3GPP TSG-RAN WG2 Meeting #110-e R2-20xxxxx

Elbonia, Online, 1 – 11 June Revision of R2-2003166

**Agenda item: 6.7.1**

**Source: Nokia (Rapporteur)**

**Title: Summary of IIOT WI agreements and open issues**

**WID/SID: NR\_IIOT - Release 16**

**Document for: Discussion and Decision**

# 1 Introduction

This document lists summarizes all the agreements and open issues for NR IIOT WI.

# 2 RAN2 agreements list for NR IIOT WI

Green highlight – agreement captured in stage-2 specifications

Grey highlight – stage-3 level agreement, not captured in stage-2 specifications

No highlight – agreement with no direct impact on specifications

**Agreements from RAN2#105bis meeting (Xi’an, China, 08 – 12 April 2019):**

|  |  |
| --- | --- |
| **Accurate reference timing** | * Confirm that we use LTE rel-15 SIB and RRC unicast based methods for reference time delivery
* The reference time information shall correspond to a reference SFN, explicitly indicated in unicast signalling, FFS if inferred from the transmission of the SIB for SIB signalling.
* R2 assumes the UE shall use the end of the reference SFN value as the precise point in time to which the reference time corresponds.
* FFS whether the reference SFN refers to time in the future, past or whether this need to mandated one way or another.
* R2 assumes that some propagation delay compensation may be needed for distance > 200m.
* FFS what would be the method, e.g. based on current TA, and whether this can be left for UE implementation or something need to be specified.
 |
| **Scheduling Enhancements** | * RAN2 think that knowledge of survival time is beneficial to gNB. FFS whether there would be any impact to AS specifications to make use of this, and such discussions would have lower priority, as it is not explicitly a WI objective. There are also concerns that QoS framework may be impacted due to survival time being provided explicitly.
* R2 assumes that the maximum number of active SPS configurations for a given BWP of a serving cell in the specification is 8 or 16 (FFS).
* R2 assumes short SPS/CG periodicities and/or multiple SPS/CG configurations and/or combination thereof could be used to mitigate the periodicity misalignment between the TSN periodicity and CG/SPS periodicity. Other solutions not precluded, e.g. to address resource consumption.
* Will support “short” SPS periodicities, at least down to 0.5ms
* Ask R1 on feasibility, and additionally the feasibility to go down to even lower values, e.g. 2 symb.
* R2 assumes that activation/deactivation is done by DCI.
* RAN1 should address activation/deactivation DCIs related with configured grant Type 2 and SPS in the case of multiple configurations
* When multiple UL CG or DL SPS configurations is configured, an offset for each configuration is needed for the calculation of the HARQ process ID
 |
| **Ethernet Header Compression** | * IETF see no issues for 3GPP to develop and maintain a ROHC profile. Also, it seems feasible in the time frame of Rel-16.
* We develop Ethernet header compression 100% in 3GPP TS (not by extending ROHC)
 |

**Agreements from RAN2#106 meeting (Reno, US, 13 – 17 May 2019):**

|  |  |
| --- | --- |
| **Accurate reference timing** | * SFN boundary at or immediately after the ending boundary of the SI-window in which SIB is transmitted is always used as a reference in case the time reference information is provided by broadcast signalling (as in LTE)
* The UE considers the frame indicated by the referenceSFN nearest to the frame where the time information is received, which can be either in the past or in future, in case the time reference information is provided by unicast signalling
* Signalling to support 10ns granularity.
* R2 assumes that either SIB9 or a new SIB is used for reference time information broadcast delivery, depending on R3 discussion outcome.
* “00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time)” as the origin of the time reference information, at least for the baseline case where time info type is not present or used (as in LTE).
* The field used for reference time information delivery is excluded from estimation of changes in system information.
* Specify uncertainty parameter in the reference time information in NR, encoding FFS
* We will have the clock type field, similar to LTE. R2 considers that this have no relation to ongoing discussions in SA2 on TSC
 |
| **Ethernet Header Compression** | * Ethernet Header Compression (EHC) is configured per DRB, separately for UL and DL.
* Use context ID concept such that compressor and decompressor associates a context ID with Ethernet header contents.
* Compression is done with following principle:

**- For Ethernet flow resulting in creation of new context, compressor transmits at least one packet with full header and context id (to establish context in decompressor).**  **- After above, compressor starts transmits compressed packets. FFS if multiple transmissions and/or feedback is needed.** * EHC header format is designed to include following mandatory fields: Context ID, Indication of header format (i.e. full header and compressed header), FFS other field, e.g. profile ID
 |
| **PDCP duplication enhancements**  | * Intention is that Copies are sent on different legs
* Dynamic Network control of DRB duplication is by MAC CE
* By the MAC CE, Network to control which of the configured RLC entities that is/are active
* Support the case that no of copies = no of active RLC entities
 |
| **Intra-UE prioritization / multiplexing** | * For de-prioritized PUSCH on dynamic grant, the UE should store the de-prioritized MAC PDU in the HARQ buffer, to allow gNB to schedule re-transmission using the same HARQ process.
* For de-prioritized PUSCH on configured grants, a) the UE could store the de-prioritized MAC PDU in the HARQ buffer, to allow gNB to schedule re-transmission. b) FFS if the UE could transmit it using the subsequent radio resources e.g. associated with the same HARQ process
* The above agreements are at least applicable for cases when MAC has already generated the de-prioritized MAC PDU
 |

