

3GPP TSG-RAN2 Meeting #108
Reno, Nevada, US 18 – 22 Nov 2019

R2-190xxxx

CHANGE REQUEST		CR-Form-v12.0
38.331	CR DraftCR rev -	Current version: 15.7.0

For [HELP](http://www.3gpp.org/Change-Requests) on using this form: comprehensive instructions can be found at
<http://www.3gpp.org/Change-Requests>.

Proposed change affects: UICC apps ☐ ME ☒ Radio Access Network ☒ Core Network ☐

Title:	RRC running CR for NR IIoT		
Source to WG:	Ericsson		
Source to TSG:	R2		
Work item code:	NR_IIOT, NR_L1enh_URLLC	Date:	2019-11-18
Category:	B	Release:	Rel-16
Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:	
F (correction)		Rel-8 (Release 8)	
A (mirror corresponding to a change in an earlier release)		Rel-9 (Release 9)	
B (addition of feature),		Rel-10 (Release 10)	
C (functional modification of feature)		Rel-11 (Release 11)	
D (editorial modification)		Rel-12 (Release 12)	
Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Rel-13 (Release 13)	
		Rel-14 (Release 14)	
		Rel-15 (Release 15)	
		Rel-16 (Release 16)	
Reason for change:	New features specified in the Work Item on support of Industrial Internet of Things (NR_IIOT) and the Work Item on Physical layer enhancements for NR ultra-reliable and low latency communication (NR_L1enh_URLLC).		
Summary of change:	This CR introduces new features specified in NR_IIOT WI and new features related to UL configured grant and UL Intra-UE prioritization in NR_L1enh_URLLC WI. The features introduced under NR_L1enh_URLLC WI are specifically indicated. If not indicated, the features are introduced under NR_IIOT WI.		

	1. Add the new information element <i>ReferenceTimeInfo</i> and its usage in SIB9 and DLInformationTransfer 2. Add support of multiple DL SPS and UL CG in one BWP. UL CG is introduced in NR_L1enh_URLLC. 3. Add LCP restriction enhancement: LCH-CG restrictive mapping and LCH to grant with DCI-indication mapping. 4. Add the RRC parameter list in R1-1911743, in relation to UL configured grant (NR_L1enh_URLLC), DL SPS and Intra-UE prioritization (NR_L1enh_URLLC). 5. Add EHC header compression support in PDCP-Config				
Consequences if not approved:	If the CR is not approved, the features introduced in NR IIoT and NR_L1enh_URLLC WI are not supported.				
Clauses affected:	To be updated				
	<table><tr><td>Y</td><td>N</td></tr></table>	Y	N		
Y	N				
Other specs affected:	<table><tr><td>X</td></tr></table>	X	Other core specifications	TS/TR ... CR ...	
X					
	<table><tr><td>X</td></tr></table>	X	Test specifications	TS/TR ... CR ...	
X					
(show related CRs)	<table><tr><td>X</td></tr></table>	X	O&M Specifications	TS/TR ... CR ...	
X					
Other comments:					
This CR's revision history:					

START OF CHANGES

5.2.2.4.10 Actions upon reception of *SIB9*

No UE requirements related to the contents of this *SIB9* apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

[Editor's note FFS: whether and how to capture propagation delay compensation.](#)

NEXT CHANGE

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 included *time* and *referenceSFN*;

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*.

[Editor's note FFS: whether and how to capture propagation delay compensation](#)

NEXT CHANGE

6.2.2 Message definitions

– *DLInformationTransfer*

The *DLInformationTransfer* message is used for the downlink transfer of NAS dedicated information [and timing information for 5G internal system clock](#).

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.)

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-v16-IEsSEQUENCE {} OPTIONAL
}

DLInformationTransfer-v16-IEs ::= SEQUENCE {
    referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL, -- Need N
    lateNonCriticalExtension OCTET STRING OPTIONAL
    nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- TAG-DLINFORMATIONTRANSFER-STOP
-- ASN1STOP
```

NEXT CHANGE

6.3.1 System information blocks

– SIB9

SIB9 contains information related to GPS time and Coordinated Universal Time (UTC). The UE may use the parameters provided in this system information block to obtain the UTC, the GPS and the local time.

NOTE: The UE may use the time information for numerous purposes, possibly involving upper layers e.g. to assist GPS initialisation, to synchronise the UE clock.

SIB9 information element

```
-- ASN1START
-- TAG-SIB9-START
```

```
SIB9 ::= SEQUENCE {
    timeInfo          SEQUENCE {
        timeInfoUTC      INTEGER (0..549755813887),
        daylightSavingTime BIT STRING (SIZE (2)),
        leapSeconds       INTEGER (-127..128),
        localTimeOffset   INTEGER (-63..64)
    },
    lateNonCriticalExtension OCTET STRING,
    ...
    [[
        referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL -- Need R
    ]]
}
-- TAG-SIB9-STOP
-- ASN1STOP
```

SIB9 field descriptions
dayLightSavingTime Indicates if and how daylight-saving time (DST) is applied to obtain the local time. The semantics are the same as the semantics of the <i>Daylight Saving Time</i> IE in TS 24.501 [23] and TS 24.008 [38]. The first/leftmost bit of the bit string contains the b2 of octet 3 and the second bit of the bit string contains b1 of octet 3 in the value part of the <i>Daylight Saving Time</i> IE in TS 24.008 [38].
leapSeconds Number of leap seconds offset between GPS Time and UTC. UTC and GPS time are related i.e. GPS time -leapSeconds = UTC time.
localTimeOffset Offset between UTC and local time in units of 15 minutes. Actual value = field value * 15 minutes. Local time of the day is calculated as UTC time + localTimeOffset.
timeInfoUTC Coordinated Universal Time corresponding to the SFN boundary at or immediately after the ending boundary of the SI-window in which SIB9 is transmitted. The field counts the number of UTC seconds in 10 ms units since 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). See NOTE 1. This field is excluded when determining changes in system information, i.e. changes of <i>timeInfoUTC</i> should neither result in system information change notifications nor in a modification of <i>valueTag</i> in <i>SIB1</i> .
referenceTimeInfo Contains timing information for 5G internal system clock.

NOTE 1: The UE may use this field together with the *leapSeconds* field to obtain GPS time as follows: GPS Time (in seconds) = timeInfoUTC (in seconds) - 2,524,953,600 (seconds) + leapSeconds, where 2,524,953,600 is the number of seconds between 00:00:00 on Gregorian calendar date 1 January, 1900 and 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time).

NEXT CHANGE

6.3.2 Radio resource control information elements

– BWP-DownlinkDedicated

The IE *BWP-DownlinkDedicated* is used to configure the dedicated (UE specific) parameters of a downlink BWP.

BWP-DownlinkDedicated information element

```
-- ASN1START
-- TAG-BWP-DOWNLINKDEDICATED-START

BWP-DownlinkDedicated ::= SEQUENCE {
    pdcch-Config          SetupRelease ( PDCCH-Config )      OPTIONAL, -- Need M
    pdsch-Config          SetupRelease ( PDSCH-Config )      OPTIONAL, -- Need M
    sps-Config            SetupRelease ( SPS-Config )         OPTIONAL, -- Need M
    radioLinkMonitoringConfig SetupRelease ( RadioLinkMonitoringConfig ) OPTIONAL, -- Need M
    ...
    sps-ConfigList-r16    SetupRelease ( SPS-ConfigList-r16 ) OPTIONAL -- Need M
}

