|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change Request** | | | | | | | |
| **Document** | **O-RAN.WG4.CUS.0** | **ver** | **10.00** | **CR** | **QCM-0029** | **rev** | **5** | |

|  |  |  |  |
| --- | --- | --- | --- |
| ***Title:*** | Changes to limit number of PRB ranges for ExtType-12 and High Priority sections | | |
| ***Source to WG:*** | QCM | | |
| ***Target WG :*** | **WG4** | | |
| ***Category:*** | **C** | ***CR Creation Date*** | 2022.02.09 |
|  | *Use one of the following* ***categories****:* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* ***F*** *(correction)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | |

|  |  |
| --- | --- |
| ***Reason for Change:*** | * For HP section + LP section with ExtType=12, number of High Priority(HP) sections are limited by “max-highest-priority-sec-per-cplane-message”, however number of frequency ranges for ExtType=12 which can be present in each HP section is not limited. * In addition, the number of frequency ranges is unlimited when Section Extension 12 is used |
| ***Summary of change:*** | In an O-RU capability report, provide the ability to limit PRB ranges per HP and LP section:   * Introduce optional M-Plane parameter ‘max-prb-ranges-per-hp-section-sec-ext-12’ within per C-Plane message limits. * Additionally introduce optional M-Plane parameter ‘max-prb-ranges-per-sec-ext-12’ within C-Plane message limits |
| ***Consequences if not aproved:*** | Not limiting number of frequency ranges which can be specified for ExtType=12 leads to dimensioning issue both for LP sections with ExtType=12 and for HP Section frequency ranges |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Clauses affected:*** | All | | | | |
|  | **Y** | **N** |  | |  |
| ***Other specs*** | **X** |  | Other core specifications: | [pullRequest#276](https://bitbucket.org/bitbucket-o-ran-alliance/workgroup4/pull-requests/276) | |
| ***affected:*** |  | **x** | Test specifications: | <fill in related CRs if “Y”> | |
| ***(show related CRs)*** |  | **X** | O&M Specifications: | <fill in related CRs if “Y”> | |
| ***Supporting material:***  ***Other comments:*** | https://oranalliance.atlassian.net/wiki/download/attachments/2431582550/QCM-2022.02.08-oRAN.WG4.ExtType-12-PRBSet-Limits-v01.pptx?api=v2 | | | | |

Change 1:

### 7.7.12 SE 12: Non-contiguous PRB allocation with frequency ranges

#### 7.7.12.1 Overview

Section Extension 12 applies only to Section Types 1, 3 and 5. It cannot be used with Section Extension 6 in the same section description.

Section Extension 12 enables allocation of non-contiguous sets of PRBs (Resource Block Groups, or RBGs) in time domain and frequency domain. This extension reduces the C-Plane overhead when users or channels are allocated with non-contiguous sets of PRBs in time or frequency. This extension is more space-efficient than Section Extension 6 if the allocation is continuous in frequency or extends over a frequency span wider than the range defined by rbgMask size and rbgMaskSize value. Structure of Section Extension 12 is presented in Table 7.7.12.1‑1.

Table 7.7.12.1‑1: Format of Section Extension 12 (non-contiguous PRB allocation with frequency ranges)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 (msb) | 1 | | 2 | 3 | 4 | 5 | 6 | 7 (lsb) | # of bytes |  |
| ef | extType[6:0] = 0x0C | | | | | | | | 1 | Octet N |
| extLen (variable) | | | | | | | | | 1 | N+1 |
| priority[1:0] | | symbolMask[13:8] | | | | | | | 1 | N+2 |
| symbolMask[7:0] | | | | | | | | | 1 | N+3 |
| offStartPrb(1) | | | | | | | | | 1 | variable |
| numPrb(1) | | | | | | | | | 1 | variable |
| offStartPrb(2) | | | | | | | | | 1 | variable |
| numPrb(2) | | | | | | | | | 1 | variable |
| … | | | | | | | | |  |  |
| offStartPrb(R-2) | | | | | | | | | 1 | variable |
| numPrb(R-2) | | | | | | | | | 1 | variable |
| offStartPrb(R-1) | | | | | | | | | 1 | variable |
| numPrb(R-1) | | | | | | | | | 1 | variable |

This extension consists of a fixed part (fields priority and symbolMask) and a variable size part (pairs of offStartPrb(r) and numPrb(r) for r = 1 … R-1). The variable part may be empty allowing the use of priority and symbolMask without overhead.