**Agreements from RAN2#107 meeting (Prague, Czechia, 26 – 30 August 2019):**

|  |  |
| --- | --- |
| **PDCP duplication enhancements**  | * The number of copies generated is equal to the number of active RLC entities, i.e. one copy per leg/RLC entity, and active/inactive state is determined by MAC CE.
* The network provides in RRC only one LCH cell restriction configuration per LCH, like in Rel-15. Changes to LCH cell restriction configuration is only possible via RRC.
* At PDCP duplication, application of the configured cell restrictions are not dynamically changed upon activation or deactivation of PDCP duplication beyond Rel-15. (FFS the case of CA duplication)
* The MAC CE signaling structure is either:

 **a. Per DRB signaling with the activation status of the associated RLC entities, or** **b. All DRBs with the activation status of the associated RLC entities for each DRB*** A new LCID is used for the Rel-16 MAC CE controlling PDCP duplication.
 |
| **Intra-UE prioritization / multiplexing** | * same prioritization solution for CG vs CG conflict and CG vs DG conflict
* Extend LCP restrictions by allowing restrictive mapping between an LCH and certain CG configurations.
* LCP restriction enhancements for DG to take into account reliability is needed, details FFS.
* no need to define UE processing time in MAC
* The same UE prioritization behaviour should be applied for resource conflicts between new transmissions or a new transmission and a retransmission.
* RAN2 assumes that MAC PDU recovery method in grant prioritization could be reused for PUSCH vs SR conflict.
* The case of highest priorities of two conflicting grants are equal is handled according to the following: for CG DG conflict, DG is prioritized, other cases FFS to what extent to specify.
* For The case when no PDU has been generated at all yet, and there is two grants where one will be de-prioritized (and there is data available for both grants). One PDU is generated
* If PUCCH resource for an SR’s transmission occasion overlaps a UL-SCH resource, SR’s transmission is allowed based on a comparison of priority of the LCH that triggered the SR and a priority value for the UL-SCH resource, if the priority of the LCH that triggered the SR is “high” (FFS). Priority value of the UL-SCH resource is FFS
* If an SR was triggered before MAC PDU assembly and PUCCH resource for the SR’s transmission occasion conflicts with UL-SCH resource of the MAC PDU, and the UL-SCH transmission is deprioritized, a MAC PDU will not be generated. (conflict = they cannot both be transmitted)
* When a PUSCH transmission is deprioritized, desired PHY behaviour is for RAN1 to decide
 |

**Agreements from RAN2#107bis meeting (Chongqing, China, 14 – 18 October 2019):**

|  |  |
| --- | --- |
| **Accurate reference timing** | * SIB9 is used for accurate reference timing delivery by broadcast.
* *DLInformationTransfer* message is used for serving cell’s accurate reference timing delivery by unicast.
* R2 assumes there will be no particular functionality to ensure accurate timing distribution at the moment of handover in Rel-16
* The uncertainty of reference time info is unspecified, if the uncertainty field is absent.
* We send an LS: RAN2 asks SA2 to provide information on whether and how the need for reference time information can be determined for any given connected UE
* FFS if The referenceSFN field indicates the time at the ending boundary of the SFN indicated by referenceSFN of PCell.
 |
| **Scheduling Enhancements** | Multiple SPS/CG configuration and new CG/SPS periodicities:* R2 assumes to support 8 as the maximum number of simultaneously activated SPS configurations per BWP per serving cell.
* Introduce SPS/CG index to identify each SPS/CG among multiple SPS/CG configurations, i.e., as in Rel-15 LTE.
* The association between “state” (used in the joint release DCI) and the CG configuration(s) for type-2 CG is configured via RRC message.
* Each CG configuration is always configured independently, as in Rel-15 LTE.
* The association between “state” (used in the joint release DCI) and the SPS configuration(s) is configured via RRC message, if RAN1 working assumption for joint release for multiple SPS configuration is confirmed.
* Each SPS configuration is always configured independently, as in Rel-15 LTE.
* Support simultaneous Type 1 & 2 CG configurations in a BWP.
* CG periodicities of any integer-multiple of one slot (FFS if we go even lower, e.g. 2 symb, 7 symb) below a maximum value should be supported. FFS on the maximum value of integer N.
* SPS periodicities of any integer-multiple of one slot below a maximum value should be supported in Rel-16. FFS on the maximum value of integer N.
* R2 assumes that HARQ offset parameter is explicitly configured by the network for each CG/SPS configuration.
* For CG, HARQ Process ID = [floor(CURRENT\_symbol/periodicity)] modulo nrofHARQ-Processes + harq-procID-offset.
* FFS (for checking) if For SPS, HARQ Process ID = [floor(CURRENT\_slot/periodicity)] modulo nrofHARQ-Processes + harq-ProcID-offset, Where CURRENT\_slot = [(SFN × numberOfSlotsPerFrame) + slot number in the frame].
* Introduce a new confirmation MAC CE format in Rel-16, which reflects the confirmation of multiple configured grant configurations

