**3GPP TSG-RAN WG2 Meeting #129bis** **R2-2502768**

**Wuhan, China, April 7th – 11th, 2025**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.321** | **CR** | **Draft** | **rev** | **-** | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | MAC Running CR for Rel-19 IoT NTN | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MediaTek Inc. | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IoT\_NTN\_Ph3-Core | | | | |  | ***Date:*** | | | 2025-04-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19) Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Draft MAC CR for Rel-19 IoT NTN enhancements. This MAC Running CR captures the RAN2 agreements up to RAN2#129. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | A new section is added to capture the IoT NTN enhancments on CB-Msg3 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No support for Release-19 enhancements for IoT NTN | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 3.2, 5.4.xx (New), 7.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

# 3 Definitions and abbreviations

## 3.1 Definitions

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

**Active Time:** Time related to DRX operation, as defined in clause 5.7, during which the MAC entity monitors the PDCCH.

***mac-******ContentionResolutionTimer***: Specifies the number of consecutive subframe(s) during which the MAC entity shall monitor the PDCCH after Msg3 is transmitted.

**CB-MSG3-RNTI:** The Contention-Based Msg3 RNTI is used on the PDCCH when response messages of Contention-Based Msg3 is transmitted.

Editor’s note: CB-MSG3-RNTI needs to be updated after the detail is clear in RAN2.

**DRX Cycle:** Specifies the periodic repetition of the On Duration followed by a possible period of inactivity (see figure 3.1-1 below).



Figure 3.1-1: DRX Cycle

***drx-InactivityTimer***: Except for NB-IoT UEs, BL UEs or UEs in enhanced coverage, it specifies the number of consecutive PDCCH-subframe(s) after the subframe in which a PDCCH indicates an initial UL, DL or SL user data transmission for this MAC entity. For NB-IoT UEs, it specifies the number of consecutive PDCCH-subframe(s), after the subframe in which the HARQ RTT timer or UL HARQ RTT timer expires, or after PDCCH indicates a new UL or DL transmission for one TB when the UE is configured with multiple HARQ processes. For BL UEs or UEs in enhanced coverage, it specifies the number of consecutive PDCCH-subframe(s) following the subframe containing the last repetition of the PDCCH reception that indicates an initial UL or DL user data transmission for this MAC entity.

***drx-RetransmissionTimer***: Specifies the maximum number of consecutive PDCCH-subframe(s) until a DL retransmission is received.

***drx-RetransmissionTimerShortTTI***: Specifies the maximum number of consecutive TTI(s) until a DL retransmission is received for HARQ processes scheduled using short TTI.

***drxShortCycleTimer***: Specifies the number of consecutive subframe(s) the MAC entity shall follow the Short DRX cycle.

***drxStartOffset***: Specifies the subframe where the DRX Cycle starts.

***drx-ULRetransmissionTimer***: Specifies the maximum number of consecutive PDCCH-subframe(s) until a grant for UL retransmission or the HARQ feedback is received.

***drx-ULRetransmissionTimeShortTTI***: Specifies the maximum number of consecutive TTI(s) until a grant for UL retransmission is received for HARQ processes scheduled using short TTI.

**Early Data Transmission**: Allows one uplink data transmission optionally followed by one downlink data transmission during the random access procedure as specified in TS 36.300 [20]. The S1 connection is established or resumed upon reception of the uplink data and may be released or suspended along with the transmission of the downlink data. Early data transmission refers to both CP-EDT and UP-EDT.

**HARQ information**: HARQ information for DL-SCH or for UL-SCH transmissions consists of New Data Indicator (NDI), Transport Block (TB) size. For DL-SCH transmissions and for asynchronous UL HARQ and for autonomous UL HARQ, the HARQ information also includes HARQ process ID, except for UEs in NB-IoT configured with a single HARQ process for which this information is not present. For UL-SCH transmission the HARQ information also includes Redundancy Version (RV). In case of spatial multiplexing on DL-SCH the HARQ information comprises a set of NDI and TB size for each transport block. HARQ information for SL-SCH and SL-DCH transmissions consists of TB size only.