-- TAG-BWP-DOWNLINKDEDICATED-STOP
-- ASN1STOP
```

BWP-DownlinkDedicated field descriptions	
pdccch-Config	UE specific PDCCCH configuration for one BWP.
pdsch-Config	UE specific PDSCH configuration for one BWP.
sps-Config	UE specific SPS (Semi-Persistent Scheduling) configuration for one BWP. Except for reconfiguration with sync, the NW does not reconfigure <i>sps-Config</i> when there is an active configured downlink assignment (see TS 38.321 [3]). However, the NW may release the <i>sps-Config</i> at any time.
sps-ConfigList	UE specific multiple SPS (Semi-Persistent Scheduling) configurations for one BWP. Editor's note: FFS if "Except for reconfiguration with sync, the NW does not reconfigure a SPS configuration when it is active (see TS 38.321 [3]). However, the NW may release a SPS configuration at any time."
radioLinkMonitoringConfig	UE specific configuration of radio link monitoring for detecting cell- and beam radio link failure occasions. The maximum number of failure detection resources should be limited up to 8 for both cell and beam radio link failure detection in Rel-15.

NEXT CHANGE

BWP-UplinkDedicated

The IE *BWP-UplinkDedicated* is used to configure the dedicated (UE specific) parameters of an uplink BWP.

BWP-UplinkDedicated information element

```
-- ASN1START
-- TAG-BWP-UPLINKDEDICATED-START

BWP-UplinkDedicated ::= SEQUENCE {
    pucch-Config          SetupRelease { PUCCH-Config }          OPTIONAL, -- Need M
    pusch-Config          SetupRelease { PUSCH-Config }          OPTIONAL, -- Need M
    configuredGrantConfig SetupRelease { ConfiguredGrantConfig } OPTIONAL, -- Need M
    srs-Config            SetupRelease { SRS-Config }            OPTIONAL, -- Need M
    beamFailureRecoveryConfig SetupRelease { BeamFailureRecoveryConfig } OPTIONAL, -- Cond SpCellOnly
    ...
    configuredGrantConfigList-r16 SetupRelease { ConfiguredGrantConfigList-r16 } OPTIONAL -- Need M
}

-- TAG-BWP-UPLINKDEDICATED-STOP
-- ASN1STOP
```

BWP-UplinkDedicated field descriptions	
beamFailureRecoveryConfig	Configuration of beam failure recovery. If <i>supplementaryUplink</i> is present, the field is present only in one of the uplink carriers, either UL or SUL.
configuredGrantConfig	A <i>Configured-Grant</i> of <i>type1</i> or <i>type2</i> . It may be configured for UL or SUL but in case of <i>type1</i> not for both at a time. Except for reconfiguration with sync, the NW does not reconfigure <i>configuredGrantConfig</i> when there is an active configured uplink grant <i>Type 2</i> (see TS 38.321 [3]). However, the NW may release the <i>configuredGrantConfig</i> at any time.
configuredGrantConfigList	A list of multiple <i>Configured grant configurations for one BWP</i> .
pucch-Config	PUCCH configuration for one BWP of the normal UL or SUL of a serving cell. If the UE is configured with SUL, the network configures PUCCH only on the BWPs of one of the uplinks (normal UL or SUL). The network configures <i>PUCCH-Config</i> at least on non-initial BWP(s) for SpCell and PUCCH SCell. If supported by the UE, the network may configure at most one additional SCell of a cell group with <i>PUCCH-Config</i> (i.e. PUCCH SCell). In EN-DC, The NW configures at most one serving cell per frequency range with PUCCH. And in EN-DC, if two PUCCH groups are configured, the serving cells of the NR PUCCH group in FR2 use the same numerology. The NW may configure PUCCH for a BWP when setting up the BWP. The network may also add/remove the <i>pucch-Config</i> in an <i>RRCReconfiguration</i> with <i>reconfigurationWithSync</i> (for SpCell or PUCCH SCell) or with SCell release and add (for PUCCH SCell) to move the PUCCH between the UL and SUL carrier of one serving cell. In other cases, only modifications of a previously configured <i>pucch-Config</i> are allowed. If one (S)UL BWP of a serving cell is configured with PUCCH, all other (S)UL BWPs must be configured with PUCCH, too.
pusch-Config	PUSCH configuration for one BWP of the normal UL or SUL of a serving cell. If the UE is configured with SUL and if it has a <i>PUSCH-Config</i> for both UL and SUL, an UL/SUL indicator field in DCI indicates which of the two to use. See TS 38.212 [17], clause 7.3.1.
srs-Config	Uplink sounding reference signal configuration.

Conditional Presence	Explanation
<i>SpCellOnly</i>	The field is optionally present, Need M, in the <i>BWP-UplinkDedicated</i> of an SpCell. It is absent otherwise.

NEXT CHANGE

ConfiguredGrantConfig

The IE *ConfiguredGrantConfig* is used to configure uplink transmission without dynamic grant according to two possible schemes. The actual uplink grant may either be configured via RRC (*type1*) or provided via the PDCCH (addressed to CS-RNTI) (*type2*). [Multiple Configured Grant configurations may be configured in one BWP of a serving cell.](#)

ConfiguredGrantConfig information element

```
-- ASN1START
-- TAG-CONFIGUREDGRANTCONFIG-START
ConfiguredGrantConfig ::= SEQUENCE {
```

```

frequencyHopping      ENUMERATED (intraSlot, interSlot)      OPTIONAL, -- Need S
cg-DMRS-Configuration DMRS-UplinkConfig,                    OPTIONAL, -- Need S
mcs-Table              ENUMERATED (qam256, qam64LowSE)      OPTIONAL, -- Need S
mcs-TableTransformPrecoder  ENUMERATED (qam256, qam64LowSE)  OPTIONAL, -- Need M
uci-OnPUSCH            SetupRelease { CG-UCI-OnPUSCH }      OPTIONAL, -- Need S
resourceAllocation     ENUMERATED ( resourceAllocationType0, resourceAllocationType1, dynamicSwitch ),
rbg-Size               ENUMERATED (config2)                 OPTIONAL, -- Need S
powerControlLoopToUse  ENUMERATED (n0, n1),                 OPTIONAL, -- Need S
p0-PUSCH-Alpha         P0-PUSCH-AlphaSetId,                 OPTIONAL, -- Need S
transformPrecoder      ENUMERATED (enabled, disabled)
nrofHARQ-Processes     INTEGER (1..16),
repK                   ENUMERATED (n1, n2, n4, n8),
repK-RV                ENUMERATED (s1-0231, s2-0303, s3-0000) OPTIONAL, -- Need R
periodicity            ENUMERATED (
    sym2, sym7, sym1x14, sym2x14, sym4x14, sym5x14, sym8x14, sym10x14, sym16x14, sym20x14,
    sym32x14, sym40x14, sym64x14, sym80x14, sym128x14, sym160x14, sym256x14, sym320x14, sym512x14,
    sym640x14, sym1024x14, sym1280x14, sym2560x14, sym5120x14,
    sym6, sym1x12, sym2x12, sym4x12, sym5x12, sym8x12, sym10x12, sym16x12, sym20x12, sym32x12,
    sym40x12, sym64x12, sym80x12, sym128x12, sym160x12, sym256x12, sym320x12, sym512x12, sym640x12,
    sym1280x12, sym2560x12
),
configuredGrantTimer   INTEGER (1..64)                       OPTIONAL, -- Need R
rrc-ConfiguredUplinkGrant
timeDomainOffset      INTEGER (0..5119),
timeDomainAllocation  INTEGER (0..15),
frequencyDomainAllocation BIT STRING (SIZE(18)),
antennaPort           INTEGER (0..31),
dmrs-SeqInitialization INTEGER (0..1),
precodingAndNumberOfLayers INTEGER (0..63),
srs-ResourceIndicator INTEGER (0..15),
mcsAndQTBs            INTEGER (0..31),
frequencyHoppingOffset INTEGER (1.. maxNrofPhysicalResourceBlocks-1)
pathlossReferenceIndex INTEGER (0..maxNrofPUSCH-PathlossReferenceRSs-1),
...
...
...
[[
configuredGrantConfigIndex-r16 ConfiguredGrantConfigIndex-r16 OPTIONAL, -- Need N
harg-ProcessID-Offset-r16      INTEGER (0..15)                OPTIONAL, -- Need N
periodicityEXT-r16            ENUMERATED (FFS)                OPTIONAL, -- Need N
startingFromRV0-r16          ENUMERATED (on,off)              OPTIONAL, -- Need N
priority-r16                  ENUMERATED (high,low)            OPTIONAL, -- Need N
]]
]
}