LCH restrictions related:* A single LCH can be map to multiple CG configurations.
* Multiple LCHs can be map to a single CG configuration.
* R2 think it would be useful to introduce a new LCP restriction in the following way: The DCI that is scheduling PUSCH may include a specific indication. LCH configuration in RRC contains information on whether the LCH can utilize grant with this indication or not. R2 intends that this mechanism can be used to differentiate grants for traffic that requires high reliability.

TSCAI related:* Granularity of burst arrival time and periodicity signalled to RAN should be preferably 1 us.
 |
| **Ethernet Header Compression** | * The EHC function is in PDCP
* The EHC header is located after the SDAP header, and it is ciphered
* The EHC can removes the following fields: SOURCE/DESTINATION ADDRESS, TYPE, and EHC do not support multiple formats
* FFS: Pad removal
* For context establishment the compressor send the full header and the context ID via PDCP data PDU
* ROHC and EHC are independent, e.g. from specification point of view they could both be configured for a DRB.
* FFS if for context establishment the explicit feedback is sent via PDCP control PDU.

Baseline feedback mechanism, enhancements not precluded: * For context establishment the de-compressor sends an explicit feedback to the compressor after the establishment of the context, i.e. when a full header packet is received with a context id.
* For context establishment the explicit feedback includes the “Context ID”.
* When the compressor receives the feedback it is confident that the context is successfully established, and from this time compressed header packets can be transmitted.
* FFS if EHC is allowed to be configured for a unidirectional link.
 |
| **Intra-UE prioritization / multiplexing** | Deprioritized MAC PDU handling:* We don’t do the solution where the UE indicate explicitly to the network that there is data for a deprioritized PDU
* There is support to have “UE autonomous retransmission in a CG resource”. Allow checking of complexity to next meeting.
 |
| **PDCP duplication enhancements** | * The mechanism of primary path defined for Rel-15 PDCP duplication should be retained for Rel-16 (FFS if allowed to deactivate a primary path ie to not send data PDU).
 |

**Agreements from RAN2#108 meeting (Reno, US, 18 – 22 November 2019):**

|  |  |
| --- | --- |
| **Accurate reference timing** | Propagation delay compensation:**The following is FFS (Ericsson and LG have concerns):*** R2 assume that UE may perform propagation delay compensation.
* We don’t specify how the UE perform propagation delay compensation.
* For unicast and broadcast, the network can indicate to the UE to not do delay compensation.

Stage-3 details:* The reference cell of the time at the ending boundary of the SFN indicated by *referenceSFN* can be PCell

Stage-3 details – uncertainty encoding:* We use linear encoding
* The uncertainty value of reference time info is the uncertainty field value multiplied by 25 ns
* The number of bits to encode uncertainty field is 15 and the maximum value of uncertainty field is 2^15 -1, i.e., the maximum uncertainty value of reference time info is 0.8096 millisecond
* The smallest uncertainty field value is zero
 |
| **Scheduling Enhancements** | * For CG/SPS periodicity determination, support the maximum values of N as specified already, depending on SCS, i.e. N= 640 for 15kHz, 1280 for 30kHz, 2560 for 60kHz and 5120 for 120kHz.
* In addition to specific CG-LCH mapping It should be possible to configure that all CGs are allowed, and none of the CGs are allowed
* Multiple CG activation/deactivation confirmation MAC CE contains only a bitmap of CG configurations using CG ID unique per MAC entity and configured by RRC in addition to CG ID introduced by RAN1.
* Multiple CG activation/deactivation confirmation MAC CE uses new LCID value.
* In MAC specifications, correct formulas for CG occasion determination so that they consider N sequentially, as for SPS.
* HARQ process ID determination with multiple SPS configurations is based on the following formula: HARQ Process ID = [floor(CURRENT\_slot/periodicity)] modulo nrofHARQ-Processes + harq-ProcID-offset, Where CURRENT\_slot = [(SFN × numberOfSlotsPerFrame) + slot number in the frame]
* In Rel-16, SPS periodicities in RRC are expressed in number of slots.
* We don’t introduce additional mechanism to align CG/SPS to TSC traffic pattern period
 |
| **Ethernet Header Compression** | Padding removal:* There is support in R2 to have Ethernet Padding Removal for IIOT
* The following tentative agreements are postponed, we send an LS to SA1, but we will decide next meeting regardless if get a reply in time or not.