**HARQ RTT Timer**: This parameter specifies the minimum amount of subframe(s) before a DL assignment for HARQ retransmission is expected by the MAC entity.

**Msg3**:Message transmitted on UL-SCH containing a C-RNTI MAC CE or a CCCH SDU optionally multiplexed with DTCH for the UP-EDT, submitted from upper layer and associated with the UE Contention Resolution Identity, as part of a random access procedure.

**NB-IoT**:NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz.

**NB-IoT UE**:A UE that uses NB-IoT.

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [23], between two or more nearby UEs, using NR technology but not traversing any network node.

**Non-terrestrial networks:** An E-UTRAN consisting of eNBs, which provide non-terrestrial LTE access to UEs by means of an NTN payload embarked on a space-borne NTN vehicle and an NTN Gateway.

***onDurationTimer***: Specifies the number of consecutive PDCCH-subframe(s) at the beginning of a DRX Cycle.

**PDCCH:** Refers to the PDCCH (see TS 36.211 [7]), EPDCCH (in subframes when configured), MPDCCH (see TS 36.213 [2]), for an RN with R-PDCCH configured and not suspended, to the R-PDCCH, for NB-IoT to the NPDCCH or for short TTI to SPDCCH.

**PDCCH period (pp):** Refers to the interval between the start of two consecutive PDCCH occasions and depends on the currently used PDCCH search space, as specified in TS 36.213 [2]. A PDCCH occasion is the start of a search space and is defined by subframe k0 as specified in clause 16.6 of TS 36.213 [2]. The calculation of number of PDCCH-subframes for the timer configured in units of a PDCCH period is done by multiplying the number of PDCCH periods with *npdcch-NumRepetitions-RA* when the UE uses the common search space or by *npdcch-NumRepetitions* when the UE uses the UE specific search space. When counting a timer whose length is calculated in PDCCH-subframes, the UE shall include PDCCH-subframes that will be dropped or not required to be monitored as specified in clause 16.6 of TS 36.213 [2]. The calculation of number of subframes for the timer configured in units of a PDCCH period is done by multiplying the number of PDCCH periods with duration between two consecutive PDCCH occasions.

**PDCCH-subframe:** Refers to a subframe with PDCCH. This represents the union over PDCCH-subframes for all serving cells excluding cells configured with cross carrier scheduling for both uplink and downlink, as specified in TS 36.331 [8]; except if the UE is not capable of simultaneous reception and transmission in the aggregated cells where this instead represents the PDCCH-subframes of the SpCell.

- For FDD serving cells, all subframes represent PDCCH-subframes, unless specified otherwise in this clause.

- For TDD serving cells, all downlink subframes and subframes including DwPTS of the TDD UL/DL configuration indicated by *tdd-Config*, as specified in TS 36.331 [8] of the cell represent PDCCH-subframes, unless specified otherwise in this clause.

- For serving cells operating according to Frame structure Type 3, all subframes represent PDCCH-subframes.

- For RNs with an RN subframe configuration configured and not suspended, in its communication with the E-UTRAN, all downlink subframes configured for RN communication with the E-UTRAN represent PDCCH-subframes.

- For SC-PTM reception on an FDD cell, all subframes except MBSFN subframes represent PDCCH-subframes, unless specified otherwise in this clause.

- For SC-PTM reception on a TDD cell, all downlink subframes and subframes including DwPTS of the TDD UL/DL configuration indicated by *tdd-Config*, as specified in TS 36.331 [8] of the cell except MBSFN subframes represent PDCCH-subframes, unless specified otherwise in this clause.

- For BL UE or UE in enhanced coverage, all subframes in which the UE is required to monitor MPDCCH represent PDCCH-subframes among all valid subframes regardless of whether the subframe is dropped, see clause 9.1.5 of TS 36.213 [2].

- For NB-IoT UE, all subframes that are part of the NPDCCH search space represent PDCCH-subframes among all NB-IoT downlink subframes, including those which the UE is not required to monitor as specified in clause 16.6 of TS 36.213 [2].

