**3GPP TSG-RAN WG2 Meeting #106 *R2-19xxxxx***

**Reno, USA, 13 – 17 May 2019**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **TBA** | **rev** | **-** | **Current version:** | **15.5.1** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Clarification to commonSearchSpaceList in PDCCH-ConfigCommon  |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | NR\_NewRAT-Core |  | ***Date:*** | 2019-05-23 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | RAN2 has agreed that it is not possible to change the size of the signalled list of common search spaces once given in PDCCH-ConfigCommon. However, this only applies for dedicated signalling, i.e. SIB change can still change all the cell parameters, but this is not clear in RRC. Since the number of PDCCH common search spaces should align with SIB1 information, network should only update the field via reconfiguration with sync for EN-DC or via SI change for standalone. Additionally, some of the SearchSpace parameters should be mandatory present also in SI (for standalone) in addition toi when “being setup” (which clearly mainly applies for EN-DC). |
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| ***Summary of change:*** | 1. Clarify that the number of elements in commonSearchSpaceList can only be changed via complete reconfiguration. For EN-DC, reconfiguration with sync is needed to do this.
2. Clarified the “mandatory presence” - part of conditions *Setup* and *SetupOnly* inside SearchSpace to also apply when the corresponding SearchSpace is included in system information

**Impact analysis**Impacted 5G architecture options: Standalone, EN-DCImpacted functionality: PDCCH decodingInter-operability: 1. If the network is implemented according to the CR and the UE is not, the UE may not properly apply the signallling for the list of common search spaces in case the number of entries changes.
2. If the UE is implemented according to the CR and the network is not, the network may change the number of common search spaces and expect UE to comply but UE may not apply the new configuration
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| ***Consequences if not approved:*** | Specification is not clear on how the list of common search spaces can be updated. |
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| ***Clauses affected:*** | 6.3.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*First Modified Subclause*

6.3.2 Radio resource control information elements

<UNNECESSARY PARTS OMITTED>

– *PDCCH-ConfigCommon*

The IE *PDCCH-ConfigCommon* is used to configure cell specific PDCCH parameters provided in SIB as well as in dedicated signalling.

***PDCCH-ConfigCommon* information element**

-- ASN1START

-- TAG-PDCCH-CONFIGCOMMON-START

PDCCH-ConfigCommon ::= SEQUENCE {

 controlResourceSetZero ControlResourceSetZero OPTIONAL, -- Cond InitialBWP-Only

 commonControlResourceSet ControlResourceSet OPTIONAL, -- Need R

 searchSpaceZero SearchSpaceZero OPTIONAL, -- Cond InitialBWP-Only

 commonSearchSpaceList SEQUENCE (SIZE(1..4)) OF SearchSpace OPTIONAL, -- Need R

 searchSpaceSIB1 SearchSpaceId OPTIONAL, -- Need S

 searchSpaceOtherSystemInformation SearchSpaceId OPTIONAL, -- Need S

 pagingSearchSpace SearchSpaceId OPTIONAL, -- Need S

 ra-SearchSpace SearchSpaceId OPTIONAL, -- Need S

 ...,

 [[

 firstPDCCH-MonitoringOccasionOfPO CHOICE {

 sCS15KHZoneT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..139),

 sCS30KHZoneT-SCS15KHZhalfT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..279),

 sCS60KHZoneT-SCS30KHZhalfT-SCS15KHZquarterT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..559),

 sCS120KHZoneT-SCS60KHZhalfT-SCS30KHZquarterT-SCS15KHZoneEighthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..1119),

 sCS120KHZhalfT-SCS60KHZquarterT-SCS30KHZoneEighthT-SCS15KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..2239),

 sCS120KHZquarterT-SCS60KHZoneEighthT-SCS30KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..4479),

 sCS120KHZoneEighthT-SCS60KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..8959),

 sCS120KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..17919)