Padding Removal tentative agreements- Specify the EHC decompressor behaviour such that it checks the frame size after reapplying the Ethernet header and in case it is lower than 64 bytes, the decompressor appends random bytes to make the frame a valid Ethernet frame (e.g. 64 bytes long).- We don’t specify the behaviour of the compressor/padding removal side- Padding removal is an optional feature that is configurable.Feedback and general operation:* RAN2 confirm the feedback mechanism already agreed in the last meeting and apply this to both AM DRB and UM DRB.
* The EHC algorithm is not allowed to be configured for a uni-directional link.
* Q-TAGs can be removed in EHC, considering all sub-fields, assuming this is static (i.e. no dynamic indications in EHC)
 |
| **Intra-UE prioritization / multiplexing** | UE autonomous (re)transmission:* The TPs can work, as baseline (maybe some details to fix)
* UE autonomously transmits the de-prioritized PDU as a new transmission in a CG resource from the same CG configuration (FFS different CG configuration)
* The new CG uses the same HARQ process as the deprioritized CG.
* The Aut (re-) transmission feature is optional
* The case when the next CG resource cannot be used for a retransmission because of UE processing time limitation can occur (no consensus on whether this is a corner case or a mainstream case). Leave the timeline restriction to UE implementation (we don’t specify a new number, can specify something).
* UE shall not perform autonomous transmission of the PDU if network has scheduled a retransmission grant for the PDU. FFS whether we specify some time restriction.

LCP restrictions enhancements:* RRC configures a LCH with one or more allowed L1-priority level values (e.g. in a *allowedPriorityLevels* list*)* in *LogicalChannelConfig* (as in the current LCH restrictions), applied at least for mapping to DG, FFS for CG

Intra-UE prioritizaiton of overlapping grants:* For CGCG conflicts, and CGDG conflicts, the priority value of an uplink grant (UL-SCH resource) is the highest priority of the LCHs that is multiplexed or can be multiplexed in MAC PDU, taking into account LCH restrictions and data availability.
* If PUCCH resource for an SR’s transmission occasion overlaps a UL-SCH resource, SR’s transmission is allowed (prioritized) based on a comparison of priority of the LCH that triggered the SR and a priority value for the UL-SCH resource (where the priority value is determined as in previous agreement), if the priority of the LCH that triggered the SR is higher.
* For CG-CG conflict with equal priority, prioritization is up to UE implementation.
* For SR-Data conflict with equal priority, UL-SCH (i.e. data) is prioritized.
 |
| **PDCP duplication enhancements** | General stage-2:* Network coordination is beneficial for PDCP duplication in the uplink in NR-DC/CA architectures.

Stage-3 details (primary path, activation/deactivation):* The primary path should not be de-activated for data PDUs.
* For PDCP duplication controlling MAC CE format, per DRB signaling with the activation status of the associated RLC entities should be adopted in Rel-16.
* The initial state for each leg can be configured by RRC
* When multiple RLC entities are configured for the DRB, and PDCP duplication is deactivated (less than 2 RLC entities activated for duplication), fallback to Split bearer operation is supported in Dual Connectivity (2 RLC entities belonging to different cell groups).
* For fallback to split bearer operation, a pointer to the secondary RLC entity is introduced in RRC to identify which of the multiple configured RLC entities shall be used.
* One PDCP entity has one primary path.
* R16 MAC CE for both leg selection and on/off
* R15 MAC CE on/off (for R16 configurations) is FFS
 |

