3GPP TSG RAN WG2 Meeting #110-e R2-200xxxx

**Electronic, 1st – 12th June 2020**

**Agenda item:** 6.0.1

**Source:** Lenovo

**Title:** Report from email discussion [AT110-e][068][NR16] NR ASN1 4

**Document for:**  Discussion and decision

# Introduction

This contribution summarizes the discussion and result of the email discussion below that took place during RAN2#110-e:

* [AT110-e][068][NR16] NR ASN1 4 (Lenovo)

 Scope: ASN1 Naming A009 H001 E229 E257 E258 N033 S463, ASN1 Structure E228 E230 S656 Q022, R2-2004952 [E228][E230] On grouping similar parameters in PUSCH-Config/PDSCH-Config, Misc I654, S461, N021, R2-2004602 [I654] Adding DL AM RLC extension in NR RRC

In detail, the following issues from [1] and [2] were discussed in the email discussion:

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| **RIL #** | **Issue** | **Feature** |
| A009 | Change field name si-Periodicity  | NRPos |
| H001 | Naming issue of referenceTimeInfo-r16 | General |
| E229 | Naming issue of tci -PresentInDCI-ForDCI-Format1-2-r16  | URLLC |
| E257 | Naming issue of dl-DCI-triggered-UL-ChannelAccess-CPextList-r16  | NR-U |
| E258 | Naming issue of ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16  | NR-U |
| N033 | Naming issues in TDD-UL-DL-SlotConfig-IAB-MT-v16xy | IAB |
| S463 | Change names and field descriptions in AreaConfiguration-r16 | MDT |
| E228 | Grouping of configurable fields in PUSCH-Config | URLLC |
| E230 | Grouping of configurable fields in PDSCH-Config | URLLC |
| S656 | Structure of CodebookConfig-r16 | MIMO |
| Q022 | Type of RepetitionSchemeConfig-r16  | MIMO |
| I654 | Addition of DL-AM-RLC-v16xy | URLLC |
| S461 | Extension and delta signalling of LoggedMeasurementConfiguration-r16-IEs | MDT |
| N021 | ‘infinity’ value for minSchedulingOffsetPreferenceProhibitTimer-r16 | PowerSaving |

# Discussion

## A009

The description of the issue is shown below.

**[RIL]**: A009 **[Delegate]**: Apple (Zhbin Wu) **[WI]**: NRPos **[Class]**: 2 **[Status]**: DiscMail **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: The field used to detrermine Positioning SI periodicity is called “posSI-periodicity”, not “Si-Periodicity”

**[Proposed Change]**: Change the wrong field name to “posSI-Periodicigty” in the two occurences of this section.

**[Comments]**:

The proposed change would affect subclause 5.2.2.3.2 in two occurrences of si-Periodicity, see the highlighted part in blue below.

5.2.2.3.2 Acquisition of an SI message

<Text omitted>

When acquiring an SI message, the UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

2> if the concerned SI message is configured in the *schedulingInfoList*:

3> for the concerned SI message, determine the number *n* which corresponds to the order of entry in the list of SI messages configured by *schedulingInfoList* in *si-SchedulingInfo* in *SIB1*;

3> determine the integer value *x = (n – 1) × w*, where *w* is the *si-WindowLength*;

3> the SI-window starts at the slot #*a*, where *a* = *x* mod N, in the radio frame for which SFN mod *T* = FLOOR(*x*/N), where *T* is the *si-Periodicity* of the concerned SI message and N is the number of slots in a radio frame as specified in TS 38.213 [13];

2> else if the concerned SI message is configured in the *posSI-SchedulingInfoList* and *offsetToSI-Used* is not configured:

3> create a concatented list of SI messages by appending the *posSI-SchedulingInfoList* in *SIB1 to schedulingInfoList* in *si-SchedulingInfo* in *SIB1*

3> for the concerned SI message, determine the number *n* which corresponds to the order of entry in the concatenated list;

3> determine the integer value *x = (n – 1) × w*, where *w* is the *si-WindowLength*;

3> the SI-window starts at the slot #*a*, where *a* = *x* mod N, in the radio frame for which SFN mod *T* = FLOOR(*x*/N), where *T* is the *si-Periodicity* of the concerned SI message and N is the number of slots in a radio frame as specified in TS 38.213 [13];

2> else if the concerned SI message is configured by the *posSI-SchedulingInfoList* and *offsetToSI-Used* is configured:

3> determine the number *m* which corresponds to the number of SI messages with an associated *si-Periodicity* of 8 radio frames (80 ms), configured by *schedulingInfoList* in *SystemInformationBlockType1*;

3> for the concerned SI message, determine the number *n* which corresponds to the order of entry in the list of SI messages configured by *posSI-SchedulingInfoList* in *SIB1*;

3> determine the integer value *x* = *m* *× w +* (*n* – 1*)* *× w*, where *w* is the *si-WindowLength*

3> the SI-window starts at the slot #*a*, where *a* = *x* mod N, in the radio frame for which SFN mod *T* = FLOOR(*x*/N), where *T* is the *si-Periodicity* of the concerned SI message and N is the number of slots in a radio frame as specified in TS 38.213 [13];

<Text omitted>

**Question 1:** Do companies agree to change the two occurrences of si-Periodicity to posSI-Periodicity?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## H001

The description of the issue is shown below.

**[RIL]**: H001 **[Delegate]**: Yinghao/David (Huawei) **[WI]**: Gen **[Class]**: 2 **[Status]**: DiscMail **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: The suffix "Info" in used in a tremendous number of new names, making them longer while actually bringing no information.

**[Proposed Change]**: Review the new -r16 parameters and IEs and remove "Info" unless really useful.

**[Comments]**:

Rapp1: List of fields/IEs need to be provided.