**PDSCH**: Refers to subframe-PDSCH/slot-PDSCH/subslot-PDSCH or for NB-IoT to NPDSCH.

**PRACH**: Refers to PRACH or for NB-IoT to NPRACH.

**PRACH Resource Index**: The index of a PRACH within a system frame, see TS 36.211 [7]

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

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

**PUSCH**: Refers to subframe-PUSCH/slot-PUSCH/subslot-PUSCH or for NB-IoT to NPUSCH.

***ra-PRACH-MaskIndex*:** Defines in which PRACHs within a system frame the MAC entity can transmit a Random Access Preamble (see clause 7.3).

**RA-RNTI:** The Random Access RNTI is used on the PDCCH when Random Access Response messages are transmitted. It unambiguously identifies which time-frequency resource was utilized by the MAC entity to transmit the Random Access preamble.

**SC Period:** Sidelink Control period, the time period consisting of transmission of SCI and its corresponding data.

**SCI:** The Sidelink Control Information contains the sidelink scheduling information such as resource block assignment, modulation and coding scheme, Group Destination ID (for sidelink communication) and PPPP (for V2X sidelink communication), see TS 36.212 [5].

**Secondary Timing Advance Group:** Timing Advance Group not containing the SpCell. A Secondary Timing Advance Group contains at least one Serving Cell with an UL configured.

**Serving Cell:** A Primary or a Secondary Cell, see TS 36.331 [8].

**Short Processing Time**: For 1 ms TTI length, the operation with short processing time in UL data transmission and DL data reception.

**Short TTI**: TTI length based on a slot or a subslot.

**Sidelink:** UE to UE interface for sidelink communication, sidelink discovery and V2X sidelink communication. The sidelink corresponds to the PC5 interface as defined in TS 23.303 [13] for sidelink communication and sidelink discovery, and as defined in TS 23.285 [14] for V2X sidelink communication.

**Sidelink communication**: AS functionality enabling ProSe Direct Communication as defined in TS 23.303 [13], between two or more nearby UEs, using E-UTRA technology but not traversing any network node.

**Sidelink Discovery Gap for Reception:** Time period during which the UE does not receive any channels in DL from any serving cell, except during random access procedure.

**Sidelink Discovery Gap for Transmission:** Time period during which the UE prioritizes transmission of sidelink discovery and associated procedures e.g. re-tuning and synchronisation over transmission of channels in UL, if they occur in the same subframe, except during random access procedure.

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

**Timing Advance Group:** A group of Serving Cells that is configured by RRC and that, for the cells with an UL configured, using the same timing reference cell and the same Timing Advance value.

**Transmission using PUR:** Allows one uplink data transmission using preconfigured uplink resource from RRC\_IDLE mode as specified in TS 36.300 [9]. Transmission using PUR refers to both CP transmission using PUR and UP transmission using PUR.

**UE-eNB RTT:** For non-terrestrial networks, the sum of the UE's Timing Advance value (see TS 36.211 [7], clause 8.1) and *k-Mac* in units of subframe, not rounded or truncated toward an integer number of subframes.

**UL HARQ RTT Timer**: This parameter specifies the minimum amount of subframe(s) before a UL HARQ retransmission grant is expected by the MAC entity.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [14], between nearby UEs, using E-UTRA technology but not traversing any network node.

NOTE: A timer is running once it is started, until it is stopped or until it expires; otherwise it is not running. A timer can be started if it is not running or restarted if it is running. A Timer is always started or restarted from its initial value.