**Agreements from RAN2#109-e meeting (Elbonia, 24 February – 6 March 2020):**

|  |  |
| --- | --- |
| **Accurate reference timing** | * **Capture for the reference time information in 38.331 that “The indicated time is referenced at the network, i.e., without compensating for RF propagation delay.”**
* **In Rel-16, propagation delay compensation may be done by UE implementation.**
* **Do not capture propagation delay compensation aspect in stage-2 specifications.**
* **No EN-DC specific enhancements are pursued for accurate reference time objective of Rel-16 IIOT WI.**
* **Do not make any specifications changes to indicate which of the received reference time information takes precedence in case the UE receives reference time via both unicast and broadcast signalling.**
* **It is FFS if UE in RRC Connected can request SIB9 using on-demand SI request (by reusing OSI mechanism defined for RRC Connected UEs, with assumption of no additional work is needed in IIOT WI).**
 |
| **Scheduling Enhancements** | * **Confirm LCH configured with allowedCG-List is allowed to be mapped to dynamic grant**
* **LCH configured with allowedPHY-PriorityIndex is allowed to be mapped to dynamic grant without any priority indication only in case the configuration allows it to be mapped on low priority grant.**
* **allowedPHY-PriorityIndex restriction applies only to dynamic grants.**
* **If configuredGrantConfigList-r16 is configured in the MAC entity, the multiple entry configured grant confirmation MAC CE is always used.**
* **As in legacy, the multiple entry configured grant confirmation MAC CE is generated if 1) the MAC entity has UL resources allocated for new transmission; 2) there is at least one triggered but not cancelled confirmation.**
* **Confirm that Multiple Entry Configured Grant Confirmation MAC CE has the same priority as Confirmation Grant Confirmation MAC CE.**
* **For Type-1 CG, after receiving the configuration, UE should first identify the lowest N value corresponding to the nearest available CG occasion, then, N is incremented after each CG occasion starting from the N identified in the first step.**
* **Introduce timeReferenceSFN in RRC CG type 1 configuration.**
* **Align the terminology and use name “phy-PriorityIndex” in TS 38.300, TS 38.321, TS 38.331 to indicate the priority of the grant/SR-source agreed by RAN1**
* **Maximum 32 CG configurations per MAC entity.**
* **MAC CE for CG configuration has a fixed size of 4 bytes.**
* **Confirm that multiple entry configured confirmation MAC CE only confirms configured grant type 2 configurations and other entries can be ignored.**
* **Multiple entry confirmation MAC CE confirms the reception of (re)-activation/de-activation DCI.**
* **Two CGs of any type, one activated in UL and another activated in SUL, are not time-overlapping by the control of the network. This can be captured in the stage-2 spec.**
 |
| **Ethernet Header Compression** | * ***Each different PCP/DE value combination in a flow across all Q Tags (single or multiple) is associated with a separate context ID.***
* ***The ROHC header is located after EHC header (illustrated below).***

* ***When a DRB is configured with RoHC and EHC, the sender/compressor behaviour for a non-IP Ethernet packet shall be to bypass ROHC and deliver that packet from EHC compressor to lower layers.***
* ***When a DRB is configured with RoHC and EHC, the receiver/decompressor behaviour for a packet that has non-IP Ethertype (after EHC decompression) is to bypass RoHC and deliver the packet directly to higher layers.***
* ***For SDAP Control PDU, the EHC header is not generated.***
* ***1-bit Indication in EHC header is used for header format differentiation.***
* ***CID overwriting mechanism is supported.***
* ***Use a NOTE to specify CID overwriting mechanism in the specification.***
* ***The compressor can use an “all zeros” context ID to indicate that no context is to be established, when transmitting uncompressed packets.***
* ***EHC feedback is transmitted via PDCP Control PDU.***
* ***No need to specify how the compressor to determine that a context establishment procedure was unsuccessful.***
* ***Configuration of a parameters (e.g. drb-ContinueEHC) indicates whether or not EHC is reset at PDCP re-establishment.***
* ***EHC context continue function can be indicated separately for UL and DL, through configuration of parameters, e.g. ul-drb-ContinueEHC and dl-drb-ContinueEHC.***
* ***The processing order of the EHC and ROHC is up to UE implementation.***
* ***Only the feedback based mechanism is supported for EHC context establishment.***
* ***No enhancement needed on the compressor side. The compressor keeps sending full header packets till the first feedback is received and start to transmit the compressed header packets.***
* ***No special mechanism is needed on the decompressor side to control the number of feedbacks.***
* Both 1-byte header and 2-bytes header is supported and the choice depends on RRC configuration (of DRB). For one DRB the header size is fixed.
 |
| **Intra-UE prioritization / multiplexing** | * Observation, acc to current R2 agreements: In case that two MAC PDUs with the same L1 priority (i.e. high-high or low-low) are delivered by MAC, the second PDU has priority from RAN2 perspective (based on LCH priority).
* FFS whether data vs. data and SR vs. data prioritization can be configured separately.
* RAN2 confirms to introduce *lch-basedPrioritization* (configuration parameter of intra-UE prioritization based on LCH priority) in MAC running CR.
* RAN2 confirms that UE can perform autonomous transmission of the de-prioritized configured uplink grant by the prioritized SR transmission.
* An uplink grant addressed to CS-RNTI with NDI=1 (retransmission of CG) is a dynamic grant in prioritization.
* An uplink grant addressed to CS-RNTI with NDI=0 ((re-)activation of type 2 CG) is a configured grant in prioritization.
* RAN2 confirms the current MAC running CR already captures that CG with *configuredGrantTimer* running is not considered in prioritization.
* An uplink grant is not de-prioritized by other de-prioritized SR or uplink grant. TP in Phase-2 discussion is a baseline.