Rapp2: Main session: “Huawei indicate that this issue is just about excessive use of the word “info”. Nokia think there is already a guideline saying this shall not be used. Agreed (for all instances)”

The issue was raised in the context of referenceTimeInfo-r16 in DLInformationTransfer-v16xy-IEs. However, if name of referenceTimeInfo-r16 needs to be changed in accordance with the agreement made it will affect SIB9 and IE ReferenceTimeInfo as well.

DLInformationTransfer-v16xy-IEs ::= SEQUENCE {

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

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

SIB9 ::= SEQUENCE {

 timeInfo SEQUENCE {

 timeInfoUTC INTEGER (0..549755813887),

 dayLightSavingTime BIT STRING (SIZE (2)) OPTIONAL, -- Need R

 leapSeconds INTEGER (-127..128) OPTIONAL, -- Need R

 localTimeOffset INTEGER (-63..64) OPTIONAL -- Need R

 } OPTIONAL, -- Need R

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...,

 [[

 referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL -- Need R

 ]]

}

– *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-r16 ::= SEQUENCE {

 time-r16 ReferenceTime-r16,

 uncertainty-r16 INTEGER (0..32767) OPTIONAL, -- Need S

 timeInfoType-r16 ENUMERATED {localClock} OPTIONAL, -- Need S

 referenceSFN-r16 INTEGER (0..1023) OPTIONAL -- Cond RefTime

}

ReferenceTime-r16 ::= SEQUENCE {

 refDays-r16 INTEGER (0..72999),

 refSeconds-r16 INTEGER (0..86399),

 refMilliSeconds-r16 INTEGER (0..999),

 refTenNanoSeconds-r16 INTEGER (0..99999)

}

**Question 2:** How should referenceTimeInfo-r16 be renamed avoiding the use of suffix “Info”?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## E229

The description of the issue is shown below.

 **[RIL]**: E229 **[Delegate]**: Ericsson (Zhenhua) **[WI]**: URLLC **[Class]**: 2 **[Status]**: PropAgree2 **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: The appendix of the name “ForDCI-Format1-2” is repetitive and not needed

**[Proposed Change]**: change to “tci-PresentInDCI-Format1-2”

**[Comments]**:

The proposed change would affect the field tci-PresentInDCI-ForDCI-Format1-2-r16 in IE ControlResourceSet.

-- ASN1START

-- TAG-CONTROLRESOURCESET-START

ControlResourceSet ::= SEQUENCE {

 controlResourceSetId ControlResourceSetId,

 frequencyDomainResources BIT STRING (SIZE (45)),

 duration INTEGER (1..maxCoReSetDuration),

 cce-REG-MappingType CHOICE {

 interleaved SEQUENCE {

 reg-BundleSize ENUMERATED {n2, n3, n6},

 interleaverSize ENUMERATED {n2, n3, n6},

 shiftIndex INTEGER(0..maxNrofPhysicalResourceBlocks-1) OPTIONAL -- Need S

 },

 nonInterleaved NULL

 },

 precoderGranularity ENUMERATED {sameAsREG-bundle, allContiguousRBs},

 tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF TCI-StateId OPTIONAL, -- Cond NotSIB1-initialBWP

 tci-StatesPDCCH-ToReleaseList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF TCI-StateId OPTIONAL, -- Cond NotSIB1-initialBWP

 tci-PresentInDCI ENUMERATED {enabled} OPTIONAL, -- Need S

 pdcch-DMRS-ScramblingID INTEGER (0..65535) OPTIONAL, -- Need S

 ...,

 [[

 rb-Offset-r16 INTEGER (0..5) OPTIONAL, -- Need S

 tci-PresentInDCI-ForDCI-Format1-2-r16 INTEGER (1..3) OPTIONAL, -- Need S

 coresetPoolIndex-r16 INTEGER (0..1) OPTIONAL, -- Need R

 controlResourceSetId-r16 ControlResourceSetId-r16 OPTIONAL -- Need S

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}

-- TAG-CONTROLRESOURCESET-STOP

-- ASN1STOP

**Question 3:** Do companies agree to change field name tci-PresentInDCI-ForDCI-Format1-2-r16 to tci-PresentInDCI-Format1-2?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## E257

The description of the issue is shown below.

**[RIL]**: E257 **[Delegate]**: Ericsson (Cecilia) **[WI]**: NR-U **[Class]**: 2 **[Status]: DiscMeet [TDoc]**: TBD **[Proposed Conclusion]**:

**[Description]**: The field description is too long and lists all parameters in the field name.

“DL-DCI triggered UL” corresponds to DCI format 1-1 and can be aligned with other names in PUCCH-Config which refer to “DCI-Format-1-X”

**[Proposed Change]**: change name to “channelAccessConfigListForDCI-Format1-1-r16” or preferably “channelAccessConfigListForDCI-1-1-r16”

**[Comments]**:

The concerned field dl-DCI-triggered-UL-ChannelAccess-CPextList-r16 in IE PUCCH-Config is shown below.

PUCCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 resourceToAddModList-r16 SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-Resource-r16 OPTIONAL, -- Need N

 dl-DataToUL-ACK-r16 SEQUENCE (SIZE (1..8)) OF INTEGER (-1..15) OPTIONAL, -- Need M

 dl-DCI-triggered-UL-ChannelAccess-CPextList-r16 SEQUENCE (SIZE (1..16)) OF INTEGER (0..15) OPTIONAL, -- Need M

 subslotLengthForPUCCH-r16 ENUMERATED {n2,n7} OPTIONAL, -- Need M

 <Text omitted>

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}

**Question 4:** Do companies agree to change field name dl-DCI-triggered-UL-ChannelAccess-CPextList-r16? If yes, which option do companies prefer?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## E258

The description of the issue is shown below.

