternative) egress links that can be used at local re-routing (at least with same destination, FFS same routing ID)
* Local re-routing based on flow control feedback is allowed based on certain value of available buffer size. FFS further details. (Current hbh fc is for DL traffic.
* NR *DLInformationTransfer* and *ULInformationTransfer* messages can be enhanced to transfer F1-C related packets in CP/UP separation.
* A new IE named *DedicatedInfoF1c* can be defined to transfer F1-C related packets via NR RRC message
* F1-C over RRC and F1-C over BAP should not be supported simultaneously on the same parent link.
* The trigger to generate a type 2 RLF indication is at RLF detection. FFS whether for both: single and dual connection cases.
* The trigger for type 3 RLF indication transmission is successful recovery after BH RLF. FFS whether for both: single and dual connection cases.
* Type 2 and Type 3 BH RLF Indications are transmitted via BAP Control PDU.
* Upon reception of the type-2 indication, the IAB node does not initiate RRC re-establishment.
* If an IAB node with dual parents (via DC) receives type-2 BH RLF indication from one parent, IAB-node may trigger a local re-routing to the other parent. The detail of local re-routing and whether/how the action on type-2 indication is configurable is FFS.

## 5 RAN2#115-e

### 5.1 Enhancements to improve topology-wide fairness multi-hop latency and congestion mitigation

* The length of LCG to be extended to 8 bits (i.e., at most 256 LCGs).
* New Short (Truncated) BSR format to specified that has a fixed size and consists of an 8-bit LCG ID field and an 8-bit Buffer Size field.

### 5.2 Topology adaptation enhancements

* A configured threshold of available buffer size based on flow control feedback is used to determine the congestion, for the purpose of local re-routing.
* For intra-CU cases, Support inter-donor-DU re-routing at least in the scenarios of NR-DC among donor-DUs, inter-donor-DU recovery and inter-donor-DU migration.
* Support inter-CU re-routing, i.e. IAB-node re-routes the data to its original donor-CU via the alternative BAP path over the topology in target CU.
* For inter-donor-DU re-routing, support the “previous routing ID to new routing ID” BAP header rewriting.
* RAN2 to further discuss the open issues for inter-CU routing:

What’s the BAP address added in BAP header in the first topology (i.e. the BAP address of ingress data at the boundary node);

How to differentiate the concatenated traffic and non-concatenated traffic;

How to determine whether a data should be delivered to upper layer (for downstream);

How to determine whether the BAP header of a data should be rewritten (i.e. whether being routed to another topology or its own topology).

* As baseline, support the 1:1 and N:1 mapping from “previous routing ID” to “new routing ID” for BAP header rewriting at the boundary node, in inter-CU routing.

## 6 RAN2#116-e

* Support of Extended BSR by an IAB-MT is an optional capability.
* The same format is adopted for Extended Long and Extended Long Truncated BSR.
* Reserved values from the one-octet eLCID space are used to identify new Extended BSR formats.
* Extended LCG space (max 256 LCGs) shall also apply to pre-emptive BSR.
* Extended pre-emptive BSR format shall be identical to the Extended Long BSR format.
* When the Extended BSR is configured, the selection between Extended BSR and legacy BSR is not left to IAB-MT implementation.
* When the Extended BSR is configured, if the maximum LCGID among the configured LCGs is 7 or lower, legacy format is always sent; otherwise the Extended format is sent.
* The following format is adopted for Extended Long and Extended Long Truncated BSR: Fixed size of 256 LCGi followed by variable number of (fixed size) Buffer Size fields; related buffer size field is added only when the corresponding LCG bit is set to 1 in the bitmap.
* RAN2 will not attempt standardizing buffer size calculation for Rel-17 pre-emptive BSR, nor make any further effort to standardizing triggering of Rel-17 pre-emptive BSR.
* Type 2 indication by dual-connected node is triggered when the node initiates RRC re-establishment resulting from BH RLF on both CGs or BH RLF on MCG with no fast MCG recovery.
* A node can transmit type-3 indication if re-establishment is successful. FFS whether to specify a detailed condition for success of re-establishment, e.g., successful transmission of RRC reestablishment complete. FFS whether to also include additional triggering condition such as successful transmission of ReconfigurationComplete, which is for the case the node initiates re-establishment and selects a CHO candidate cell and hence performs CHO successfully.
* A node can transmit type-3 indication only if it previously sent type-2 indication, i.e., type-3 indication cannot be triggered without triggering type-2 indication previously.
* Upon reception of type-2 indication, the node should perform local re-routing if possible.
* Upon reception of type-3 indication, the actions (e.g. local re-routing) triggered upon reception of a previous type-2 indication should be reversed, if possible.
* FFS if Type 2 indication by dual-connected node can be triggered when the node detects BH RLF on any BH and it cannot perform re-routing for affected traffic (if agreed see R2-2111539 for more details)
* [032] For triggering condition of type-2 indication by a single-connected node, initiation of RRC re-establishment is a sufficient condition to trigger type-2 indication.
* [032] Proposal 5\_alt: If option 2) is chosen in P1 (i.e. dual-connected node triggers type 2 indication when the node detects BH RLF on any BH link) and option 2 is chosen in P7 (i.e. Received type-2 indication is further propagated),  type-2 indication sent by a single-connected node includes routing ID information indicating which routing IDs are not available. FFS whether inclusion of routing ID can be omitted in some cases. Otherwise, type-2 indication sent by a single-connected node does not carry any further information related to BH RLF.
* [032] Conditional mobility is not triggered by reception of type-2 indication.
* [032] For the need of further propagating received type-2 indication, FFS which option to take:

Option 1) Received type-2 indication is not propagated further (unless a normal type-2 triggering condition is met).

Option 2) Upon reception of type-2 indication, the node should further propagate type-2 indication to the child if it has no alternative path available.

* [032] RAN2 does not specify UL transmission constraints (e.g. SR/BSR) to a node receiving the type-2 indication, i.e., whether the node can transmit uplink transmission is left to implementation of the node and also up to scheduling policy of a node transmitting the type-2 indication. FFS whether we need to add a Note in stage-2/3 CR.
* [032] RAN2 does not specify that IAB-support indicator is toggled by reception of type-2 indication, i.e., when how to set IAB-support indicator it is up to implementation. FFS whether we need to add a Note in stage-2/3 CR.
* [032] To agree that the following terms are used:

-  Type-2:  “BH RLF detection indication”,

-  Type-3: “BH RLF recovery indication” , and

- Type-4: FFS whether “BH RLF recovery failure indication” or existing name “BH RLF indication”

* The configuration of F1-C traffic on the indication of the the leg(s) used for transferring the F1-C traffic is configured to IAB-MT by a new field , e.g., *f1c-TransferPath-r17* ENUMERATED {MCG, SCG, both}.
* As long as the BH RLC CH for F1-C on the indicated Cell Group is configured (the CG is indicated by the field *f1c-TransferPath-r17*), IAB node can be aware of whether to use F1-C transferring over BH or F1-C transferring over RRC, i.e. F1-C-over-BAP is selected as long as BH RLC CH for F1-C on the indicated CG is configured.
* It is not necessary for IAB-node to be aware whether the gNB allows “F1 over BAP” or only allows “F1-C over RRC” during cell (re)selection, in case the gNB broadcasts *iab-Support*.
* ONLY SRB2 is used for F1-C transport in CP/UP-separation scenario 1.
* ONLY split SRB2 is used for F1-C transport in CP/UP-separation scenario 2
* FFS if For IAB-MT’s RRC message that carries F1-C/F1-C related traffic, the IAB-MT use split SRB2 via SCG in scenario 2 if *f1c-TransferPath-r17* indicates ‘*SCG’* or ‘*both’* regardless of the *primaryPath* configuration. FFS on how to capture this in specs.
* FFS if In case the split SRB2 RRC message contains both F1-C traffic and other information unrelated to IAB, the IAB-MT follows the configuration of F1-C transfer path (if configured) to transmit this RRC message.

**Inter Topology Routing**

* Go with B, including the following:

- If BAP address matches, deliver to upper layer;

Else:

- If routing ID matches rewriting table, perform the header rewriting;

- perform routing and mapping to BH RLC CH.

* For downstream, the boundary node is able to identify/differentiate the traffic routed from inter-topology vs. the traffic routed from intra-topology, based on the ingress link.
* For downstream at the boundary node, for any received data from inter-topology identified by the ingress link:

The data is delivered to upper layer, if the BAP address in the header is same as the boundary node BAP address configured in the topology of the ingress link (of this packet); otherwise, the data is determined as to be header rewritten (assumes support only of topology where decedent nodes belong to same topology).

(This requires that traffic not terminated at the boundary node should not use the BAP address in header same as the boundary node BAP address configured in the topology of the ingress link.)