CG-UCI-OnPUSCH ::= CHOICE {
    dynamic          SEQUENCE (SIZE (1..4)) OF BetaOffsets,
    semiStatic       BetaOffsets
}

-- TAG-CONFIGUREDGRANTCONFIG-STOP

```

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-- ASN1STOP

3GPP

ConfiguredGrantConfig field descriptions	
antennaPort	Indicates the antenna port(s) to be used for this configuration, and the maximum bitwidth is 5. See TS 38.214 [19], clause 6.1.2, and TS 38.212 [17], clause 7.3.1.
cg-DMRS-Configuration	DMRS configuration (see TS 38.214 [19], clause 6.1.2.3).
configuredGrantConfigIndex	Indicates the index of one of multiple Configured Grant configurations.
configuredGrantTimer	Indicates the initial value of the configured grant timer (see TS 38.321 [3]) in multiples of periodicity.
dmrs-SeqInitialization	The network configures this field if <i>transformPrecoder</i> is disabled. Otherwise the field is absent.
frequencyDomainAllocation	Indicates the frequency domain resource allocation, see TS 38.214 [19], clause 6.1.2, and TS 38.212 [17], clause 7.3.1).
frequencyHopping	The value <i>intraSlot</i> enables 'Intra-slot frequency hopping' and the value <i>interSlot</i> enables 'Inter-slot frequency hopping'. If the field is absent, frequency hopping is not configured.
frequencyHoppingOffset	Frequency hopping offset used when frequency hopping is enabled (see TS 38.214 [19], clause 6.1.2 and clause 6.3).
hmq-ProcessID-Offset	Indicates the offset used in deriving the HARQ process IDs, see TS 38.321 [3], clause 5.4.1.
mcs-Table	Indicates the MCS table the UE shall use for PUSCH without transform precoding. If the field is absent the UE applies the value <i>qam64</i> .
mcs-TableTransformPrecoder	Indicates the MCS table the UE shall use for PUSCH with transform precoding. If the field is absent the UE applies the value <i>qam64</i> .
mcsAndTBS	The modulation order, target code rate and TB size (see TS 38.214 [19], clause 6.1.2). The NW does not configure the values 28–31 in this version of the specification.
nrofHARQ-Processes	The number of HARQ processes configured. It applies for both Type 1 and Type 2. See TS 38.321 [3], clause 5.4.1.
p0-PUSCH-Alpha	Index of the <i>P0-PUSCH-AlphaSet</i> to be used for this configuration.
periodicity	Periodicity for UL transmission without UL grant for type 1 and type 2 (see TS 38.321 [3], clause 5.8.2). The following periodicities are supported depending on the configured subcarrier spacing [symbols]: 15 kHz: 2, 7, $n \cdot 14$, where $n = \{1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 320, 640\}$ 30 kHz: 2, 7, $n \cdot 14$, where $n = \{1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 640, 1280\}$ 60 kHz with normal CP: 2, 7, $n \cdot 14$, where $n = \{1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1280, 2560\}$ 60 kHz with ECP: 2, 6, $n \cdot 12$, where $n = \{1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1280, 2560\}$ 120 kHz: 2, 7, $n \cdot 14$, where $n = \{1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1024, 1280, 2560, 5120\}$
periodicityExt	If this field is present, the field <i>periodicity</i> is ignored and <i>periodicityExt</i> is used instead to determine the periodicity for UL transmission without UL grant for type 1 and type 2. (see TS 38.321 [3], clause 5.8.2). Value FFS.
powerControlLoopToUse	Closed control loop to apply (see TS 38.213 [13], clause 7.1.1).

priority
Indicates the PHY priority of CG PUSCH at least for PHY-layer collision handling.
rbg-Size
Selection between configuration 1 and configuration 2 for RBG size for PUSCH. The UE does not apply this field if <i>resourceAllocation</i> is set to <i>resourceAllocationType1</i> . Otherwise, the UE applies the value <i>config1</i> when the field is absent. Note: <i>rbg-Size</i> is used when the <i>transformPrecoder</i> parameter is disabled.
repK-RV
The redundancy version (RV) sequence to use. See TS 38.214 [19], clause 6.1.2. The network configures this field if repetitions are used, i.e., if <i>repK</i> is set to <i>n2</i> , <i>n4</i> or <i>n8</i> . Otherwise, the field is absent.
repK
The number of repetitions of K.
resourceAllocation
Configuration of resource allocation type 0 and resource allocation type 1. For Type 1 UL data transmission without grant, <i>resourceAllocation</i> should be <i>resourceAllocationType0</i> or <i>resourceAllocationType1</i> .
rrc-ConfiguredUplinkGrant
Configuration for "configured grant" transmission with fully RRC-configured UL grant (Type1). If this field is absent the UE uses UL grant configured by DCI addressed to CS-RNTI (Type2). Type 1 configured grant may be configured for UL or SUL, but not for both simultaneously.
srs-ResourceIndicator
Indicates the SRS resource to be used.
startingFromRV0
If configured to be <i>on</i> , the transmission can start from any RV0 occasion for RV cyclic sequences {0,0,0,0} and {0,3,0,3}. If configured to be <i>off</i> , the transmission starts always from the first transmission occasion.
timeDomainAllocation
Indicates a combination of start symbol and length and PUSCH mapping type, see TS 38.214 [19], clause 6.1.2 and TS 38.212 [17], clause 7.3.1.
timeDomainOffset
Offset related to SFN=0, see TS 38.321 [3], clause 5.8.2.
transformPrecoder
Enables or disables transform precoding for <i>type1</i> and <i>type2</i> . If the field is absent, the UE enables or disables transform precoding in accordance with the field <i>msg3-transformPrecoder</i> in <i>RACH-ConfigCommon</i> , see TS 38.214 [19], clause 6.1.3.
uci-OnPUSCH
Selection between and configuration of dynamic and semi-static beta-offset. For Type 1 UL data transmission without grant, <i>uci-OnPUSCH</i> should be set to <i>semiStatic</i> .

ConfiguredGrantConfigIndex

The IE *ConfiguredGrantConfigIndex* is used to indicate the index of one of multiple UL Configured Grant configurations.

ConfiguredGrantConfigIndex information element

```
-- ASN1START
-- TAG-CONFIGUREDGRANTCONFIGINDEX-START

ConfiguredGrantConfigIndex-r16 ::= INTEGER (1..maxNrofConfiguredGrantConfig-r16)