**[RIL]**: E258 **[Delegate]**: Ericsson (Cecilia) **[WI]**: NR-U **[Class]**: 2 **[Status]: DiscMeet2 [TDoc]**: TBD **[Proposed Conclusion]**:

**[Description]**: The field description is too long and lists all parameters in the field name.

“UL-DCI triggered UL” corresponds to DCI format 0-1 and can be more generic and aligned with other names in PUSCH-Config which all refer to “DCI-Format-0-X”

**[Proposed Change]**: change name to “channelAccessConfigListForDCI-Format0-1-r16” or preferably “channelAccessConfigListForDCI-0-1-r16”

**[Comments]**:

The concerned field ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16 in IE PUSCH-Config is shown below.

PUSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 minimumSchedulingOffsetK2-r16 SetupRelease { MinSchedulingOffsetK2-Values-r16 } OPTIONAL, -- Need M

 ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16 SEQUENCE (SIZE (1..64)) OF INTEGER (0..63) OPTIONAL, -- Need M

 pusch-RepTypeIndicator SEQUENCE {

 pusch-RepTypeIndicatorForDCI-Format0-2-r16 ENUMERATED { pusch-RepTypeA, pusch-RepTypeB} OPTIONAL, -- Need M

 pusch-RepTypeIndicatorForDCI-Format0-1-r16 ENUMERATED { pusch-RepTypeA, pusch-RepTypeB} OPTIONAL -- Need M

 },

 <Text omitted>

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}

**Question 5:** Do companies agree to change field name ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16? If yes, which option do companies prefer?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## N033

The description of the issue is shown below.

**[RIL]**: N033 **[Delegate]**: Nokia (Tero) **[WI]**: IAB **[Class]**: 2 **[Status]**: DiscMail [**Tdoc]**: None **[Proposed Conclusion]**:

**[Description]**: This structure is very hard to read: first of all, there’s no need to add IAB-MT to every field since the -r16 suffixes already identify them uniquely. the differences between teh two branches of “explicit” is also very hard to see, and the field names do not help.

**[Proposed Change]**: suggest to use more descriptive field names:

TDD-UL-DL-SlotConfig-IAB-MT-v16xy::= SEQUENCE {

 slotIndex-r16 TDD-UL-DL-SlotIndex,

 symbols-r16 CHOICE {

 allDownlink-r16 NULL,

 allUplink-r16 NULL,

 explicit-DownlinkFirst-r16 SEQUENCE {

 nrofDownlinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL, -- Need FFS

 nrofUplinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL -- Need FFS

 },

 explicit-UplinkFirst-r16 SEQUENCE {

 nrofUplinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL, -- Need FFS

 nrofDownlinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL -- Need FFS

 }

 }

}

And for field description, the following:

***symbols-r16***

The *Symbols-r16*is used to configure an IAB-MT with the SlotConfig applicable for one serving cell. Value *allDownlink* indicates that all symbols in this slot are used for downlink; value *allUplink* indicates that all symbols in this slot are used for uplink; value *explicit-DownlinkFirst* indicates explicitly how many symbols in the beginning and end of this slot are allocated to downlink and uplink, respectively; value *explicit-UplinkFirst* indicates explicitly how many symbols in the beginning and end of this slot are allocated to uplink and downlink, respectively.

This would be far easier to read than the current one.

**[Comments]**: Rapp1: Looks to be exactly same structure, but shorter field names. But looks OK to me.

Referring to N033 it is proposed to change

* Field name symbols-IAB-MT-r16 to symbols-r16
* Field name explicit-r16 to explicit-DownlinkFirst-r16
* Field name explicit-IAB-MT-r16 to explicit-UplinkFirst-r16

and to update the field description of symbols-IAB-MT accordingly.

TDD-UL-DL-SlotConfig-IAB-MT-v16xy::= SEQUENCE {

 slotIndex-r16 TDD-UL-DL-SlotIndex,

 symbols-IAB-MT-r16 CHOICE {

 allDownlink-r16 NULL,

 allUplink-r16 NULL,

 explicit-r16 SEQUENCE {

 nrofDownlinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL, -- Need FFS

 nrofUplinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL -- Need FFS

 },

 explicit-IAB-MT-r16 SEQUENCE {

 nrofDownlinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL, -- Need FFS

 nrofUplinkSymbols-r16 INTEGER (1..maxNrofSymbols-1) OPTIONAL -- Need FFS

 }

 }

}

***symbols-IAB-MT***

The *Symbols-IAB-MT*is used to configure an IAB-MT with the SlotConfig applicable for one serving cell. Value *allDownlink* indicates that all symbols in this slot are used for downlink; value *allUplink* indicates that all symbols in this slot are used for uplink; value *explicit* indicates explicitly how many symbols in the beginning and end of this slot are allocated to downlink and uplink, respectively; value *explicit-{IAB-MT}* indicates explicitly how many symbols in the beginning and end of this slot are allocated to uplink and downlink, respectively.

**Question 6:** Do companies agree to change field names and field description in TDD-UL-DL-SlotConfig-IAB-MT-v16xy?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## S463

The description of the issue is shown below.

**[RIL]**: S463 **[Delegate]**: Samsung (Sangbum Kim) **[WI]**: MDT **[Class]**: 2 **[Status]**: Tdoc **[TDoc]**: R2-2002826 **[Proposed Conclusion]**:

**[Description]**: In order to reflect the intention clearly, need to rename both areaConfigForServing and areaConfigForNeighbour

**[Proposed Change]**: Change the name and field descriptions of areaConfigForServing and areaConfigForNeighbour as to areaConfig and interFreqTargetList

**[Comments]**:

The proposed changes would affect IE AreaConfiguration-r16 as shown below. It should be noted that the proposed changes were already captured in the MDTSON WI CR.