 } OPTIONAL -- Cond OtherBWP

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}

-- TAG-PDCCH-CONFIGCOMMON-STOP

-- ASN1STOP

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| ***PDCCH-ConfigCommon* field descriptions** |
| ***commonControlResourceSet***An additional common control resource set which may be configured and used for any common or UE-specific search space. If the network configures this field, it uses a *ControlResourceSetId* other than 0 for this *ControlResourceSet*. The network configures the *commonControlResourceSet* in *SIB1* so that it is contained in the bandwidth of CORESET#0. |
| ***commonSearchSpaceList***A list of additional common search spaces. If the network configures this field, it uses the *SearchSpaceId*s other than 0. NOTE1 |
| ***controlResourceSetZero***Parameters of the common CORESET#0 which can be used in any common or UE-specific search spaces. The values are interpreted like the corresponding bits in *MIB* *pdcch-ConfigSIB1*. Even though this field is only configured in the initial BWP (BWP#0) *controlResourceSetZero* can be used in search spaces configured in other DL BWP(s) than the initial DL BWP if the conditions defined in TS 38.213 [13], clause 10 are satisfied. |
| ***firstPDCCH-MonitoringOccasionOfPO***Indicates the first PDCCH monitoring occasion of each PO of the PF on this BWP, see TS 38.304 [20]. |
| ***pagingSearchSpace***ID of the Search space for paging (see TS 38.213 [13], clause 10.1). If the field is absent, the UE does not receive paging in this BWP (see TS 38.213 [13], clause 10). |
| ***ra-SearchSpace***ID of the Search space for random access procedure (see TS 38.213 [13], clause 10.1). If the field is absent, the UE does not receive RAR in this BWP. This field is mandatory present in the DL BWP(s) if the conditions described in TS 38.321 [3], subclause 5.15 are met. |
| ***searchSpaceOtherSystemInformation***ID of the Search space for other system information, i.e., *SIB2* and beyond (see TS 38.213 [13], clause 10.1) If the field is absent, the UE does not receive other system information in this BWP. |
| ***searchSpaceSIB1***ID of the search space for *SIB1* message. In the initial DL BWP of the UE′s PCell, the network sets this field to 0. If the field is absent, the UE does not receive *SIB1* in this BWP. (see TS 38.213 [13], clause 10) |
| ***searchSpaceZero***Parameters of the common SearchSpace#0. The values are interpreted like the corresponding bits in *MIB* *pdcch-ConfigSIB1*. Even though this field is only configured in the initial BWP (BWP#0), *searchSpaceZero* can be used in search spaces configured in other DL BWP(s) than the initial DL BWP if the conditions described in TS 38.213 [13], clause 10, are satisfied. |

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| **Conditional Presence** | **Explanation** |
| *InitialBWP-Only* | If *SIB1* is broadcast the field is mandatory present in the *PDCCH-ConfigCommon* of the initial BWP (BWP#0) in *ServingCellConfigCommon*; it is absent in other BWPs and when sent in system information. If SIB1 is not broadcast and there is an SSB associated to the cell, the field is optionally present, Need M, in the *PDCCH-ConfigCommon* of the initial BWP (BWP#0) in *ServingCellConfigCommon* (still with the same setting for all UEs). In other cases, the field is absent. |
| *OtherBWP* | This field is optionally present, Need R, if this BWP is not the initial DL BWP and *pagingSearchSpace* is configured in this BWP. Otherwise this field is not present. |

NOTE 1: This field cannot use delta configuration to reconfigure one or more entries of the list. To modify an entry, the list must be signalled again in its entirety. However, the size of the list can be changed by signalling the complete list again, i.e. the updated size of the list replaces the previous size. In this case the network should not signal any changes to the existing list members. For EN-DC, the list can only be changed via reconfiguration with sync.

<UNNECESSARY PARTS OMITTED>

– *SearchSpace*

The IE *SearchSpace* defines how/where to search for PDCCH candidates. Each search space is associated with one *ControlResourceSet*. For a scheduled cell in the case of cross carrier scheduling, except for *nrofCandidates*, all the optional fields are absent.