-- TAG-CONFIGUREDGRANTCONFIGINDEX-STOP
-- ASN1STOP
```

— ConfiguredGrantConfigList

The IE *ConfiguredGrantConfigList* is used to configure multiple uplink Configured Grant configurations in one BWP.

ConfiguredGrantConfigList information element

```
-- ASN1START
-- TAG-CONFIGUREDGRANTCONFIGLIST-START
ConfiguredGrantConfigList-r16 ::= SEQUENCE {
    configuredGrantConfigToAddModList-r16      ::= ConfiguredGrantConfigToAddModList-r16      OPTIONAL, -- Need N
    configuredGrantConfigToReleaseList-r16     ::= ConfiguredGrantConfigToReleaseList-r16     OPTIONAL, -- Need N
    configuredGrantConfigType2DeactivationStateList-r16 ::= ConfiguredGrantConfigType2DeactivationStateList-r16 OPTIONAL -- Need N
}
ConfiguredGrantConfigToAddModList-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig
ConfiguredGrantConfigToReleaseList-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfigIndex-r16
ConfiguredGrantConfigType2DeactivationState-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfigIndex-r16
ConfiguredGrantConfigType2DeactivationStateList-r16 ::= SEQUENCE (SIZE (1..FFS)) OF ConfiguredGrantConfigType2DeactivationState-r16
-- TAG-CONFIGUREDGRANTCONFIGLIST-STOP
-- ASN1STOP
```

ConfiguredGrantConfigList field descriptions
<u>configuredGrantConfigToAddModList</u> Indicates a list of multiple UL Configured Grant configured to be added or modified.
<u>configuredGrantConfigToReleaseList</u> Indicates a list of multiple UL Configured Grant configured to be released.
<u>configuredGrantConfigType2DeactivationStateList</u> Indicates a list of the deactivation states in which each state can be mapped to a single or multiple Configured Grant type 2 configurations to be deactivated when the corresponding deactivation DCI is received, see clause 7.3.1 in TS 38.212 [17] and clause 6.1 in TS 38.214 [19].

Commented [E1]: RAN1 agreement
• M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is
o Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released

The length of the sequence is 2^M and not clear yet how M is signalled.

NEXT CHANGE

— LogicalChannelConfig

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

LogicalChannelConfig information element

```

-- ASN1START
-- TAG-LOGICALCHANNELCONFIG-START

LogicalChannelConfig ::=
    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, -- FDCP-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 (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfigIndex-r16
                OPTIONAL, -- Need R
            allowedGrantIndication-r16
                FFS
                OPTIONAL, -- Cond UL
            ...
        }
-- TAG-LOGICALCHANNELCONFIG-STOP
-- ASN1STOP

```

LogicalChannelConfig field descriptions
allowedCG-List If present, UL MAC SDUs from this logical channel can only be mapped to the configured grant configurations with the indicated indexes. Otherwise, UL MAC SDUs from this logical channel can be mapped to any configured grant configurations. Corresponds to "allowedCG-List" as specified in TS 38.321 [3].
allowedGrantIndication If present, UL MAC SDUs from this logical channel can only be mapped to the grant with this indication. Otherwise, UL MAC SDUs from this logical channel can be mapped to any grant with an indication (if present). Editor's note: The field <i>allowedGrantIndication</i> and its description is a placeholder. RAN2 should wait for RAN1 progress to decide the value of <i>allowedGrantIndication</i> . The name <i>allowedGrantIndication</i> can also be changed to reflect RAN1 agreement.
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].
bitRateQueryProhibitTimer The timer is used for bit rate recommendation query in TS 38.321 [3], in seconds. Value <i>s0</i> means 0 s, <i>s0dot4</i> means 0.4 s and so on.
bucketSizeDuration Value in ms. <i>ms5</i> corresponds to 5 ms, value <i>ms10</i> corresponds to 10 ms, and so on.
configuredGrantType1Allowed If present, UL MAC SDUs from this logical channel can be transmitted on a configured grant type 1. Corresponds to 'configuredGrantType1Allowed' in TS 38.321 [3].
logicalChannelGroup ID of the logical channel group, as specified in TS 38.321 [3], which the logical channel belongs to.
logicalChannelSR-Mask Controls SR triggering when a configured uplink grant of <i>type1</i> or <i>type2</i> is configured. <i>true</i> 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 <i>false</i> if <i>logicalChannelSR-DelayTimer</i> is not included in <i>BSR-Config</i> .
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].
Priority Logical channel priority, as specified in TS 38.321 [3].
prioritisedBitRate Value in kiloBytes/s. Value <i>kBps0</i> corresponds to 0 kiloBytes/s, value <i>kBps8</i> corresponds to 8 kiloBytes/s, value <i>kBps16</i> corresponds to 16 kiloBytes/s, and so on. For SRBs, the value can only be set to <i>infinity</i> .
schedulingRequestId If present, it indicates the scheduling request configuration applicable for this logical channel, as specified in TS 38.321 [3].

Commented [E2]: It was discussed in RAN2#107bis that it should be possible to configure a logical channel to be mapped to any configured grant configurations.

From rapporteur's point of view, this implementation is preferred since it follows the same as the rest of the LCP restriction rules.

Conditional Presence	Explanation
PDCP-CA Duplication	The field is mandatory present if the DRB/SRB associated with this logical channel is configured with PDCP CA duplication in UL (i.e. the PDCP entity is associated with multiple RLC entities belonging to the same 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.

NEXT CHANGE

– 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
},
..
ehc-Uplink-r16                FFS,
ehc-Downlink-r16              FFS,
),
integrityProtection            ENUMERATED { enabled }
statusReportRequired           ENUMERATED { true }
outOfOrderDelivery             ENUMERATED { true }
OPTIONAL, -- Cond ConnectedTo5GC1
OPTIONAL, -- Cond RLC-AM
OPTIONAL, -- Need R
OPTIONAL, -- Cond DRB
}
moreThanOneRLC                SEQUENCE {
    primaryPath                SEQUENCE {
        cellGroup              CellGroupId
        logicalChannel          LogicalChannelIdentity
    },
    ul-DataSplitThreshold       UL-DataSplitThreshold
    pdcp-Duplication            BOOLEAN
    OPTIONAL, -- Cond SplitBearer
    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
]]
}

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}
-- TAG-PDCP-CONFIG-STOP
-- ASN1STOP

```

PDCP-Config field descriptions
<i>cipheringDisabled</i> 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.
<i>discardTimer</i> Value in ms of <i>discardTimer</i> specified in TS 38.323 [5]. Value <i>ms10</i> corresponds to 10 ms, value <i>ms20</i> corresponds to 20 ms and so on.
<i>ehc-Uplink</i> FFS
<i>ehc-Downlink</i> FFS
<i>drb-ContinueROHC</i> 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 <i>fullConfig</i> is not indicated.
<i>headerCompression</i> If rohc is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink. If <i>uplinkOnlyROHC</i> 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 . The network reconfigures <i>headerCompression</i> only upon reconfiguration involving PDCP re-establishment. Network configures <i>headerCompression</i> to <i>notUsed</i> when <i>outOfOrderDelivery</i> is configured.
<i>integrityProtection</i> 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.
<i>maxCID</i> 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 <i>maxNumberROHC-ContextSessions</i> parameter as indicated by the UE.
<i>moreThanOneRLC</i> This field configures UL data transmission when more than one RLC entity is associated with the PDCP entity.
<i>outOfOrderDelivery</i> Indicates whether or not <i>outOfOrderDelivery</i> specified in TS 38.323 [5] is configured. This field should be either always present or always absent, after the radio bearer is established.
<i>pdcp-Duplication</i> 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 initial state of the duplication. If set to <i>true</i> , duplication is activated. The value of this field is always <i>true</i> , when configured for a SRB.
<i>pdcp-SN-SizeDL</i> PDCP sequence number size for downlink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value <i>len12bits</i> is applicable.
<i>pdcp-SN-SizeUL</i> PDCP sequence number size for uplink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value <i>len12bits</i> is applicable.
<i>primaryPath</i> 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. The NW indicates <i>cellGroup</i> for split bearers using logical channels in different cell groups. The NW indicates <i>logicalChannel</i> for CA based PDCP duplication, i.e., if both logical channels terminate in the same cell group.