-- ASN1START

-- TAG-AREACONFIGURATION-START

AreaConfiguration-r16 ::= SEQUENCE {

 areaConfig-r16 AreaConfig-r16,

 interFreqTargetList-r16 InterFreqTargetList-r16 OPTIONAL

}

AreaConfig-r16 ::= CHOICE {

 cellGlobalIdList-r16 CellGlobalIdList-r16,

 trackingAreaCodeList-r16 TrackingAreaCodeList-r16,

 trackingAreaIdentityList-r16 TrackingAreaIdentityList-r16

}

InterFreqTargetList-r16 ::= SEQUENCE {

 dl-CarrierFreq ARFCN-ValueNR,

 frequencyBandList MultiFrequencyBandListNR,

 cellList SEQUENCE (SIZE (1..32)) OF PhysCellId OPTIONAL

}

CellGlobalIdList-r16 ::= SEQUENCE (SIZE (1..32)) OF CGI-Info-Logging-r16

TrackingAreaCodeList-r16 ::= SEQUENCE (SIZE (1..8)) OF TrackingAreaCode

TrackingAreaIdentityList-r16 ::= SEQUENCE (SIZE (1..8)) OF TrackingAreaIdentity-r16

TrackingAreaIdentity-r16 ::= SEQUENCE {

 plmn-Identity-r16 PLMN-Identity,

 trackingAreaCode-r16 TrackingAreaCode

}

-- TAG-AREACONFIGURATION-STOP

-- ASN1STOP

**Question 7:** Do companies agree to change name and field descriptions of areaConfigForServing and areaConfigForNeighbour to areaConfig and interFreqTargetList?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## E228

The description of the issue is shown below. E228 is related to grouping of configurable fields in PUSCH-Config.

**[RIL]**: E228 **[Delegate]**: Ericsson (Zhenhua) **[WI]**: URLLC **[Class]**: 2 **[Status]**: Tdoc2 **[TDoc]**: R2-2004952 **[Proposed Conclusion]**:

**[Description]**: The grouping of these configurable fields is not consistent. Some of them are grouped with DCI format, while some others are grouped with functionality, such as Priority indicator. Once the grouping is done, the name can be shortened.

**[Proposed Change]**:

Group the configurable fields by DCI formats and shorten the name by removing, e.g., “forDCI-Format0-2-r16”.

**[Comments]**: Rapp3: Ericsson is asked to provide tdoc. All these RILs concern same topic: E228 and E230.

Below the current structure of PUSCH-Config is shown (to simplify matters only the field names are shown).

PUSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 minimumSchedulingOffsetK2-r16

 ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16

 pusch-RepTypeIndicator SEQUENCE {

 pusch-RepTypeIndicatorForDCI-Format0-2-r16

 pusch-RepTypeIndicatorForDCI-Format0-1-r16

 },

 configurableFieldForDCI-Format0-2 SEQUENCE {

 harq-ProcessNumberSizeForDCI-Format0-2-r16

 dmrs-SequenceInitializationForDCI-Format0-2-r16

 numberOfBitsForRV-ForDCI-Format0-2-r16

 antennaPortsFieldPresenceForDCI-Format0-2-r16

 ...

 },

 resourceAllocationType1GranularityForDCI-Format0-2-r16

 frequencyHoppingForDCI-Format0-2-r16 CHOICE {

 pusch-RepTypeA

 pusch-RepTypeB

 }

 frequencyHoppingOffsetListsForDCI-Format0-2-r16

 uci-OnPUSCH-ForDCI-Format0-2-r16

 uci-OnPUSCH-ListForDCI-Format0-2-r16

 uci-OnPUSCH-ListForDCI-Format0-1-r16

 pusch-TimeDomainAllocationListForDCI-Format0-2-r16

 pusch-TimeDomainAllocationListForDCI-Format0-1-r16

 maxRankForDCI-Format0-2-r16

 codebookSubsetForDCI-Format0-2-r16

 dmrs-UplinkForPUSCH-MappingTypeA-ForDCI-Format0-2-r16

 dmrs-UplinkForPUSCH-MappingTypeB-ForDCI-Format0-2-r16

 mcs-TableForDCI-Format0-2-r16

 mcs-TableTransformPrecoderForDCI-Format0-2-r16

 resourceAllocationForDCI-Format0-2-r16

 priorityIndicator SEQUENCE {

 priorityIndicatorForDCI-Format0-2-r16

 priorityIndicatorForDCI-Format0-1-r16

 }

 invalidSymbolPatternIndicator SEQUENCE {

 invalidSymbolPatternIndicatorForDCI-Format0-1-r16

 invalidSymbolPatternIndicatorForDCI-Format0-2-r16

 }

 frequencyHoppingForDCI-Format0-1-r16

 invalidSymbolPattern-r16

 pusch-PowerControl-v16xy

 ul-FullPowerTransmission-r16

 pusch-TimeDomainAllocationListForMultiPUSCH-r16

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}

In the contribution R2-2004952 [3] a proposal is given how the configurable fields in PUSCH-Config can be grouped more efficiently. In summary, the configurable fields are grouped now under the new sequences configurableFieldsForDCI-Format0-1 and configurableFieldsForDCI-Format0-2 as shown below. In this context long field names with suffix “ForDCI-Formatx-x” have been shortened.

PUSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 minimumSchedulingOffsetK2-r16

 ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-List-r16

 configurableFieldsForDCI-Format0-1 SEQUENCE {

 frequencyHoppingDCI-0-1-r16

 invalidSymbolPatternIndicatorDCI-0-1-r16

 priorityIndicatorDCI-0-1-r16

 pusch-RepTypeIndicatorDCI-0-1-r16

 pusch-TimeDomainAllocationListDCI-0-1-r16

 uci-OnPUSCH-ListDCI-0-1-r16

 ...