***SearchSpace* information element**

-- ASN1START

-- TAG-SEARCHSPACE-START

SearchSpace ::= SEQUENCE {

 searchSpaceId SearchSpaceId,

 controlResourceSetId ControlResourceSetId OPTIONAL, -- Cond SetupOnly

 monitoringSlotPeriodicityAndOffset CHOICE {

 sl1 NULL,

 sl2 INTEGER (0..1),

 sl4 INTEGER (0..3),

 sl5 INTEGER (0..4),

 sl8 INTEGER (0..7),

 sl10 INTEGER (0..9),

 sl16 INTEGER (0..15),

 sl20 INTEGER (0..19),

 sl40 INTEGER (0..39),

 sl80 INTEGER (0..79),

 sl160 INTEGER (0..159),

 sl320 INTEGER (0..319),

 sl640 INTEGER (0..639),

 sl1280 INTEGER (0..1279),

 sl2560 INTEGER (0..2559)

 } OPTIONAL, -- Cond Setup

 duration INTEGER (2..2559) OPTIONAL, -- Need R

 monitoringSymbolsWithinSlot BIT STRING (SIZE (14)) OPTIONAL, -- Cond Setup

 nrofCandidates SEQUENCE {

 aggregationLevel1 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

 aggregationLevel2 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

 aggregationLevel4 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

 aggregationLevel8 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

 aggregationLevel16 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8}

 } OPTIONAL, -- Cond Setup

 searchSpaceType CHOICE {

 common SEQUENCE {

 dci-Format0-0-AndFormat1-0 SEQUENCE {

 ...

 } OPTIONAL, -- Need R

 dci-Format2-0 SEQUENCE {

 nrofCandidates-SFI SEQUENCE {

 aggregationLevel1 ENUMERATED {n1, n2} OPTIONAL, -- Need R

 aggregationLevel2 ENUMERATED {n1, n2} OPTIONAL, -- Need R

 aggregationLevel4 ENUMERATED {n1, n2} OPTIONAL, -- Need R

 aggregationLevel8 ENUMERATED {n1, n2} OPTIONAL, -- Need R

 aggregationLevel16 ENUMERATED {n1, n2} OPTIONAL -- Need R

 },

 ...

 } OPTIONAL, -- Need R

 dci-Format2-1 SEQUENCE {

 ...

 } OPTIONAL, -- Need R

 dci-Format2-2 SEQUENCE {

 ...

 } OPTIONAL, -- Need R

 dci-Format2-3 SEQUENCE {

 dummy1 ENUMERATED {sl1, sl2, sl4, sl5, sl8, sl10, sl16, sl20} OPTIONAL, -- Cond Setup

 dummy2 ENUMERATED {n1, n2},

 ...

 } OPTIONAL -- Need R

 },

 ue-Specific SEQUENCE {

 dci-Formats ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1},

 ...