PDCP-Config field descriptions	
statusReportRequired	For AM DRBs, indicates whether the DRB is configured to send a 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 <i>ms0</i> corresponds to 0 ms, value <i>ms20</i> corresponds to 20 ms, value <i>ms40</i> corresponds to 40 ms, and so on. When the field is absent the UE applies the value <i>infinity</i> .
ul-DataSplitThreshold	Parameter specified in TS 38.323 [5]. Value <i>b0</i> corresponds to 0 bytes, value <i>b100</i> corresponds to 100 bytes, value <i>b200</i> corresponds to 200 bytes, and so on. The network sets this field to <i>infinity</i> for UEs not supporting <i>splitDRB-withUL-Both-MCG-SCG</i> . If the field is absent when the split bearer is configured for the radio bearer first time, then the default value <i>infinity</i> is applied.

Conditional presence	Explanation
<i>DRB</i>	This field is mandatory present when the corresponding DRB is being set up, absent for SRBs. Otherwise this field is optionally present, need M.
<i>MoreThanOneRLC</i>	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 an additional logical channel to the PDCP entity. 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.
<i>Rlc-AM</i>	For RLC AM, the field is optionally present, need R. Otherwise, the field is absent.
<i>Setup</i>	The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need M.
<i>SplitBearer</i>	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.
<i>ConnectedTo5GC</i>	The field is optionally present, need R, if the UE is connected to 5GC. Otherwise the field is absent.
<i>ConnectedTo5GC1</i>	The field is optionally present, need R, if the UE is connected to NR/5GC. Otherwise the field is absent.
<i>Setup2</i>	This field is mandatory present in case for radio bearer setup for RLC-AM and RLC-UM. Otherwise, this field is absent, Need M.

[Editor's note: FFS if EHC is allowed to be configured for a unidirectional link.](#)

NEXT CHANGE

ReferenceTimeInfo

The IE *ReferenceTimeInfo* contains timing information for 5G internal system clock used for, e.g., time stamping, see TS 23.501 [32], clause 5.27.1.2.

ReferenceTimeInfo information element

```
-- ASN1START
-- TAG-REFERENCETIMEINFO-START
ReferenceTimeInfo-r16 ::= SEQUENCE (
    time-r16                ReferenceTime-r16,
    uncertainty-r16          FFS,                                OPTIONAL,  -- Need R
    timeInfoType-r16         ENUMERATED (localClock)            OPTIONAL,  -- Need R
    referenceSFN-r16         INTEGER (0..1023)                  OPTIONAL  -- Cond TimeRef
)
```

```

}
ReferenceTime-r16 ::=
    SEQUENCE {
        refDays-r16          INTEGER (0..72999),
        refSeconds-r16       INTEGER (0..86399),
        refMilliseconds-r16  INTEGER (0..999),
        refTenNanoSeconds-r16 INTEGER (0..99999)
    }
-- TAG-REFERENCETIMEINFO-STOP
-- ASN1STOP

```

ReferenceTimeInfo field descriptions
referenceSFN This field indicates the reference SFN corresponding to the reference time information.
time This field indicates time reference with 10ns granularity. The indicated time in 10ns unit from the origin is $refDays * 86400 * 1000 * 1000000 + refSeconds * 1000 * 1000000 + refMilliseconds * 1000000 + refTenNanoSeconds$. The <i>refDays</i> field specifies the sequential number of days (with day count starting at 0) from the origin of the <i>time</i> field. If the <i>referenceTimeInfo</i> field is received in <i>DLInformationTransferRRCUnicast</i> message, the time field indicates the <i>time</i> at the ending boundary of the system frame indicated by <i>referenceSFN</i> . The UE considers this frame (indicated by <i>referenceSFN</i>) to be the frame which is nearest to the frame where the message is received (which can be either in the past or in the future). If the <i>referenceTimeInfo</i> field is received in <i>SystemInformationBlockTypeXSIB9</i> , the <i>time</i> field indicates the time at the SFN boundary at or immediately after the ending boundary of the SI-window in which <i>SystemInformationBlockTypeXSIB9</i> is transmitted. If <i>referenceTimeInfo</i> field is received in <i>SystemInformationBlockTypeXSIB9</i> , this field is excluded when determining changes in system information, i.e. changes of time should neither result in system information change notifications nor in a modification of <i>valueTag</i> in <i>SIB1</i> .
timeInfoType If <i>timeInfoType</i> is not included, the <i>time</i> indicates the GPS time and the origin of the <i>time</i> field is 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time). If <i>timeInfoType</i> is set to <i>localClock</i> , the origin of the <i>time</i> is unspecified.
uncertainty This field indicates the uncertainty of the reference time information provided by the time field. FFS: encoding

Conditional Presence	Explanation
<i>TimeRef</i>	The field is mandatory present if <i>TimeReferenceInfo</i> is included in <i>RRUnicastDLInformationTransfer</i> message; otherwise the field is absent.

Editor's note: FFS if The *referenceSFN* field indicates the time at the ending boundary of the SFN indicated by *referenceSFN* of PCCell.

Editor's note: FFS: RRCUnicast message and SystemInformationBlockTypeX message.

Editor's note: FFS: The procedure text on UE actions upon receiving RRCUnicast message (e.g., 5.7.x.y) and SystemInformationBlockTypeX (e.g., clause 5.2.2.4.X).

Commented [E3]: To be replaced with exact name

Commented [E4]: To be replaced with exact name

Commented [E5]: Further discuss this based on RAN1's reply to the LS R2-1908160 (propagation delay compensation for reference time information delivery)

NEXT CHANGE

SchedulingRequestResourceConfig

The IE *SchedulingRequestResourceConfig* determines physical layer resources on PUCCH where the UE may send the dedicated scheduling request (D-SR) (see TS 38.213 [13], clause 9.2.4).