Deprioritized transmissions:* Retransmission grants are not reused for new transmissions in Rel-16. No specification changes are required.
* When the CG is de-prioritized, it is up to the UE implementation to determine the processing time restriction determining whether the very next CG resource with same HARQ process can be used, or the/a following one, for an autonomous transmission
* **UE autonomous transmission uses the same HARQ process and the same CG configuration. No change to the current running CR.**
* **A PDU from a de-prioritized DG scheduled for a re-transmission of a de-prioritized CG cannot be autonomously transmitted using the subsequent CG with same HARQ process. No change to the current running CR.**
* ***autonomousReTx* is only configurable per configured grant configuration.**
* **No limit (timer or counter) is specified in Rel-16 on the number of times a MAC PDU is consecutively de-prioritized. No specification changes are required.**
* **No optimization of the *configuredGrantTimer* procedure is foreseen to reduce the delay to the next available CG for autonomous transmission.**
* **No new condition on whether at least some DM-RS symbols associated with the de-prioritized PUSCH have been transmitted is added to trigger/no trigger an autonomous transmission.**
* **No optimization is foreseen to address** **the issue of a PDCCH scheduling a dynamic retransmission of the deprioritized TB received before the PUSCH used for the autonomous transmission whereas the PUSCH corresponding to the PDCCH occurs after the PUSCH resource for the autonomous transmission**
* **The issue of a type-2 CG configuration change between the de-prioritized CG and the new CG resource for autonomous transmission preventing the de-prioritized PDU to fit the new CG resource will be addressed.**
* **A HARQ process cannot be shared between different CGs.**
* **The issue of a running *configuredGrantTimer* when the HARQ buffer of the corresponding HARQ process is empty is not addressed.**
* **The issue of a LCH mapping restrictions mismatch when rescheduling a dropped CG with new transmission DG (as opposed to re-transmission DG) is not addressed.**
* **Postpone the discussion on the solution addressing autonomous transmission when type-2 CG’s configuration changes to the next meeting.**
 |
| **PDCP duplication enhancements** | => Rel-16 PDCP duplication is applied to SRBs.=> For SRBs, all secondary RLC entities are activated when configured.=> MAC CE based activation/deactivation of PDCP duplication is not supported for SRBs.=> When a secondary RLC entity is deactivated (but PDCP duplication is still activated), the UE shall discard duplicated PDCP PDUs in the deactivated secondary RLC entity.=> If Rel-16 MAC CE indicates all secondary RLC entities are deactivated for a DRB, the UE shall deactivate PDCP duplication for the DRB. FFS whether and how this has TS impact.=> DRBdup ID in Rel-16 MAC CE is set to 5bits full DRB ID.=> FFS if and how Rel-15 MAC CE is used for Rel-16 Duplication  |
| **UE capabilities** | * The UE supporting multipleCG-Configs shall also support lch-ToConfiguredGrantMapping.
* A single capability for PDCP duplication with more than two RLC entities covers both RLC AM and RLC UM mode.
* UE signals the maximum number of supported EHC contexts as a capability.
* A separate UE capability is defined for EHC context continuation.
* FFS whether signalling of maximum value of additional SPS periodicities and additional CG periodicities supported by a UE is required.
* FFS whether to support allowing CG periodicities of multiple of 2/7 symbols as a separate capability with a cross-slot boundary capability as a pre-requisite.
* FFS if Data vs. data and SR vs. data prioritization are signalled as a single capability.
* FFS whether LCH based prioritization can be supported without PHY prioritization. It is expected this can be discussed once RAN1 has defined feature/capability related to PHY layer prioritization
 |