## 3.2 Abbreviations

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

AS Access Stratum

AUL Autonomous Uplink

BL Bandwidth reduced Low complexity

BR Bandwidth Reduced

BSR Buffer Status Report

C-RNTI Cell RNTI

CB-MSG3-RNTI Contention-Based Msg3 RNTI

CBR Channel Busy Ratio

CC-RNTI Common Control RNTI

CG Cell Group

CQI Channel Quality Indicator

CRI CSI-RS Resource Indicator

CSI Channel State Information

DAPS Dual Active Protocol Stack

DCQR Downlink Channel Quality Report

DRB Data Radio Bearer

DSA Diversity Slotted ALOHA

EDT Early Data Transmission

eIMTA Enhanced Interference Management and Traffic Adaptation

eIMTA-RNTI Enhanced Interference Management and Traffic Adaptation - RNTI

E-UTRA Evolved UMTS Terrestrial Radio Access

E-UTRAN Evolved UMTS Terrestrial Radio Access Network

G-RNTI Group RNTI

H-SFN Hyper SFN

MAC Medium Access Control

MCG Master Cell Group

M-RNTI MBMS RNTI

MPDCCH MTC Physical Downlink Control Channel

LCG Logical Channel Group

NB-IoT Narrow Band Internet of Things

NPDCCH Narrowband Physical Downlink Control Channel

NPDSCH Narrowband Physical Downlink Shared channel

NPRACH Narrowband Physical Random Access Control Channel

NPUSCH Narrowband Physical Uplink Shared channel

PCell Primary Cell

PSCell Primary Secondary Cell

PHR Power Headroom Report

PMI Precoding Matrix Index

PPPP ProSe Per-Packet Priority

P-RNTI Paging RNTI

ProSe Proximity-based Services

pTAG Primary Timing Advance Group

PTI Precoding Type Indicator

PUR Preconfigured Uplink Resource

RA-RNTI Random Access RNTI

RAI Release Assistance Indication

RI Rank Indicator

RN Relay Node

RNTI Radio Network Temporary Identifier

SCell Secondary Cell

SC-FDM Single-Carrier Frequency Division Multiplexing

SCG Secondary Cell Group

SCI Sidelink Control Information

SC-N-RNTI Single Cell Notification RNTI

SC-PTM Single Cell Point to Multipoint

SC-RNTI Single Cell RNTI

SI-RNTI System Information RNTI

SL Sidelink

SL-RNTI Sidelink RNTI

SL-V-RNTI Sidelink V2X RNTI

SR Scheduling Request

SRS Sounding Reference Symbols

SRS-TPC-RNTI Sounding Reference Symbols-Transmit Power Control-RNTI

SpCell Special Cell

sTAG Secondary Timing Advance Group

sTTI Slot or subslot TTI

TAG Timing Advance Group

TB Transport Block

TPC-PUCCH-RNTI Transmit Power Control-Physical Uplink Control Channel-RNTI

TPC-PUSCH-RNTI Transmit Power Control-Physical Uplink Shared Channel-RNTI

V2X Vehicle-to-Everything

# 5 MAC procedures

<Skip>

## 5.4 UL-SCH data transfer

<Skip>

### 5.4.xx Contention-Based Msg3 Procedure

#### 5.4.xx.1 Contention-Based Msg3 initialization

The Contention-Based Msg3 procedure described in this clause is initiated [by the RRC sublayer].

The following information is assumed to be available before the procedure can be initiated for NB-IoT UEs, BL UEs or UEs in enhanced coverage in a non-terrestrial network, as specified in TS 36.331 [8]:

- the available set of PUSCH resources associated with Contention-Based Msg3 for each enhanced coverage level supported for the transmission of Contention-Based Msg3, [*FFS configuration field name in SI*].

- the criteria to select PUSCH resources based on RSRP measurement per enhanced coverage level supported [*FFS configuration field name in SI*]

- the number of replicas for DSA transmission corresponding to the selected enhanced coverage level [*FFS configuration field name in SI*]

- [FFS other parameters]

The Contention-Based Msg3 procedure shall be performed as follows:

- if the RSRP threshold of enhanced coverage level 3 is configured by upper layers in [*FFS configuration field name in SI*]and the measured RSRP is less than the RSRP threshold of enhanced coverage level 3 and the UE is capable of enhanced coverage level 3 then:

- the MAC entity considers to be in enhanced coverage level 3;

- else if the RSRP threshold of enhanced coverage level 2 configured by upper layers [*FFS configuration field name in SI*]and the measured RSRP is less than the RSRP threshold of enhanced coverage level 2 and the UE is capable of enhanced coverage level 2 then:

- the MAC entity considers to be in enhanced coverage level 2;

- else if the measured RSRP is less than the RSRP threshold of enhanced coverage level 1 as configured by upper layers in [*FFS configuration field name in SI*] then:

- the MAC entity considers to be in enhanced coverage level 1;

- else:

- the MAC entity considers to be in enhanced coverage level 0;

- [FFS on other initial procedure for CB-MSG3 procedure]

#### 5.4.xx.2 Contention-Based Msg3 Resource selection

The Contention-Based Msg3 Resource selection procedure shall be performed as follows:

- if DSA is configured by upper layers:

- the UE shall select the next DSA transmission window.