***SchedulingRequestResourceConfig* information element**

```
-- ASN1START
-- TAG-SCHEDULINGREQUESTRESOURCECONFIG-START

SchedulingRequestResourceConfig ::= SEQUENCE {
    schedulingRequestResourceId      SchedulingRequestResourceId,
    schedulingRequestId              SchedulingRequestId,
    periodicityAndOffset             CHOICE {
        sym2                        NULL,
        sym6or7                    NULL,
        s11                        NULL,
        s12                        INTEGER (0..1),
        s14                        INTEGER (0..3),
        s15                        INTEGER (0..4),
        s18                        INTEGER (0..7),
        s110                       INTEGER (0..9),
        s116                       INTEGER (0..15),
        s120                       INTEGER (0..19),
        s140                       INTEGER (0..39),
        s180                       INTEGER (0..79),
        s1160                      INTEGER (0..159),
        s1320                      INTEGER (0..319),
        s1640                      INTEGER (0..639)
    }
    resource                         PUCCH-ResourceId
}

SchedulingRequestResourceConfig-r16 ::= SEQUENCE {
    schedulingRequestResourceId-r16 SchedulingRequestResourceId,
    schedulingRequestId-r16         SchedulingRequestId,
    periodicityAndOffset-r16        CHOICE {
        sym2                        NULL,
        sym6or7                    NULL,
        s11                        NULL,
        s12                        INTEGER (0..1),
        s14                        INTEGER (0..3),
        s15                        INTEGER (0..4),
        s18                        INTEGER (0..7),
        s110                       INTEGER (0..9),
        s116                       INTEGER (0..15),
        s120                       INTEGER (0..19),
        s140                       INTEGER (0..39),
        s180                       INTEGER (0..79),
        s1160                      INTEGER (0..159)
    }
}
```

s1320	INTEGER (0..319),		
s1640	INTEGER (0..639)		
)		OPTIONAL,	-- Need M
resource-r16	PUCCH-ResourceId	OPTIONAL,	-- Need M
priority-r16	ENUMERATED {high, low}	OPTIONAL	-- Need M

)			
-- TAG-SCHEDULINGREQUESTRESOURCECONFIG-STOP			
-- ASN1STOP			

SchedulingRequestResourceConfig field descriptions
periodicityAndOffset SR periodicity and offset in number of symbols or slots (see TS 38.213 [13], clause 9.2.4) The following periodicities may be configured depending on the chosen subcarrier spacing: SCS = 15 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 5sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl SCS = 30 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl, 160sl SCS = 60 kHz: 2sym, 7sym/6sym, 1sl, 2sl, 4sl, 8sl, 16sl, 20sl, 40sl, 80sl, 160sl, 320sl SCS = 120 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 16sl, 40sl, 80sl, 160sl, 320sl, 640sl sym6or7 corresponds to 6 symbols if extended cyclic prefix and a SCS of 60 kHz are configured, otherwise it corresponds to 7 symbols. For periodicities 2sym, 7sym and sl1 the UE assumes an offset of 0 slots.
priority Indicates whether this scheduling request resource is high or low priority in PHY prioritization/multiplexing handling.
Resource ID of the PUCCH resource in which the UE shall send the scheduling request. The actual <i>PUCCH-Resource</i> is configured in <i>PUCCH-Config</i> of the same UL BWP and serving cell as this <i>SchedulingRequestResourceConfig</i> . The network configures a <i>PUCCH-Resource</i> of <i>PUCCH-format0</i> or <i>PUCCH-format1</i> (other formats not supported) (see TS 38.213 [13], clause 9.2.4)
schedulingRequestID The ID of the <i>SchedulingRequestConfig</i> that uses this scheduling request resource.

NEXT CHANGE

SPS-Config

The IE *SPS-Config* is used to configure downlink semi-persistent transmission. ~~Downlink-SPS may be configured on the SpCell as well as on SCells. The network ensures SPS-Config is configured for at most one cell in a cell group.~~ Multiple Downlink SPS configurations may be configured in one BWP of a serving cell.

Editor's note: FFS: relating to the delated part, whether multiple downlink SPS can be configured on different serving cells in one cell group

SPS-Config information element

```
-- ASN1START
-- TAG-SPS-CONFIG-START

SPS-Config ::=
    SEQUENCE {
        periodicity          ENUMERATED {ms10, ms20, ms32, ms40, ms64, ms80, ms128, ms160, ms320, ms640,
                                         spare6, spare5, spare4, spare3, spare2, spare1},
        nrofHARQ-Processes   INTEGER (1..8),
        n1PUCCH-AN           PUCCH-ResourceId                                OPTIONAL, -- Need M
        mcs-Table            ENUMERATED {qam64LowSE}                        OPTIONAL, -- Need S
        ...
    }
    [[
        sps-ConfigIndex-r16   SPS-ConfigIndex-r16                                OPTIONAL, -- Need N
        harq-ProcessID-Offset-r16 INTEGER (0..15)                                OPTIONAL, -- Need N
        periodicityExt-r16    ENUMERATED {FFS}                                OPTIONAL, -- Need N
    ]]
-- TAG-SPS-CONFIG-STOP
-- ASN1STOP
```

SPS-Config field descriptions
<u>harq-ProcessID-Offset</u> Indicates the offset used in deriving the HARQ process IDs, see TS 38.321 [3], clause 5.3.1.
<u>mcs-Table</u> Indicates the MCS table the UE shall use for DL SPS (see TS 38.214 [19], clause 5.1.3.1. If present, the UE shall use the MCS table of low-SE 64QAM table indicated in Table 5.1.3.1-3 of TS 38.214 [19]. If this field is absent and field mcs-table in PDSCH-Config is set to 'qam256' and the activating DCI is of format 1_1, the UE applies the 256QAM table indicated in Table 5.1.3.1-2 of TS 38.214 [19]. Otherwise, the UE applies the non-low-SE 64QAM table indicated in Table 5.1.3.1-1 of TS 38.214 [19].
<u>n1PUCCH-AN</u> HARQ resource for PUCCH for DL SPS. The network configures the resource either as format0 or format1. The actual PUCCH-Resource is configured in PUCCH-Config and referred to by its ID. See TS 38.213 [13], clause 9.2.3.
<u>nrofHARQ-Processes</u> Number of configured HARQ processes for SPS DL (see TS 38.321 [3], clause 5.8.1).
<u>periodicity</u> Periodicity for DL SPS (see TS 38.214 [19] and TS 38.321 [3], clause 5.8.1).
<u>periodicityExt</u> If this field is present, the field periodicity is ignored and periodicityExt is used instead to determine the periodicity for DL SPS (see TS 38.214 [19] and see TS 38.321 [3], clause 5.8.1).
<u>sps-ConfigIndex</u> Indicates the index of one of multiple SPS configurations.

SPS-ConfigIndex

The IE *SPS-ConfigIndex* is used to indicate the index of one of multiple DL SPS configurations.

SPS-ConfigIndex information element

```
-- ASN1START
-- TAG-SPS-CONFIGINDEX-START
SPS-ConfigIndex-r16 ::= INTEGER (1..maxNrofSPS-Config-r16)
-- TAG-SPS-CONFIGINDEX-STOP
-- ASN1STOP
```

SPS-ConfigList

The IE *SPS-ConfigList* is used to configure multiple downlink SPS configurations in one BWP.

SPS-ConfigList information element

```
-- ASN1START
-- TAG-SPS-CONFIGLIST-START
SPS-ConfigList-r16 ::= SEQUENCE {
    SPS-ConfigDeactivationStateList-r16 SPS-ConfigDeactivationStateList-r16 OPTIONAL, -- Need N
    sps-ConfigToAddModList-r16 SPS-ConfigToAddModList-r16 OPTIONAL, -- Need N
    sps-ConfigToReleaseList-r16 SPS-ConfigToReleaseList-r16 OPTIONAL, -- Need N
    sps-PUCCH-AN-CodebookList-r16 SPS-PUCCH-AN-CodebookList-r16 OPTIONAL -- Need N
}
SPS-ConfigToAddModList-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-Config
SPS-ConfigToReleaseList-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-ConfigIndex-r16
SPS-ConfigDeactivationStateList-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-ConfigIndex-r16
SPS-ConfigDeactivationStateList-r16 ::= SEQUENCE (SIZE (1..FFS)) OF SPS-ConfigDeactivationState-r16
SPS-PUCCH-AN-CODEBOOKLIST-r16 ::= SEQUENCE (SIZE (1..2)) OF SPS-PUCCH-AN-Codebook-r16
-- TAG-SPS-CONFIGLIST-STOP
-- ASN1STOP
```

Commented [E6]: RAN1 agreement
 • $M \leq 4$ bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is
 o Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released

The length of the sequence is 2^M and not clear yet how M is signalled.