**Agreements from RAN2#109-e meeting (Elbonia, 20 – 30 April 2020):**

|  |  |
| --- | --- |
| **Accurate reference timing** | * The CONNECTED UE can request the reference time information.
* [025] The request of the reference time information is sent via the *UEAssistanceInformation* message.
* [025] The UE indication of the delivery periodicity of the reference time is not supported in this release.
* [025] The GPS time of the Rel-16 reference time information is provided independently without using the Rel-15 GPS 10ms resolution of SIB9.
* [025] The reference time is encoded by using multiple fields, as the current specification, i.e. no optimization into a single field.
* [025] The text proposal given in Annex A is used as the baseline for the request of the reference time information.
 |
| **Scheduling Enhancements** | * [026] Not to introduce restrictions of how many SPS configurations are supported, e.g. per cell/ per UE (SPS/CG).
* [026] No need to capture limitation of maximum CG/SPS configurations per MAC entity in TS 38.300.
* [026] Support up to 32 SPS configurations per MAC entity.
* [026] SPS-Config and SPS-ConfigList in BWP-DownlinkDedicated cannot be configured simultaneously at a given time.
* [026] ConfiguredGrantConfig and ConfiguredGrantConfigList in BWP-UplinkDedicated cannot be configured simultaneously at a given time.
* The change in the time domain offset seems agreeable, not sufficient support to clarify closest N, at least the way that was proposed here, can discuss more.
* FFS if Option 1 or 2 (*Rapporteur comment: this relates to CG Type 1 occasion determination upon BWP switch)*
* [027] Remove sps-PUCCH-AN-ListPerCodebook from SPS-ConfigList and add sps-PUCCH-AN-List in PUCCH-Config. This can be revisited if RAN1 impacts are identified.
* [027] SPS-ConfigList can be used to configure one SPS Configuration per BWP.
 |
| **Ethernet Header Compression** | Agreements email [030]:* Decompressor behaviour is unspecified if it receives a compressed packet with an unknown context ID (not much support to specify).
* Network reconfigures ethernetHeaderCompression only upon reconfiguration involving PDCP re-establishment.
* For LTE, EHC cannot be configured together with UDC.
* In RRC specifications, replace parameter ehc-HeaderSize with ehc-CID-Length.
* The clause “5.12.3 Protocol parameters” in TS 38.323 and clause “5.14.3 Protocol parameters” in TS 36.323 are VOID’ed.
* If both SDAP header and EHC are configured, how to distinguish SDAP control PDU from SDAP Data PDU is left to UE implementation.
* There is no reserved bit/codepoint in EHC header.
* CID length is 7 or 15 bits, for 1 byte and 2 byte EHC header, respectively.
* EHC feedback packet format in TS 38.323 v16.0.0 clause A2.1.2 can be confirmed, i.e. there is 1 reserved bit in EHC feedback packet.

**Remaining agreements:*** postpone the discussion to next meeting regarding whether to capture example of operation on different Ethernet header structures as informative text.
 |
| **Intra-UE prioritization / multiplexing** | * MAC CE is not considered for grant prioritization in Rel-16.
* On P3, it seems no company have strong reasons that we need to do either Option 1 or 2, can be resolved later (TS rapporteur to choose what is simplest)
* On P5, we send an LS to R1 informing on R2 agreements and the current gap, we explain the solutions on the table and we ask R1 for feedback (quick). LS to R1: Nokia (in email discussion above). LS approval 24h after stable.

*Rapporteur’s comment: P3 and P5 relate to proposals from R2-2003226***Agreements email [028] :*** No text change in TS 38.321 to address the cases with multiple overlapping SPS PDSCH.
* Adopt the first TP in R2-2003226 (the one targets at Section 5.4.2.1. of TS38.321) to address the issue of HARQ buffer flushing when the grant for autonomous retransmission is again de-prioritized.
* For Rel-16, no enhancement is introduced for SR counter and SR Prohibit Timer.
* Data/Data and Data/SR prioritization should be configured as a single configuration
* Both Multiple Entry Configured Grant Confirmation MAC CE and Duplication RLC Activation/Deactivation MAC CE are assigned to LCID Set2.
* Autonomous retransmission should be continued upon reactivation of Type-2 CG if and only if the TBS remains the same.
* NOTE5 in MAC to be updated: “NOTE 5: If cg\_RetransmissionTimer is not configured, A HARQ process is not shared between different configured grant configurations.”
* Keep Rel-15 principle for resource overlapping with uplink grant received in RAR:

A) For the collision with case UL grant received in RAR (or addressed to temporary C-RNTI) vs CG, the uplink grant in RAR is prioritized and used for transmission. (need text change). B) For the collision with case UL grant received in RAR (or addressed to temporary C-RNTI) vs DG, it is up to UE implementation which resource is chosen. (no need to change)”* Capture “De-prioritized uplink grant is excluded in prioritization of other grants”. CATT’s TP in the comment is a baseline (adding “which was not already deprioritized”)
* Use AutonomousTx.
* Use the MAC Correction CR, R2-2002947, for Part 2 discussion on CR update.
* RAN2 confirms the following problematic scenario happens for the case of two PDUs generation: “An already de-prioritized uplink grant needs to be prioritized after high-priority data arrival. But the current normative text does not allow it”
* How to fix in the spec will be discussed in the next meeting.
 |
| **PDCP duplication enhancements** | Email [029] agreements:* Rel-15 Duplication MAC CE is not used for Rel-16 Duplication configuration (with more than two RLC entities configured).
* For DRBs, if the duplicationState is absent, the initial duplication states are deactivated for all RLC entities.
* Add the text in the duplicationState field description as “For DRBs, if the field is absent, the initial PDCP duplication states are deactivated for all associated RLC entities.”
* Update the definition of split secondary RLC entity to specify the setting of the split secondary RLC entity for the PDCP entity associated with only two RLC entities
* The following text proposal is agreed: Split secondary RLC entity: in dual connectivity, the RLC entity other than the primary RLC entity which is responsible for split bearer operation. If the PDCP entity is associated with two RLC entities, the split secondary RLC entity is the RLC entity other than the primary RLC entity. If the PDCP entity is associated with more than two RLC entities, the split secondary RLC entity is configured by upper layers.
* Agree to clearly specify that PDCP duplication is deactivated for the DRB when all secondary RLC entities are deactivated
* Confirm that index I for RLCi field of Rel-16 MAC CE is determined by ascending order of logical channel ID of secondary RLC entities in MCG and SCG, and remove the Editor’s Note from the MAC specification.
* No clarification is needed for CA duplication.