 },

 configurableFieldsForDCI-Format0-2 SEQUENCE {

 antennaPortsFieldPresenceDCI-0-2-r16

 dmrs-SequenceInitializationDCI-0-2-r16

 dmrs-UplinkForPUSCH-MappingTypeA-DCI-0-2-r16

 dmrs-UplinkForPUSCH-MappingTypeB-DCI-0-2-r16

 frequencyHoppingDCI-0-2-r16 CHOICE {

 forRepTypeA

 forRepTypeB

 }

 frequencyHoppingOffsetListsDCI-0-2-r16

 harq-ProcessNumberDCI-0-2-r16

 invalidSymbolPatternIndicatorDCI-0-2-r16

 maxRankDCI-0-2-r16

 mcs-TableDCI-0-2-r16

 mcs-TableTransformPrecoderDCI-0-2-r16

 numberOfBitsRV-DCI-0-2-r16

 priorityIndicatorDCI-0-2-r16

 pusch-RepTypeIndicatorDCI-0-2-r16

 pusch-TimeDomainAllocationListDCI-0-2-r16

 resourceAllocationDCI-0-2-r16

 resourceAllocationType1GranularityDCI-0-2-r16

 uci-OnPUSCH-DCI-0-2-r16

 uci-OnPUSCH-ListDCI-0-2-r16

 ...

 },

 invalidSymbolPattern-r16

 pusch-PowerControl-v16xy

 ul-FullPowerTransmission-r16

 pusch-TimeDomainAllocationListForMultiPUSCH-r16

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}

**Question 8:** Do companies agree to re-structure the fields in PUSCH-Config? If yes, do you agree with the proposal acc. to R2-2004952?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## E230

The description of the issue is shown below. E230 is related to grouping of configurable fields in PDSCH-Config.

**[RIL]**: E230 **[Delegate]**: Ericsson (Zhenhua) **[WI]**: URLLC **[Class]**: 2 **[Status]**: Tdoc2 **[TDoc]**: R2-2004952 **[Proposed Conclusion]**:

**[Description]**: There is no consistent structure in introducing these new fields in Rel-16 and they are not readable. There are some other IEs introduced by the URLLC WI.

**[Proposed Change]**: Group the configurable fields by different DCI formats 1-2 and DCI formats 1-1. The names within the group can be shorted by removing “ForDCIFormat1-2” and the field description can be simplified. We should change also for other IEs like SRS-Config,

**[Comments]**: Rapp3: Ericsson is asked to provide tdoc. All these RILs concern same topic: E228 and E230.

Below the current structure of PDSCH-Config is shown (to simplify matters only the field names are shown).

PDSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 maxMIMO-Layers-r16

 minimumSchedulingOffsetK0-r16

 prb-BundlingTypeForDCI-Format1-2-r16 CHOICE {

 staticBundling-r16 SEQUENCE {

 bundleSize-r16

 },

 dynamicBundling-r16 SEQUENCE {

 bundleSizeSet1-r16

 bundleSizeSet2-r16

 }

 }

 rateMatchPatternGroup1ForDCI-Format1-2-r16

 rateMatchPatternGroup2ForDCI-Format1-2-r16

 aperiodicZP-CSI-RS-ResourceSetsToAddModListForDCI-Format1-2-r16

 aperiodicZP-CSI-RS-ResourceSetsToReleaseListForDCI-Format1-2-r16

 pdsch-TimeDomainAllocationListForDCI-Format1-2-r16

 configurableFieldForDCI-Format1-2 SEQUENCE {

 harq-ProcessNumberSizeForDCI-Format1-2-r16

 dmrs-SequenceInitializationForDCI-Format1-2-r16

 numberOfBitsForRV-ForDCI-Format1-2-r16

 antennaPortsFieldPresenceForDCI-Format1-2-r16

 ...

 },

 resourceAllocationType1GranularityForDCI-Format1-2-r16

 vrb-ToPRB-InterleaverForDCI-Format1-2-r16

 dmrs-DownlinkForPDSCH-MappingTypeAForDCI-Format1-2-r16

 dmrs-DownlinkForPDSCH-MappingTypeBForDCI-Format1-2-r16

 referenceOfSLIVForDCI-Format1-2-r16

 mcs-TableForDCI-Format1-2-r16

 resourceAllocationForDCI-Format1-2-r16

 priorityIndicator SEQUENCE {

 priorityIndicatorForDCI-Format1-2-r16

 priorityIndicatorForDCI-Format1-1-r16

 }

 dataScramblingIdentityPDSCH2-r16

 pdsch-TimeDomainAllocationList-v16xy

 repetitionSchemeConfig-r16

 ]]

}

In the contribution R2-2004952 [3] a proposal is given how the configurable fields in PDSCH-Config can be grouped more efficiently. In summary, the configurable fields are grouped now under the new sequence configurableFieldsForDCI-Format1-2-r16 as shown below. In this context long field names with suffix “ForDCI-Formatx-x” have been shortened.

PDSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 maxMIMO-Layers-r16

 minimumSchedulingOffsetK0-r16

 configurableFieldsForDCI-Format1-2-r16 SEQUENCE {

 antennaPortsFieldPresenceDCI-1-2-r16

 aperiodicZP-CSI-RS-ResourceSetsToAddModList-DCI-1-2-r16

 aperiodicZP-CSI-RS-ResourceSetsToReleaseList-DCI-1-2-r16

 dmrs-DownlinkForPDSCH-MappingTypeA-DCI-1-2-r16

 dmrs-DownlinkForPDSCH-MappingTypeB-DCI-1-2-r16

 dmrs-SequenceInitializationDCI-1-2-r16

 harq-ProcessNumberDCI-1-2-r16

 mcs-TableDCI-1-2-r16

 numberOfBitsForRV-DCI-1-2-r16

 pdsch-TimeDomainAllocationListDCI-1-2-r16

 prb-BundlingTypeDCI-1-2-r16 CHOICE {

 staticBundling-r16 SEQUENCE {

 bundleSize-r16

 },

 dynamicBundling-r16 SEQUENCE {

 bundleSizeSet1-r16

 bundleSizeSet2-r16

 }

 }

 priorityIndicatorDCI-1-2-r16

 rateMatchPatternGroup1DCI-1-2-r16

 rateMatchPatternGroup2DCI-1-2-r16

 referenceOfSLIV-DCI-1-2-r16

 resourceAllocationDCI-1-2-r16

 resourceAllocationType1GranularityDCI-1-2-r16

 vrb-ToPRB-InterleaverDCI-1-2-r16

 ...