- the UE shall randomly select[*number of replicas*] PUSCH resources in time domain within the selected DSA transmission window from the Contention-Based Msg3 resources associated with the selected enhanced coverage level.

- else

- the UE shall select the next PUSCH occasion from the Contention-Based Msg3 resources associated with the selected enhanced coverage level.

Editor’s Note: It is FFS whether DSA transmission should be mandatory for a UE supports CB-MSG3.

- the UE shall randomly select a frequency domain PUSCH resource for each selected PUSCH resources in time domain.

- [FFS on more details]

- proceed to the transmission of the Contention-Based Msg3 (see clause 5.4.xx.3).

#### 5.4.xx.3 Contention-Based Msg3 transmission

The Contention-Based Msg3 transmission shall be performed as follows:

- [FFS on more details]

#### 5.4.xx.4 Contention-Based Msg3 respose reception

After the Contention-Based Msg3 transmission, the MAC entity shall monitor PDCCH identified by CB-MSG3-RNTI in the Contention-Based Msg3 response window [using timer *cb-msg3**-ResponseWindowTimer*]:

Editor’s Note: To update when to start PDCCH monitoring after more FFS is resolved from below agreements:

* For SA case (single replica), after the end of all repetition of CB-Msg3 PUSCH transmission, UE starts a window for response reception taking UE-eNB RTT into account. FFS if we need to consider additional delay e.g. for the processing time
* For DSA case, FFS if we only have one or multiple PDCCH monitoring window(s) (i.e. one window per each replica) for response reception. FFS when the window(s) is/are started (or restarted) and stopped. FFS on the window length. FFS if the UE needs to monitor only one RNTI or multiple RNTIs)

Editor’s Note: It is still FFS on how to calculate the RNTI used to monitor Msg4 reception based on the resource associated to the CB-Msg3 transmission.

Editor’s Note: To update how to do contention resolution when to stop PDCCH monitoring window based on below agreement:

* The UE stops the PDCCH monitoring window(s) once it receives a CB-msg4 containing a matching Contention Resolution Identity (FFS if there is no RRC message together with the CB-msg4)

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# 7 Variables and constants

## 7.1 RNTI values

RNTI values are presented in Table 7.1-1 and their usage and associated Transport Channels and Logical Channels are presented in Table 7.1-2.

Table 7.1-1: RNTI values.

|  |  |
| --- | --- |
| Value (hexa-decimal) | RNTI |
| 0000 | N/A |
| 0001-0960  0001-1000 (Note 3) | RA-RNTI, C-RNTI, Semi-Persistent Scheduling C-RNTI, Temporary C-RNTI, eIMTA-RNTI, TPC-PUCCH-RNTI, TPC-PUSCH-RNTI, SL-RNTI (see note), G-RNTI, SL-V-RNTI, UL Semi-Persistent Scheduling V-RNTI, SL Semi-Persistent Scheduling V-RNTI, SRS-TPC-RNTI, AUL C-RNTI, CB-MSG3-RNTI, and PUR-RNTI |
| 0961-FFF3  1001-FFF3 (Note 3) | C-RNTI, Semi-Persistent Scheduling C-RNTI, eIMTA-RNTI, Temporary C-RNTI, TPC-PUCCH-RNTI, TPC-PUSCH-RNTI, SL-RNTI, G-RNTI, SL-V-RNTI, UL Semi-Persistent Scheduling V-RNTI, SL Semi-Persistent Scheduling V-RNTI, SRS-TPC-RNTI, AUL C-RNTI, and PUR-RNTI |
| FFF4-FFF8 | Reserved for future use |
| FFF9 | SI-RNTI |
| FFFA | SC-N-RNTI |
| FFFB | SC-RNTI |
| FFFC | CC-RNTI |
| FFFD | M-RNTI |
| FFFE | P-RNTI |
| FFFF | SI-RNTI |

NOTE 1: A MAC entity uses the same C-RNTI on all Serving Cells.