SPS-ConfigList field descriptions
<u>sps-ConfigDeactivationStateList</u> Indicates a list of the deactivation states in which each state can be mapped to a single or multiple SPS configurations to be deactivated, see clause 10.2 in TS 38.213 [13].
<u>sps-ConfigToAddModList</u> Indicates a list of multiple DL SPS configurations to be added or modified.
<u>sps-ConfigToReleaseList</u> Indicates a list of multiple DL SPS configurations to be released.
<u>sps-PUCCH-AN-CodebookList</u> Indicates PUCCH resources for a list of HARQ-ACK codebooks. The PUCCH resources are common for all SPS configurations with the indicated HARQ-ACK codebook. If configured, this overrides <i>n1PUCCH-AN</i> in <i>SPS-config</i> .

SPS-PUCCH-AN

The IE *SPS-PUCCH-AN* is used to indicate a PUCCH resource for HARQ ACK and configure the corresponding maximum payload size for the PUCCH resource.

SPS-PUCCH-AN information element

```
-- ASN1START
-- TAG-SPS-PUCCH-AN-START

SPS-PUCCH-AN-r16 ::= SEQUENCE {
    sps-PUCCH-AN-ResourceID-r16 PUCCH-ResourceId
    maxPayloadSize-r16 INTEGER (4..256) OPTIONAL -- Need N
}

-- TAG-SPS-PUCCH-AN-STOP
-- ASN1STOP
```

SPS-PUCCH-AN field descriptions
<u>maxPayloadSize</u> Indicates the maximum payload size for the corresponding PUCCH resource ID.
<u>sps-PUCCH-AN-ResourceID</u> Indicates the PUCCH resource ID

SPS-PUCCH-AN-Codebook

The IE *SPS-PUCCH-AN-Codebook* is used to configure the list of PUCCH resources per HARQ ACK codebook

SPS-PUCCH-AN-Codebook information element

```
-- ASN1START
-- TAG-SPS-PUCCH-AN-CODEBOOK-START
```

```

SPS-PUCCH-AN-Codebook-r16 ::= SEQUENCE {
    harq-CodebookID-r16          INTEGER (1..2),
    sps-PUCCH-AN-CodebookResource-r16  SEQUENCE (SIZE(1..4)) OF SPS-PUCCH-AN-r16
}
-- TAG-SPS-PUCCH-AN-CODEBOOK-STOP
-- ASN1STOP

```

SPS-PUCCH-AN-Codebook field descriptions

harq-CodebookID

Indicates the HARQ codebook ID.

sps-PUCCH-AN-CodebookResource

Indicates a list of PUCCH resources for HARQ ACK. The field *maxPayloadSize* is absent for the first and the last SPS-PUCCH-AN in the list.

NEXT CHANGE

6.4 RRC multiplicity and type constraint values

– Multiplicity and type constraint definitions

```

-- ASN1START
-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxBandComb          INTEGER ::= 65536  -- Maximum number of DL band combinations
maxCellBlack         INTEGER ::= 16      -- Maximum number of NR blacklisted cell ranges in SIB3, SIB4
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
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
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
maxNrofServingCells  INTEGER ::= 32      -- Max number of serving cells (SpCells + SCells)
maxNrofServingCells-1 INTEGER ::= 31      -- Max number of serving cells (SpCell + SCells) per cell group
maxNrofAggregatedCellsPerCellGroup INTEGER ::= 16
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
maxNrofSS-BlocksToAverage INTEGER ::= 16 -- Max number for the (max) number of SS blocks to average to determine cell

```

3GPP

maxNrofCSI-RS-ResourcesToAverage	INTEGER ::= 16	-- measurement -- Max number for the (max) number of CSI-RS to average to determine cell
maxNrofDL-Allocations	INTEGER ::= 16	-- measurement
maxNrofSR-ConfigPerCellGroup	INTEGER ::= 8	-- Maximum number of PDSCH time domain resource allocations
maxLCG-ID	INTEGER ::= 7	-- Maximum number of SR configurations per cell group
maxLC-ID	INTEGER ::= 32	-- Maximum value of LCG ID
maxNrofTAGs	INTEGER ::= 4	-- Maximum value of Logical Channel ID
maxNrofTAGs-1	INTEGER ::= 3	-- Maximum number of Timing Advance Groups
maxNrofBWPs	INTEGER ::= 4	-- Maximum number of Timing Advance Groups minus 1
maxNrofCombIDC	INTEGER ::= 128	-- Maximum number of BWPs per serving cell
maxNrofSymbols-1	INTEGER ::= 13	-- Maximum number of reported MR-DC combinations for IDC
		-- 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-1	INTEGER ::= 11	-- Max number of CoReSets configurable on a serving cell minus 1
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
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 resources per cell
maxNrofNZP-CSI-RS-ResourceSets-1	INTEGER ::= 63	-- Maximum number of NZP CSI-RS resources 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. See CSI-IM-ResourceMax in 38.214.
maxNrofCSI-IM-Resources-1	INTEGER ::= 31	-- Maximum number of CSI-IM resources minus 1. See CSI-IM-ResourceMax in 38.214.

maxNrofCSI-IM-ResourcesPerSet	INTEGER ::= 8	-- Maximum number of CSI-IM resources per set. See CSI-IM-ResourcePerSetMax -- in 38,214
maxNrofCSI-IM-ResourceSets	INTEGER ::= 64	-- Maximum number of NZP CSI-IM resources per cell
maxNrofCSI-IM-ResourceSetsPerConfig	INTEGER ::= 63	-- Maximum number of NZP CSI-IM resources per cell minus 1
maxNrofCSI-SSB-ResourcePerSet	INTEGER ::= 16	-- Maximum number of CSI IM resource sets per resource configuration
maxNrofCSI-SSB-ResourceSets	INTEGER ::= 64	-- Maximum number of SSB resources in a resource set
maxNrofCSI-SSB-ResourceSets-1	INTEGER ::= 63	-- Maximum number of CSI SSB resource sets per cell
maxNrofCSI-SSB-ResourceSetsPerConfig	INTEGER ::= 1	-- Maximum number of CSI SSB resource sets per cell minus 1
maxNrofFailureDetectionResources	INTEGER ::= 10	-- Maximum number of CSI SSB resource sets per resource configuration
maxNrofFailureDetectionResources-1	INTEGER ::= 9	-- Maximum number of failure detection resources
maxNrofObjectId	INTEGER ::= 64	-- Maximum number of failure detection resources minus 1
maxNrofPageRec	INTEGER ::= 32	-- Maximum number of measurement objects
maxNrofPCI-Ranges	INTEGER ::= 8	-- Maximum number of page records
maxPLMN	INTEGER ::= 12	-- Maximum number of PCI ranges
maxNrofCSI-RS-ResourcesRRM	INTEGER ::= 96	-- Maximum number of PLMNs broadcast and reported by UE at establishment
maxNrofCSI-RS-ResourcesRRM-1	INTEGER ::= 95	-- Maximum number of CSI-RS resources for an RRM measurement object
maxNrofMeasId	INTEGER ::= 64	-- Maximum number of CSI-RS resources for an RRM measurement object minus 1
maxNrofQuantityConfig	INTEGER ::= 2	-- Maximum number of configured measurements
maxNrofCSI-RS-CellsRRM	INTEGER ::= 96	-- Maximum number of quantity configurations
		-- Maximum number of cells with CSI-RS resources for an RRM measurement object
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-Resources	INTEGER ::= 64	-- Maximum number of SRS resources.
maxNrofSRS-Resources-1	INTEGER ::= 63	-- Maximum number of SRS resources in an SRS 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
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.
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.
maxNrofP0-PUSCH-AlphaSets	INTEGER ::= 30	-- Maximum number of P0-pusch-alpha-sets (see 38,213, clause 7.1)
maxNrofP0-PUSCH-AlphaSets-1	INTEGER ::= 29	-- Maximum number of P0-pusch-alpha-sets minus 1 (see 38,213, 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.
maxNrofNAICS-Entries	INTEGER ::= 8	-- Maximum number of supported NAICS capability set
maxBands	INTEGER ::= 1024	-- Maximum number of supported bands in UE capability.
maxBandsMDC	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.
maxFreqIDC-MRDC        INTEGER ::= 32     -- Maximum number of candidate NR frequencies for MR-DC IDC indication
maxNrofCandidateBeams  INTEGER ::= 16     -- Max number of PRACH-ResourceDedicatedBFR that in BFR config.
maxNrofPCIsPerSMTc     INTEGER ::= 64     -- Maximum number of PCIs per SMTc.
maxNrofQFIs            INTEGER ::= 64
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
maxNrofIndexesToReport INTEGER ::= 32
maxNrofIndexesToReport2 INTEGER ::= 64
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
maxSCS                 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-Resources INTEGER ::= 7       -- Maximum number of codebook resources supported by the UE
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 Categories
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 NR-DC/NR) Total number of Feature set combinations (size of the pool)

```