 },

 priorityIndicatorDCI-1-1-r16

 dataScramblingIdentityPDSCH2-r16

 pdsch-TimeDomainAllocationList-v16xy

 repetitionSchemeConfig-r16

 ]]

}

Offline a further alternative for grouping the configurable fields in PDSCH-Config was provided by Huawei. In summary, the alternative looks as follows:

* The configurable fields in PDSCH-Config are grouped under the new sequences pdschParametersOnlyForDCI-Format1-2-r16 and pdschParametersOnlyForDCI-Format1-1-r16 as shown below.
* In addition, in IE BWP-DownlinkDedicated new field pdsch-ConfigForDCI-Format1-2 is configured. The field pdsch-ConfigForDCI-Fomat1-2 applies to DCI format 1\_2 and the presence of pdschParametersOnlyForDCI-Format1-2-r16 in PDSCH-Config in condition to setup of pdsch-ConfigForDCI-Format1-2.

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-ConfigMulti-r16 SPS-ConfigMulti-r16 OPTIONAL, -- Need M

 beamFailureRecoverySCellConfig-r16 SetupRelease {BeamFailureRecoverySCellConfig-r16} OPTIONAL, -- Cond SCellOnly

 pdsch-ConfigForDCI-Format1-2 SetupRelease { PDSCH-Config } OPTIONAL -- Need M

 ]],

 [[

 sl-PDCCH-Config-r16 SetupRelease { PDCCH-Config } OPTIONAL, -- Need M

 sl-V2X-PDCCH-Config-r16 SetupRelease { PDCCH-Config } OPTIONAL -- Need M

]]

}

***pdsch-Config, pdsch-Config-ForDCI-Fomat1-2***

UE specific PDSCH configuration for one BWP. Parameters in *pdsch-ConfigForDCI-Fomat1-2* apply to DCI format 1\_2. *pdsch-ConfigForDCI-Fomat1-2* can only be configured when *pdsch-Config* is also configured.

Editor's note: For a dormant BWP, if this field is configured, it is FFS if IEs other than those related to TCI state are applicable.

PDSCH-Config ::= SEQUENCE {

 <Text omitted>

 ...,

 [[

 maxMIMO-Layers-r16

 minimumSchedulingOffsetK0-r16

 pdschParametersOnlyForDCI-Format1-2-r16 SEQUENCE {

 prb-BundlingTypeForDCI-Format1-2-r16 CHOICE {

 staticBundling-r16 SEQUENCE {

 bundleSize-r16

 },

 dynamicBundling-r16 SEQUENCE {

 bundleSizeSet1-r16

 bundleSizeSet2-r16

 }

 }

 harq-ProcessNumberSizeForDCI-Format1-2-r16

 dmrs-SequenceInitializationForDCI-Format1-2-r16

 numberOfBitsForRV-ForDCI-Format1-2-r16

 antennaPortsFieldPresenceForDCI-Format1-2-r16

 resourceAllocationType1GranularityForDCI-Format1-2-r16

 vrb-ToPRB-InterleaverForDCI-Format1-2-r16

 referenceOfSLIVForDCI-Format1-2-r16

 priorityIndicatorForDCI-Format1-2-r16

 ...

 } -- Cond dciFormat1-2

 pdschParametersOnlyForDCI-Format1-1-r16 SEQUENCE {

 priorityIndicatorForDCI-Format1-1-r16

 ...

 }

 dataScramblingIdentityPDSCH2-r16

 pdsch-TimeDomainAllocationList-v16xy

 repetitionSchemeConfig-r16

 ]]

}

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| --- | --- |
| dciFormat1-2 | The field is optionally present, Need R, in pdsch-ConfigForDCIFormat1-2. The field is absent in pdsch-Config. |

**Question 9:** Do companies agree to re-structure the fields in PDSCH-Config? If yes, which option do companies prefer?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## S656

The description of the issue is shown below.

**[RIL]**: S656 **[Delegate]**: Samsung (Seungri Jin) **[WI]**: MIMO **[Class]**: 2 **[Status]**: DiscMail **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: No need two-level CHOICE structure in CodebookConfig-r16 IE because there are no more entries in this CHOICE structure below codebookType.

**[Proposed Change]**: Remove codebookType CHOICE structure and type2 SEQUENCE structure. Then change the field name of subType to codebookType-r16 to follow the RAN1 suggestion in R1-2001478.

**[Comments]**: **]**: Nokia (Tero): We should retain the same structure as in Rel-15 for specification compatibility: Otherwise the Rel-15 and Rel-16 parameters use different structures, which may requires RAN1 changes as well. This was already discussed during RAN2#108, which is why the structure is like this.

If we follow the proposal from S656 the resulting structure of CodebookConfig-r16 will look like as below:

CodebookConfig-r16 ::= SEQUENCE {

 ~~codebookType CHOICE {~~

 ~~type2 SEQUENCE {~~

 ~~subType~~**codebookType-r16** CHOICE {

 typeII-r16 SEQUENCE {

 n1-n2-codebookSubsetRestriction-r16 CHOICE {

 two-one BIT STRING (SIZE (16)),

 two-two BIT STRING (SIZE (43)),

 four-one BIT STRING (SIZE (32)),

 three-two BIT STRING (SIZE (59)),

 six-one BIT STRING (SIZE (48)),

 four-two BIT STRING (SIZE (75)),

 eight-one BIT STRING (SIZE (64)),

 four-three BIT STRING (SIZE (107)),

 six-two BIT STRING (SIZE (107)),

 twelve-one BIT STRING (SIZE (96)),

 four-four BIT STRING (SIZE (139)),

 eight-two BIT STRING (SIZE (139)),

 sixteen-one BIT STRING (SIZE (128))

 },

 typeII-RI-Restriction-r16 BIT STRING (SIZE(4))

 },

 typeII-PortSelection-r16 SEQUENCE {

 portSelectionSamplingSize-r16 ENUMERATED {n1, n2, n3, n4},

 typeII-PortSelectionRI-Restriction-r16 BIT STRING (SIZE (4))

 }

 },

 numberOfPMI-SubbandsPerCQI-Subband-r16 INTEGER (1..2),

 paramCombination-r16 INTEGER (1..8)

 }

 }

}

**Question 10:** Do companies agree to change structure of IE CodebookConfig-r16?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## Q022

The description of the issue is shown below.