NOTE 2: SI-RNTI value FFFF may be used for MBMS-dedicated carrier. SI-RNTI value FFF9 is only used for MBMS-dedicated carrier.

NOTE 3: Range applicable for NB-IoT.

Table 7.1-2: RNTI usage.

|  |  |  |  |
| --- | --- | --- | --- |
| RNTI | Usage | Transport Channel | Logical Channel |
| P-RNTI | Paging and System Information change notification | PCH | PCCH |
| SI-RNTI | Broadcast of System Information | DL-SCH | BCCH, BR-BCCH |
| M-RNTI | MCCH Information change notification | N/A | N/A |
| RA-RNTI | Random Access Response | DL-SCH | N/A |
| eIMTA-RNTI | eIMTA TDD UL/DL configuration notification | N/A | N/A |
| Temporary C-RNTI | Contention Resolution (when no valid C-RNTI is available) | DL-SCH | CCCH, DCCH |
| Temporary C-RNTI | Msg3 transmission | UL-SCH | CCCH, DCCH, DTCH |
| C-RNTI | Dynamically scheduled unicast transmission | UL-SCH | DCCH, DTCH |
| C-RNTI | Dynamically scheduled unicast transmission | DL-SCH | CCCH, DCCH, DTCH |
| C-RNTI | Triggering of PDCCH ordered random access | N/A | N/A |
| Semi-Persistent Scheduling C-RNTI | Semi-Persistently scheduled unicast transmission  (activation, reactivation and retransmission) | DL-SCH, UL-SCH | DCCH, DTCH |
| Semi-Persistent Scheduling C-RNTI | Semi-Persistently scheduled unicast transmission  (deactivation) | N/A | N/A |
| TPC-PUCCH-RNTI | Physical layer Uplink power control | N/A | N/A |
| TPC-PUSCH-RNTI | Physical layer Uplink power control | N/A | N/A |
| SL-RNTI | Dynamically scheduled sidelink transmission for sidelink communication | SL-SCH | STCH |
| SC-RNTI | Dynamically scheduled SC-PTM control information | DL-SCH | SC-MCCH |
| G-RNTI | Dynamically scheduled SC-PTM transmission | DL-SCH | SC-MTCH |
| SC-N-RNTI | SC-MCCH Information change notification | N/A | N/A |
| CC-RNTI | Providing common control PDCCH information | N/A | N/A |
| SL-V-RNTI | Dynamically scheduled sidelink transmission for V2X sidelink communication | SL-SCH | STCH |
| UL Semi-Persistent Scheduling V-RNTI | Semi-Persistently scheduled uplink transmission for V2X communication  (activation, reactivation and retransmission) | UL-SCH | DCCH, DTCH |
| UL Semi-Persistent Scheduling V-RNTI | Semi-Persistently scheduled uplink transmission for V2X communication  (deactivation) | N/A | N/A |
| SL Semi-Persistent Scheduling V-RNTI | Semi-Persistently scheduled sidelink transmission for V2X sidelink communication  (activation, reactivation and retransmission) | SL-SCH | STCH |
| SL Semi-Persistent Scheduling V-RNTI | Semi-Persistently scheduled sidelink transmission for V2X sidelink communication  (deactivation) | N/A | N/A |
| SRS-TPC-RNTI | SRS and TPC for the PUSCH-less SCells | N/A | N/A |
| AUL C-RNTI | Autonomous Uplink C-RNTI unicast transmission (activation and reactivation) | UL-SCH | DCCH, DTCH |
| AUL C-RNTI | Autonomous Uplink C-RNTI unicast transmission (deactivation) | N/A | N/A |
| PUR-RNTI | Transmission using Preconfigured Uplink Resource | DL-SCH, UL-SCH | CCCH, DCCH, DTCH |
| PUR-RNTI | Transmission using Preconfigured Uplink Resource (L1 ACK or fallback indication) | N/A | N/A |
| CB-MSG3-RNTI | Contention-Based Msg3 response message | DL-SCH | CCCH, DCCH, DTCH |

Editor’s note: FFS for CB-MSG3-RNTI usage of CB-Msg3 transmission.