Perform the header rewriting based on the configured rewriting table, and then perform routing and mapping to BH RLC CH.

* For upstream at the boundary node, for any received data from lower layer:

We may keep the ingress BAP text of R16 (that is intended for donor DU but general in Stage-3), i.e. if the BAP address in header match the boundary node BAP address configured in the topology of the ingress link, deliver to upper layer.

The data is determined as to be header rewritten and perform the header rewriting accordingly, if routing ID in header matches any “previous routing ID” in the rewriting table; and then perform routing and mapping to BH RLC CH.

**Intra topology**

* For Upstream, The pre-condition/criteria of “BAP header rewriting for re-routing” is that there is no available next hop found based on BAP routing ID and based on BAP address in the routing table (e.g. due to BH RLF, congestion or type2 indication, etc.), as in R16.
* Will have rewriting mapping configuration(s) Old routing ID to New routing ID that limits the possible rewriting (for all cases of re-writing), details FFS

## 7 RAN2#116bis-e

### 7.1 RLF indication

* Type-2 indication by a dual-connected node is triggered when the node detects BH RLF on a BH link and it cannot perform re-routing for any traffic, i.e. NR RLF for ENDC scenario, (FFS UP Link RLF for CPUP split scenario 1).
* For these cases, the Type-2 indication is handled in the same way as for the case when both links goes down.
* FFS whether Type-2 is propagated further (for all its cases)

### 7.2 CP-UP separation

* The network is allowed to configure the primaryPath to SCG for the IAB-MT
* The IAB-MT should always follow the primary path configuration for all the RRC messages, regardless of whether F1-C information or IAB-unrelated information are contained

### 7.3 BAP routing

* For each topology, the BAP address is configured to the boundary node by the CU of that topology via RRC (may need to check different scenarios).
* In the Routing configuration: A BH link and the corresponding next-hop BAP address belong to the topology of the CU that provided the configuration of that BH link and next-hop BAP address.
* FFS if The routing entry is associated by configuration with the topology the entry applies to, e.g. by an explicit indicator.
* The header rewriting configuration is provided via F1AP.
* FFS if The header rewriting configuration to include an indicator, which identifies either the egress topology, or the ingress topology, or the traffic direction (RAN2 to select one of these three options).
* For the two scenario of inter-topology routing and intra-to-inter-topology re-routing, there is only one header rewriting for a packet, where the header rewriting entry includes the BAP routing ID of the packet’s ingress topology and the BAP routing ID of the packet’s egress topology.
* Referring to previous agreement “*Will have rewriting mapping configuration(s) Old routing ID to New routing ID that limits the possible rewriting (for all cases of re-writing)*”: It is FFS whether for upstream there would be a configuration optimization such that the “New Routing ID” is the same for all entries (a.k.a. default routing ID)
* [049] For inter-topology routing, the header rewriting configuration to include information that allows the boundary node to determine either the egress topology, or the ingress topology, or the traffic direction of a header-rewriting entry (selection of one of these expected). RAN3 to handle the St3-related aspects.
* [049] The BH RLC CH mapping configuration of the boundary node includes information for the boundary node to differentiate mappings based on ingress topology and egress topology.
* [049] The UL mapping configuration to include information for the boundary node to determine the egress topology of each UL mapping entry.
* [049] In configurations, the topology is referred to as “F1-terminating CU’s topology” vs. “non-F1-terminating CU’s topology”. The terms “F1-terminating CU” and “non-F1-terminating CU” to be defined in St2 spec.
* [049] Determination/execution of header rewriting is handled by the BAP TX entity.
* [049] The routing configuration to include information that allows the boundary node to determine the topology each routing entry applies to. RAN3 to decide on St3-related aspects.

### 7.4 MAC

* [050] LCP priority levels range extension is NOT pursued in this Release.
* [050] Baseline: For IAB-MTs supporting Extended BSR formats, use exclusively the Extended formats for padding BSR by fully mirroring the legacy padding BSR procedure (use the Extended equivalents of all formats therein).

FFS whether to report Extended Short Truncated BSR in lieu of Extended Long Truncated BSR if the number of padding bits cannot include the fixed size of 256 LCGi plus subheader of the Extended Long Truncated BSR.

* [050] RAN2 should focus on 2 new timing modes (Case-6 timing and Case-7 timing) for Desired guard symbols and Provided guard symbols, as well as on the Case-7 timing offset (deprioritizing work on other MAC CEs until further input from RAN1/RAN4 is received).
* [050] New MAC CEs are introduced to indicate desired/provided number of symbols for the Case-6 and Case-7 timings.
* [050] A new MAC CE is introduced to indicate the Case-7 Timing Offset.