**[RIL]**: Q022 **[Delegate]**: Qualcomm (Masato) **[WI]**: MIMO **[Class]**: 2 **[Status]**: PropReject2 **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: It was discussed whether to use 'SEQUENCE' or 'CHOICE' here in R2-2001677 and RAN2 #109e meeting. The conclusion was to ask RAN1 if schemes 2a/2b/3 and scheme 4 (slotBased) are always mutually exclusive or not. RAN1 reply LS in R2-2004251 states that the schemes 2a/2b/3 and scheme 4 should be mutually exclusive.

**[Proposed Change]**: Change 'SEQUENCE' to 'CHOICE'

**[Comments]**: Rapp3: RAN1 LS was discussed in email discussion (POST109bis-e)(903)(MIMO), and RAN2 agreed to not change asn.1, but add IE description text above (refer to restriction details as specified in RAN1 spec).

Below the latest description of IE RepetitionSchemeConfig is shown where a RAN1 reference to configuration limitations for the repetition schemes has been added.

– *RepetitionSchemeConfig*

The IE *RepetitionSchemeConfig* is used to configure the UE with repetition schemes according to restrictions as specified in TS 38.214 [19] clause 5.1.

-- ASN1START

-- TAG-REPETITIONSCHEMECONFIG-START

RepetitionSchemeConfig-r16 ::= SEQUENCE {

 fdm-TDM-r16 SetupRelease { FDM-TDM-r16 } OPTIONAL, -- Need M

 slotBased SetupRelease { SlotBased-r16 } OPTIONAL -- Need M

}

FDM-TDM-r16 ::= SEQUENCE {

 repetitionScheme-r16 ENUMERATED {fdmSchemeA, fdmSchemeB,tdmSchemeA },

 startingSymbolOffsetK-r16 INTEGER (0..7) OPTIONAL -- Need R

}

SlotBased-r16 ::= SEQUENCE {

 tciMapping-r16 ENUMERATED {cyclicMapping, sequenticalMapping},

 sequenceOffsetforRV-r16 INTEGER (1..3)

}

-- TAG-REPETITIONSCHEMECONFIG-STOP

-- ASN1STOP

**Question 11:** Do companies agree with rapporteur’s suggestion to add a RAN1 reference to configuration limitations for the repetition schemes in the description of IE RepetitionSchemeConfig and keep the SEQUENCE type for the IE?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## I654

The description of the issue is shown below.

**[RIL]**: I654 **[Delegate]**: Intel (Sudeep) **[WI]**: URLLC **[Class]**: 2 **[Status]**: ConcAgree WI-CR **[TDoc]**: R2-2004602 **[Proposed Conclusion]**:

**[Description]**: DL-AM-RLC-v16xy is not used anywhere and is an orphan.

**[Proposed Change]**: Update where it is to be used.

**[Comments]**:

IE DL-AM-RLC-v16xy in RLC-Config was introduced by URLLC CR in order to add shorter values of [ms1, ms2, ms3, ms4] for t-StatusProhibit. In RAN2#109bis-e the issue I654 was discussed during offline discussion [071] but could not be resolved as it was not fully clear how to add IE DL-AM-RLC-v16xy in RRC. Now, in the contribution R2-2004602 [4], the following solution is proposed to resolve I654:

* Add IE DL-AM-RLC-v16xy (with Need M) as non-critical extension of IE RLC-Config in IE RLC-BearerConfig.
* Furthermore, clarify in the field description of rlc-Config (in RLC-BearerConfig field descriptions) that *“The network may configure rlc-Config-v16xy only when rlc-Config (without suffix) is set to am”*, see below.

RLC-BearerConfig ::= SEQUENCE {

 logicalChannelIdentity LogicalChannelIdentity,

 servedRadioBearer CHOICE {

 srb-Identity SRB-Identity,

 drb-Identity DRB-Identity

 } OPTIONAL, -- Cond LCH-SetupOnly

 reestablishRLC ENUMERATED {true} OPTIONAL, -- Need N

 rlc-Config RLC-Config OPTIONAL, -- Cond LCH-Setup

 mac-LogicalChannelConfig LogicalChannelConfig OPTIONAL, -- Cond LCH-Setup

 ...,

 [[

 rlc-Config-v16xy RLC-Config-v16xy OPTIONAL -- Need M

 ]]

}

***rlc-Config***

Determines the RLC mode (UM, AM) and provides corresponding parameters. RLC mode reconfiguration can only be performed by DRB release/addition or full configuration.

The network may configure *rlc-Config-v16xy* only when *rlc-Config* (without suffix) is set to *am*.

RLC-Config ::= CHOICE {

 am SEQUENCE {

 ul-AM-RLC UL-AM-RLC,

 dl-AM-RLC DL-AM-RLC

 },

 um-Bi-Directional SEQUENCE {

 ul-UM-RLC UL-UM-RLC,

 dl-UM-RLC DL-UM-RLC

 },

 um-Uni-Directional-UL SEQUENCE {

 ul-UM-RLC UL-UM-RLC

 },

 um-Uni-Directional-DL SEQUENCE {

 dl-UM-RLC DL-UM-RLC

 },

 ...