# Appendix – RAN2 Agreements on EDT enhancement

## Notes

* Assuming that only EDT enhancement agreements will impact MAC SPEC
* Agreements are highlighted as
  + Already implemented.
  + to be implemented or to be discussed whether and how to capture in the MAC SPEC
  + No impact to MAC SPEC

## RAN2#129, Feb’25

Agreements:

1. It is FFS if separate CB-msg3 resources would be needed for CB-msg-3 using OCC or if the same CB-msg3 resources could be used

2. RAN2 assumes that one possibility to take power imbalance under control is to define RSRP ranges that need to be respected to transmit CB-msg3 using OCC

3. RAN2 assumes that at least the following will be part of the shared resources configuration for CB-msg3 (FFS on other aspects)

- Time domain resources for (N)PUSCH occasions: periodicity and start time (e.g., start subframe, start SFN)

- Frequency domain resources for (N)PUSCH occasions

- repetition number

- (N)PDCCH resource

- MCS

4. For CB-msg3 transmission, for eMTC NTN, up to three separate RSRP thresholds (on top of the minimum RSRP threshold and possibly different from the thresholds for PRACH) can be supported for achieving at most 4 CE levels; for NB-IoT NTN, up to two separate RSRP thresholds (on top of the minimum RSRP threshold possibly different from the thresholds for PRACH) can be supported for achieving at most 3 repetition levels.

5. The UE shall at most have one ongoing CB EDT procedure at any time.

6. The CB EDT Config has one minimum RSRP threshold (as agreed in RAN2#128) to use CB EDT.

7. The CB EDT Config has two RSRP thresholds for NB-IoT for the three CE levels.

8. CB EDT Config has three RSRP thresholds for eMTC for the four CE levels.

7. As Signalling design Baseline RAN2 assumes the PUR config and the NPRACH config for shared (N)PUSCH config can be used and some of the parameters can be included in a new CB EDT config.

8. RAN2 consider a new CBEDT-ConfigSIB-NB IE for configuring the CB EDT feature

Working assumption:

1. One CB-MSG4 can target multiple UEs simultaneously (FFS on the details)
2. For CB-MSG3, the Transmission window is configured by the network with a starting point (e.g. H-SFN offset), a window length, and a window periodicity (window length and periodicity could be the same). For k=1 the window length can be equal to 1: same behaviour as today

The UE first selects the next DSA transmission window and then randomly select K replicasinside the window.

RAN2 assumes that a pointer solution is not needed in Rel-19

## RAN2#128, Nov’24

Agreements:

1. Only system Information is used to provide cell-specific CB-Msg3 PUSCH resources (FFS if anything is needed in dedicated signalling for the TA validation parameters, if needed, for the case of 15kHz SCS NB-IoT and eMTC CE mode B)

2. Reuse the existing CE level selection procedure for CB-Msg3, at least for the initial selection. FFS whether we can reuse the same thresholds. FFS on the number of levels

3. The UE triggers CB-Msg3 only if the size of pending UL data is less than the configured maximum TBS (FFS if the maximum TBS is same or different for different CE levels)

4. There will be a RSRP threshold that determines whether CB-Msg3 can be used (if the RSRP is below such threshold, PRACH will have to be used) (FFS if we need a separate set of thresholds, including a different minimum threshold, in case CB-msg3 EDT is combined with OCC)

5. The number of replicas for DSA will be configured by the NW: 1 (SA), 2, 3, 4. The configuration of the number of replicas is CE-level specific

6. There will be a configurable time window for DSA CB-Msg3 occasion selection. FFS on the details (e.g. when the time window starts)

7. For SA case (single replica), after the end of all repetition of CB-Msg3 PUSCH transmission, UE starts a window for response reception taking UE-eNB RTT into account. FFS if we need to consider additional delay e.g. for the processing time

8. For DSA case, FFS if we only have one or multiple PDCCH monitoring window(s) (i.e. one window per each replica) for response reception. FFS when the window(s) is/are started (or restarted) and stopped. FFS on the window length. FFS if the UE needs to monitor only one RNTI or multiple RNTIs)