 }

 } OPTIONAL -- Cond Setup

}

-- TAG-SEARCHSPACE-STOP

-- ASN1STOP

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| ***SearchSpace* field descriptions** |
| ***common***Configures this search space as common search space (CSS) and DCI formats to monitor. |
| ***controlResourceSetId***The CORESET applicable for this SearchSpace. Value 0 identifies the common CORESET#0 configured in MIB and in ServingCellConfigCommon. Values 1..maxNrofControlResourceSets-1 identify CORESETs configured in System Information or by dedicated signalling. The CORESETs with non-zero controResourceSetId locate in the same BWP as this SearchSpace. |
| ***dummy1, dummy2***This field is not used in the specification. If received it shall be ignored by the UE. |
| ***dci-Format0-0-AndFormat1-0***If configured, the UE monitors the DCI formats 0\_0 and 1\_0 according to TS 38.213 [13], clause 10.1. |
| ***dci-Format2-0***If configured, UE monitors the DCI format 2\_0 according to TS 38.213 [13], clause 10.1, 11.1.1. |
| ***dci-Format2-1***If configured, UE monitors the DCI format 2\_1 according to TS 38.213 [13], clause 10.1, 11.2. |
| ***dci-Format2-2***If configured, UE monitors the DCI format 2\_2 according to TS 38.213 [13], clause 10.1, 11.3. |
| ***dci-Format2-3***If configured, UE monitors the DCI format 2\_3 according to TS 38.213 [13], clause 10.1, 11.4 |
| ***dci-Formats***Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1. |
| ***duration***Number of consecutive slots that a SearchSpace lasts in every occasion, i.e., upon every period as given in the periodicityAndOffset. If the field is absent, the UE applies the value 1 slot, except for DCI format 2\_0. The UE ignores this field for DCI format 2\_0. The maximum valid duration is periodicity-1 (periodicity as given in the monitoringSlotPeriodicityAndOffset). |
| ***monitoringSlotPeriodicityAndOffset***Slots for PDCCH Monitoring configured as periodicity and offset. If the UE is configured to monitor DCI format 2\_1, only the values 'sl1', 'sl2' or 'sl4' are applicable. If the UE is configured to monitor DCI format 2\_0, only the values ′sl1′, ′sl2′, ′sl4′, ′sl5′, ′sl8′, ′sl10′, ′sl16′, and ′sl20′ are applicable (see TS 38.213 [13], clause 10). |
| ***monitoringSymbolsWithinSlot***The first symbol(s) for PDCCH monitoring in the slots configured for PDCCH monitoring (see *monitoringSlotPeriodicityAndOffset* and *duration*). The most significant (left) bit represents the first OFDM in a slot, and the second most significant (left) bit represents the second OFDM symbol in a slot and so on. The bit(s) set to one identify the first OFDM symbol(s) of the control resource set within a slot. If the cyclic prefix of the BWP is set to extended CP, the last two bits within the bit string shall be ignored by the UE .For DCI format 2\_0, the first one symbol applies if the *duration* of CORESET (in the IE *ControlResourceSet*) identified by *controlResourceSetId* indicates 3 symbols, the first two symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 2 symbols, and the first three symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 1 symbol.See TS 38.213 [13], clause 10. |
| ***nrofCandidates-SFI***The number of PDCCH candidates specifically for format 2-0 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 11.1.1). |
| ***nrofCandidates***Number of PDCCH candidates per aggregation level. The number of candidates and aggregation levels configured here applies to all formats unless a particular value is specified or a format-specific value is provided (see inside searchSpaceType). If configured in the SearchSpace of a cross carrier scheduled cell, this field determines the number of candidates and aggregation levels to be used on the linked scheduling cell (see TS 38.213 [13], clause 10). |
| ***searchSpaceId***Identity of the search space. SearchSpaceId = 0 identifies the searchSpaceZero configured via PBCH (MIB) or ServingCellConfigCommon and may hence not be used in the SearchSpace IE. The searchSpaceId is unique among the BWPs of a Serving Cell. In case of cross carrier scheduling, search spaces with the same *searchSpaceId* in scheduled cell and scheduling cell are linked to each other. The UE applies the search space for the scheduled cell only if the DL BWPs in which the linked search spaces are configured in scheduling cell and scheduled cell are both active. |
| ***searchSpaceType***Indicates whether this is a common search space (present) or a UE specific search space as well as DCI formats to monitor for. |
| ***ue-Specific***Configures this search space as UE specific search space (USS). The UE monitors the DCI format with CRC scrambled by C-RNTI, CS-RNTI (if configured), and SP-CSI-RNTI (if configured) |

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| **Conditional Presence** | **Explanation** |
| *Setup* | This field is mandatory present upon creation of a new SearchSpace and when the SearchSpace is included in system information. It is optionally present, Need M, otherwise. |
| *SetupOnly* | This field is mandatory present upon creation of a new SearchSpace and when the SearchSpace is included in system information. It is absent otherwise. |