}

RLC-Config-v16xy ::= SEQUENCE {

 dl-AM-RLC-v16xy DL-AM-RLC-v16xy

}

DL-AM-RLC-v16xy ::= SEQUENCE {

 t-StatusProhibit-v16xy T-StatusProhibit-v16xy OPTIONAL -- Need R

}

T-StatusProhibit-v16xy ::= ENUMERATED { ms1, ms2, ms3, ms4, spare4, spare3, spare2, spare1}

**Question 12:** Do companies agree on the solution to add IE DL-AM-RLC-v16xy (with Need M) as non-critical extension of IE RLC-Config in IE RLC-BearerConfig?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## S461

The description of the issue is shown below.

**[RIL]**: S461 **[Delegate]**: Samsung (Sangbum Kim) **[WI]**: MDT **[Class]**: 2 **[Status]**: DiscMail **[TDoc]**: R2-2002826 **[Proposed Conclusion]**:

**[Description]**: For the future extension, add the nonCriticalExtension and laterNonCriticalExtension fields to the LoggedMeasurementConfiguration message.

In addition, RAN2 is requested to discuss whether to support delta signalling alike for RRM measurements (i.e. that in future it should e possible to merely signal an event triggered logging configuration to be added). If so, we propose to delta signalling at least for reportType (by SetupRelease with need M).

RAN2 can discuss ASN.1 details in R2-2002826.

**[Proposed Change]**:

LoggedMeasurementConfiguration-r16-IEs ::= SEQUENCE {

 traceReference-r16 TraceReference-r16,

 traceRecordingSessionRef-r16 OCTET STRING (SIZE (2)),

 tce-Id-r16 OCTET STRING (SIZE (1)),

 absoluteTimeInfo-r16 AbsoluteTimeInfo-r16,

 areaConfiguration-r16 AreaConfiguration-r16 OPTIONAL, --Need R

 plmn-IdentityList-r16 PLMN-IdentityList3-r16 OPTIONAL, --Need R

 bt-NameList-r16 BT-NameListConfig-r16 OPTIONAL, --Need R

 wlan-NameList-r16 WLAN-NameListConfig-r16 OPTIONAL, --Need R

 sensor-NameList-r16 Sensor-NameListConfig-r16 OPTIONAL, --Need R,

 loggingDuration-r16 LoggingDuration-r16,

 reportType CHOICE {

 periodical LoggedPeriodicalReportConfig-r16,

 eventTriggered LoggedEventTriggerConfig-r16

 }

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension LoggedMeasurementConfiguration-vNxy-IEs OPTIONAL

}

**[Comments]**: Rapp1: Ok to add the nonCriticalExtension and laterNonCriticalExtension fields. Whether to support Delta signalling need further discussion based on R2-2002826.

The proposal for adding nonCriticalExtension and lateNonCriticalExtension fields to the LoggedMeasurementConfiguration message is straightforward and consistent with what we do when new messages are introduced in RRC. Therefore, remaining issue is whether to allow delta signalling for reportType (by SetupRelease with need M). In this context it should be noted that delta signalling for bt-NameList-r16, wlan-NameList-r16 and sensor-NameList-r16 were already captured in the MDTSON WI CR.

**Question 13a:** Do companies agree to add nonCriticalExtension and lateNonCriticalExtension fields to the LoggedMeasurementConfiguration message?

**Question 13b:** Do companies agree to allow delta signalling for reportType (by SetupRelease with need M)?

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| **Company** | **Agree/Disagree** | **Additional comments** |
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## N021

The description of the issue is shown below.

**[RIL]**: N021 **[Delegate]**: Nokia (Tero) **[WI]**: PowSave **[Class]**: 2 **[Status]**: DiscMeet **[TDoc]**: None **[Proposed Conclusion]**:

**[Description]**: Inifinity value was agreed in RAN2#108 as per follows: “*minimum K0/K2 value is signalled as UE assistance.  Value of infinity can be configured for the prohibit timer*.”, but infinity value is not listed here.

**[Proposed Change]**: Add infinity to replace “spare2” as follows:

MinSchedulingOffsetPreferenceConfig-r16 ::= SEQUENCE {

 minSchedulingOffsetPreferenceProhibitTimer-r16 ENUMERATED {

 s0, s0dot5, s1, s2, s3, s4, s5, s6, s7,

 s8, s9, s10, s20, s30, infinity, spare1}

}

Generally, it’s not clear why infinity is not allowed for all of the prohibit timers?

**[Comments]**: Rapp1: Need to be discussed if infinity should be used only for this field.

RappPS: Agree that infinity needs to be added to this field only. The range of prohibit timers for the remaining timers have been discussed and agreed at R2-109e (see R2-2001912)

However, having looked at the Session minutes for NR-U, Power Savings, NTN and 2-step RACH in R2-2001664 (RAN2#109-e) the max value of 30s was agreed for all prohibit timers used for UE assistance incl. minimum scheduling offset see agreement #7 below. Therefore, it seems that previous agreement on ‘infinity’ value may not be valid anymore.

7. The prohibit timer for UE assistance on DRX, aggregated bandwidth, number of cell, number of MIMO layers, releasePreference and minimum scheduling offset for power savings can be configured up to 30s.

**Question 14:** Do companies think that value ‘infinity’ should be added for minSchedulingOffsetPreferenceProhibitTimer-r16?

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments** |
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# Conclusion

xxx

# Reference

[1] R2-2005318, 38331 Rel-16 Ph2 ASN.1 review file v166, Ericsson

[2] R2-2005319, RIL list Rel-16 Ph2 ASN.1 review v166, Ericsson

[3] R2-2004952, [E228][E230] On grouping similar parameters in PUSCH-Config/PDSCH-Config, Ericsson

[4] R2-2004602, [I654] Adding DL AM RLC extension in NR RRC, Lenovo, Motorola Mobility, Intel Corporation