9. The UE stops the PDCCH monitoring window(s) once it receives a CB-msg4 containing a matching Contention Resolution Identity (FFS if there is no RRC message together with the CB-msg4)

10. Assuming that there will be scenarios where it’s possible to receive a CB-msg4 before the UE transmits some replicas, a UE stops transmitting the remaining replicas if it has received a CB-msg4 containing a matching Contention Resolution Identity (FFS if there is no RRC message together with the CB-msg4)

11. Within the configured time window, the UE shall select randomly different time domain occasions for transmitting different replicas. And for each time domain occasion, the UE shall select randomly a frequency domain resource.

12. RAN2 understands that, for DSA, once the eNB successfully decodes one of the multiple replicas, it may respond without waiting for the remaining replica(s) (FFS when the response window(s) is/are started)

## RAN2#127bis, Oct’24

Agreements:

1. RAN2 will introduce support for DSA (i.e. the possibility to transmit more than one replica of CB-msg3, if configured by the NW). RAN2 does not intend to work on CRDSA in Rel-19.

2. RAN2 will continue their work on CB-msg3 assuming that OCC2 might also apply to CB-msg3 transmission (“CB-NPUSCH”) (final decision whether this is feasible is up to RAN1). FFS whether an LS to indicate this to RAN1 is needed.

3. At least system Information is used to provide CB-msg3 EDT cell-specific PUSCH resources for Msg3 transmission. FFS on signalling details.

4. CB-msg3 EDT cell specific PUSCH resources for Msg3 transmission are provided per CE level (FFS whether we have a CE level specific configuration for DSA)

5. RAN2 assumes that CB-msg3 EDT cell specific PUSCH resources are associated with number of repetitions, RSRP selection threshold to determine the CE level and largest TBS for Msg3 transmission, but this has to be confirmed by RAN1. FFS if there is an RSRP threshold that determines whether CB-msg3 EDT cannot be used (the UE will have to use 4-step RA)

6. At least in the cases confirmed by RAN1/RAN4, a running TAT is not needed to initiate a CB-msg3 EDT transmission

7. The RNTI used at least to schedule Msg4 transmission is derived based on the resource associated to the PUSCH occasion used for contention based Msg3 EDT transmission (FFS on the details. FFS how this is impacted by DSA)

8. CB-msg3 EDT procedures and any Msg4 enhancement are only introduced for IoT NTN.

## RAN2#127, Aug’24

Agreements:

1. RAN2 will continue working on a CB-msg3 EDT-like mechanism

2. RAN2 assumes that a DSA based scheme would not have RAN1 impacts, while RAN2 thinks that a CRDSA based scheme would necessarily have RAN1 impacts

3. In the next meeting continue the comparison (e.g. in terms of packet loss ratio, usage of UL/DL radio resources) between existing CB mechanism (Slotted Aloha) and other mechanisms (DSA, CRDSA, others) and try to decide on which way to go and in case whether/what to ask to RAN1.

4. For DSA and CRDSA, RAN2 can consider in the evaluation how to integrate them with repetition.

## RAN2#126, May’24

Agreements:

1. RAN2 focusses the study on contention-based Msg3 transmission to complete an EDT-like transaction (FFS on the details of Msg3. FFS on the procedural steps, e.g. how much we reuse of EDT and PUR procedures. FFS on allocation of resources).
2. RAN2 can continue the discussion on Diversity Slotted ALOHA (DSA) and Contention Resolution Diversity Slotted Aloha (CRDSA) for Msg3-EDT transmissions without msg1/ RAR, evaluating possible impacts on the specification, in the next RAN2 meeting (RAN2 might send an LS to RAN1 later on this)
3. If an IoT NTN UE in IDLE state is to use the new R19 contention-based procedure, the UE needs to verify/update the uplink synchronization (e.g. get GNSS fix, acquire TA) just before sending msg3.

## RAN2#125bis, April’24

Agreements:

1. Both NB-IoT and eMTC are within scope of uplink capacity enhancements
2. Both C-plane and U-plane solutions are within scope of uplink capacity enhancements.
3. Only CIoT EPS is within scope of uplink capacity enhancements