```
maxInterRAT-RSTD-Freq          INTEGER ::= 3
maxNrofConfiguredGrantConfig-r16  INTEGER ::= 12  -- Maximum number of simultaneous configured grant configurations per BWP
maxNrofSPS-Config-r16           INTEGER ::= 8    -- Maximum number of simultaneous SPS configurations per BWP

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP
-- ASN1STOP
```

– End of NR-RRC-Definitions

```
-- ASN1START
END
-- ASN1STOP
```

Annex- capture status of RAN2 Agreements in RRC running CR for IIOT WI

No Color: Captured

Gray: No RRC impact

Blue: Not clear if RRC impact, will re-visit in the next running CR when more agreements are reached.

Red: Not Captured

1. Accurate reference timing

1.1 RAN2#105bis

- ⇒ 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.

Commented [ZZ7]: Captured by the new IE
ReferenceTimeInfo

Commented [ZZ8]: Captured as an FFS in
5.2.2.4.10 Actions upon reception of SIB9 and in
5.7.1.3 Reception of the DLInformationTransfer by the UE

1.2 RAN2#106

- ⇒ 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

Commented [ZZ9]: Captured by the new IE *ReferenceTimeInfo*

1.3 RAN2#107

1.4 RAN2#107bis

- ⇒ 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.

Commented [ZZ10]: Captured by the new IE *ReferenceTimeInfo* and in 5.7.1.3 Reception of the DLInformationTransfer by the UE. No need to change the procedure text for SIB9 as it is covered by the existing text.

Commented [ZZ11]: Captured by the new IE *ReferenceTimeInfo*

Commented [ZZ12]: Captured by an FFS in the new IE *ReferenceTimeInfo*

2. Scheduling Enhancement

2.1 RAN2#105bis

- ⇒ 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

Commented [ZZ13]: Captured by maxNrofConfiguredGrantConfig-r16 and maxNrofSPS-Config-r16 in clause 6.4 and SPS-ConfigList clause 6.3.2

Commented [ZZ14]: Captured by the new field *periodicityExt* in SPS-Config

- ⇒ 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.

Commented [ZZ15]: Captured by the new field *harq-ProcessID-Offset*

2.2 RAN2#106

2.3 RAN2#107

2.4 RAN2#107bis

- ⇒ 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 = $\lfloor \text{CURRENT_symbol} / \text{periodicity} \rfloor \bmod \text{nrofHARQ-Processes} + \text{harq-procID-offset}$.
- ⇒ FFS (for checking) if For SPS, HARQ Process ID = $\lfloor \text{CURRENT_slot} / \text{periodicity} \rfloor \bmod \text{nrofHARQ-Processes} + \text{harq-ProcID-offset}$, Where $\text{CURRENT_slot} = \lfloor (\text{SFN} \times \text{numberOfSlotsPerFrame}) + \text{slot number in the frame} \rfloor$.
- ⇒ Introduce a new confirmation MAC CE format in Rel-16, which reflects the confirmation of multiple configured grant configurations
- ⇒ 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.
- ⇒ Granularity of burst arrival time and periodicity signalled to RAN should be preferably 1 us.

Commented [ZZ16]: Captured by *maxNrofSPS-Config-r16* in clause 6.4 and *SPS-ConfigList* clause 6.3.2

Commented [ZZ17]: Captured by the field *configuredGrantConfigIndex* and *sps-ConfigIndex*

Commented [ZZ18]: Captured by *ConfiguredGrantConfigType2DeactivationStateList* and *ConfiguredGrantConfigType2DeactivationStateList*

Commented [ZZ19]: Captured by *ConfigGrantConfigList* which contains a list of *configGrantConfig*

Commented [ZZ20]: Similar to configured grant configuration

Commented [ZZ21]: The current implementation does not explicitly differentiate between type 1 and type 2. It already supports this agreement and not change is identified.

Commented [ZZ22]: Captured by field *periodicityExt* and *harq-ProcessID-Offset*

Commented [ZZ23]: Captured by *allowedCG-List* in *LogicalChannelConfig*

Commented [ZZ24]: Captured by *allowedGrantIndication* in *LogicalChannelConfig*

3. Intra-UE prioritization

3.1 RAN2#105bis

3.2 RAN2#106

- ⇒ 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

3.3 RAN2#107

- ⇒ R2 will de-prioritize work on intra-UE prioritization until R1 has made more progress.
- ⇒ 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 are 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

Commented [ZZ25]: Captured by *allowedCG-List* and *allowedGrantIndication* in *LogicalChannelConfig*

3.4 RAN2#107bis

- ⇒ 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.

4. Ethernet Header Compression

4.1 RAN2#105bis

- ⇒ 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)

4.2 RAN2#106

- ⇒ 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

Commented [ZZ26]: Captured by two fields in *PDCCP-Config:ehc-Uplink* and *ehc-Downlink*. The contents are FFS

4.3 RAN2#107

4.4 RAN2#107bis

- ⇒ 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.

Commented [ZZ27]: *ehc-Uplink* and *ehc-Downlink* is configured in *PDCCP-Config*

Commented [ZZ28]: *ehc-Uplink* and *ehc-Downlink* can be configured together with *rohc* in the field of *headerCompression* in *PDCCP-Config*

- ⇒ 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.

Commented [ZZ29]: Captured as an FFS in the PDCP-Config

5. PDCP duplication

5.1 RAN2#105bis

5.2 RAN2#106

- ⇒ 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

5.3 RAN2#107

- ⇒ 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, or
- ⇒ A new LCID is used for the Rel-16 MAC CE controlling PDCP duplication.

Commented [ZZ30]: Already supported in rel-15

5.4 RAN2#107bis

- ⇒ 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).