### 7.5 Capabilities

* [051] Confirm to define a new UE capability for LCG Extension in *MAC-ParametersCommon* as optional UE capability for IAB-MT.
* [051] Define a new UE capability (1 bit) for ‘BH RLF detection indication and BH RLF recovery indication’ as optional UE capability for IAB-MT.
* [051] Define a new UE capability ‘*f1c-OverNR-RRC*’ as optional UE capability for IAB-MT. The parent IE of this UE capability is *NRDC-Parameters* under *UE-NR-Capability*.
* [051] Define a new UE capability for BAP header rewriting based inter-donor CU routing as optional UE capability for IAB-MT.
* [051] The single UE capability is used for all UL local re-routing trigger conditions.
* [051] Define a new type of feature group for LCG extension.
* [051] Reuse ‘RLF handling’ FG for BH RLF detection and recovery indication in Rel-17 eIAB feature list section.
* [051] Define a new type of feature group for F1-C over NR RRC.
* [051] Following open issues of Rel-17 eIAB UE capability are FFS:

FFS UE capability for Rel-17 intra-donor DU local-rerouting and inter-donor DU re-routing.

FFS whether need to differentiate the capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”

FFS the feature group for BAP header rewriting based inter-donor CU routing

FFS the feature group for local rerouting

## 8 RAN#117-e

* Type-2/3 indication MAY be propagated, if the situation in the node doing the propagation is such that all BAP links are affected by the condition (e.g. single connected) (additional decision if to propagate or not can be left for implementation).
* Type-2/3 indication is not propagated if the situation in the node doing the propagation is such that some BAP links are un-affected by the condition (e.g. dual connected).
* For the 2 above agreements, no stage-3 impact is foreseen.
* For Type-2/3 indication in any case there is no routing information included.
* The Rel-16 term “BH RLF indication” is used for type-4 indication in Rel-17.
* Clarification: Successful CHO triggered by RLF is a triggering condition for type-3 indication (in addition to legacy reestablishment). This is already sufficiently covered by existing Stage-2 text.
* RAN2 does not have specific concerns about RAN3’s WA that upon migration/HO failure, the buffered RRC message is still transferred to the child node.
* RAN2 agrees with RAN3 that RAN3’s solution 1 for latency reduction should not be applied for CHO.
* Align terminology with RAN1: use Toffset,2 as the designation for the content of the Case-7 timing offset MAC CE (instead of the currently used Tdelta\_Case7).
* Rename this MAC CE to “Case-7 timing advance offset MAC CE” and have it in a separate clause 6.1.3.y, thereby reverting the clause 6.1.3.21 to its original content.
* Keep the description of both MAC CEs (Timing Delta MAC CE, and the Case-7 timing offset MAC CE) in the same clause (5.18.18).
* (O2) For the case of Padding BSR when logicalChannelGroup-IABExt-r17 is configured, Report Extended Short Truncated BSR in lieu of Extended Long Truncated BSR, if the number of padding bits cannot include the fixed size of 256 LCGi plus subheader of the Extended Long Truncated BSR;
* We go with Option c (if we find that some config is needed we include also Option b), where Option c = Rewriting mapping for inter-donor-DU re-routing is based on the BAP routing IDs included in the routing entries configured for each parent, and Option b = Rewriting mapping for inter-donor-DU re-routing is based on a default egress BAP routing ID(s) configured for each parent link.
* RAN2 leave the signalling details to RAN3 on open issue BAP#2 and #3 (ref [R2-2203934](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2203934.zip)).
* For the flow control feedback triggered local re-routing, the re-routing is performed on routing IDs level.
* As in R16, the trigger conditions (not the propagation) for type 2/3 will be captured in BAP spec. rather than in RRC spec., with just some general descriptions.
* Add new F1AP signalling to directly disable the inter-donor-DU re-routing. The new IE applies to all routing entries.
* No need to split UE capability further for different local re-routing trigger conditions.
* No need to differentiate “inter-donor CU routing” UE capability between “inter-donor CU partial migration” and “inter-donor CU routing for topology redundancy”.
* No UE capability is defined for Rel-17 intra-donor DU local re-routing.
* Define a new separate UE capability for BAP header rewriting-based re-routing (including inter-donor DU local re-routing and inter-donor CU re-routing) as optional UE capability for IAB-MT.