**Remaining agreements:*** Confirm that duplication is always activated for all RLC entities for SRB (meaning e.g. that *duplicationState* has no meaning for SRB).
 |
| **UE capabilities** | Agreements email [031]* Data vs. data and SR vs. data prioritization are signalled as a single capability.
* Do not introduce additional signalling for maximum value of supported periodicities for SPS/CG.
* Introduce an indication parameter, e.g. maxNumberEHC-ContextsSN, in ConfigRestrictInfoSCG IE of CG-ConfigInfo Message, to indicate the maximum number of EHC contexts allowed to the SN terminated bearer.

**Remaining agreements:*** UE signals the maximum number of supported EHC contexts across all DRBs using maxNumberEHC-Contexts parameter.
* maxNumberEHC-Contexts parameter indicates the number of EHC contexts supported by the UE’s compressor and decompressor jointly.
* Maximum value of maxNumberEHC-Contexts that can be signalled is 65536
* Minimum value of maxNumberEHC-Contexts that can be signalled is 2
* FFS whether additional capability or related signalling is needed for joint EHC and ROHC operation
* R2 assumes that PHY-based prioritization and LCH-based prioritization are configured independently and one can be configured without the other (assumption may be modified when LS reply from R1 is received)
* FFS how to address the scenario where PHY layer of a UE which is not configured to perform PHY-based prioritization, receives from MAC layer two MAC PDUs related to overlapping grants.
* FFS: Revisit the discussion on the number of DRBs the UE shall support with Rel-16 PDCP duplication after the related issue for Rel-15 is clarified.
* FFS: Allow additional RLC entities to be configured for duplication without impacting the maximum number of DRBs. Discuss further the conditions for allowing additional RLC entities to be configured.
 |

# 2 Remaining issues list

## 2.1 TS 38.300

|  |
| --- |
| **Editor’s note / open issue** |
|  |
|  |
| For NR-DC, it is FFS how the nodes can coordinate RLC entities activation/deactivation between each other (pending RAN3 discussions). |
|  |

## 2.2 TS 38.331

|  |  |
| --- | --- |
| **Editor’s note / open issue** | Handle in WI or ASN.1 review? |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

## 2.3 TS. 38.323

|  |
| --- |
| **Editor’s note / open issue** |
|  |
|  |
|  |
|  |
|  |
|  |
| FFS whether to capture an example of operation on different Ethernet header structures as informative text. |

## 2.4 TS. 38.321

|  |
| --- |
| **Editor’s note / open issue** |
|  |
|  |
|  |
|  |
| Editor’s Note: The step of determining the closest N needs to be added. |
|  |
|  |
|  |
| Impact of RAN2 observation that “In case that two MAC PDUs with the same L1 priority (i.e. high-high or low-low) are delivered by MAC, the second PDU has priority from RAN2 perspective (based on LCH priority).”, e.g. verify that UE handling of the PDU delivered to PHY is clear and whether any specifications changes are required. |
|  |
|  |
|  |
| FFS how to address the scenario where PHY layer of a UE which is not configured to perform PHY-based prioritization, receives from MAC layer two MAC PDUs related to overlapping grants. |
| FFS how to address CG Type 1 occasion determination upon BWP switch. |
| FFS how to fix in the specification the following scenario for the case of two PDUs generation: “An already de-prioritized uplink grant needs to be prioritized after high-priority data arrival. But the current normative text does not allow it” |

## 2.5 UE feature list (TS 38.822, 38.306)

|  |
| --- |
| **Editor’s note / open issue** |
|  |
|  |
|  |
| FFS whether to support allowing CG periodicities of multiple of 2/7 symbols as a separate capability with a cross-slot boundary capability as a pre-requisite. |
| FFS whether LCH based prioritization can be supported without PHY prioritization. It is expected this can be discussed once RAN1 has defined feature/capability related to PHY layer prioritization |
| FFS whether additional capability or related signalling is needed for joint EHC and ROHC operation. |
| FFS: Revisit the discussion on the number of DRBs the UE shall support with Rel-16 PDCP duplication after the related issue for Rel-15 is clarified. |
| FFS: Allow additional RLC entities to be configured for duplication without impacting the maximum number of DRBs. Discuss further the conditions for allowing additional RLC entities to be configured. |