If Section Extension 12 is present in a section description, then the section description shall be applied to symbols identified by symbolMask and one or more frequency ranges calculated from startPrbc and numPrbc from the section description and offStartPrb(r) and numPrb(r) pairs from this Section Extension.

If Section Extension 12 is present in a section description, then following requirements apply:

1. The field startSymbolId in the message header and the fields rb, symInc, and numSymbol in the section description shall not be used for identification of symbols and PRBs referred by the section description.
2. O‑DU may set symInc and numSymbol to any allowed value without restriction to values corresponding to symbols actually referred by the section description; the values of these parameters may be used to affect range of symbols referred by subsequent section descriptions in the message.
3. O-DU shall set rb to the value of zero.
4. O-DU shall set startSymbolId to the earliest symbol referred by any of section descriptions in the message, including, but not limited to, section descriptions with Section Extension 12. The earliest symbol referenced by a section description with Section Extension 12 is the earliest symbol selected by a set bit in the symbolMask. That means symbolMask’s bit n, such that n < startSymbolId, shall be zero.

If Section Extension 12 is present in a section description, then the section description shall be applied to one or more PRB ranges. Specifically, the section description shall be applied to R spectrum fragments identified by pairs startPrb(r) and numPrb(r) for r = 0,…,R-1 where startPrb(r) values are calculated by recurrence:

startPrb(0) and numPrb(0) are values of section description’s parameter startPrbc and numPrbc; values of numPrb(1), numPrb(2), … numPrb(R-1) are from the variable part of section description.

startPrb(r) = startPrb(r-1) + numPrb(r-1) + offStartPrb(r) for r = 1, ..., R-1

The section description applies to PRB #p if startPrb(r) ≤  < startPrb(r) + numPrb(r) for any r = 0,...,R-1.

Number of frequency ranges R shall be derived from extLen: R = (extLen – 1) × 2 + 1. Empty PRB ranges are allowed e.g., numPrb(r) = 0 may be used to shift the following PRB range beyond limit of 8-bit offset. Similarly, offStartPrb(r) = 0 may be used to concatenate two PRB ranges and effectively extend range width beyond the limit of 8-bit numPrb(r). If the last pair in the extension are present (due to extension size alignment to multiple of 4 bytes) but not used, then they shall have offStartPrb(R-1) = 0 and numPrb(R-1) = 0. The number of frequency ranges R per section description shall be less than or equal to the value of optional M-Plane parameter “max-prb-ranges-per-sec-ext-12” ~~if this parameter exists~~. This single M-Plane limit shall apply when empty range numPrb(r) = 0 is used for range extension and also when offStartPrb(r) = 0 is used for concatenating two PRB ranges.

Additionally, number of frequency ranges R per highest priority section description shall be less than or equal to the value of another optional M-Plane parameter “max-prb-ranges-per-hp-section-sec-ext-12” ~~if this parameter exists~~ and this shall be applicable when C-Plane message limits apply (as specified in clause 7.8.2.2).

NOTE 1: Usage of Section Extension 12 does not affect the operation of user plane. A data section in the user plane is not required to contain a contiguous range of PRBs. By invoking the sectionId multiple times in the user plane, either within a single message or in different messages, it is possible to handle sets of non-contiguous PRBs.

NOTE 2: Utilization of Section Extension 12 does not put any restriction on utilization of sections with contiguous PRB utilization except for the general rules of utilization of sections e.g. in context of one eAxC a resource element shall be referenced by at most one data section description in the control plane.

In case C-Plane and U-Plane coupling via sectionId is used then control plane section descriptions with the same sectionId shall allocate same set of PRBs and symbols.

When utilizing this Section Extension together with Section Type 3 where freqOffset parameter is present, then freqOffset affects the frequency span for the specific range of PRB numbers.

Change 2:

#### 7.8.2.2 O-RU C-Plane message limits

For O-RUs with per C-Plane message processing limits in addition to per endpoint processing limits, the O-RU may choose to advertise its limitations on a per C-Plane message basis. The O-DU may choose to indicate that it adheres to the associated limitations. The defined limits are the maximum number of beams, maximum number of highest priority sections and maximum number of PRB ranges per highest priority section with Section Extension 12, within a C-Plane message. Refer to clause 15.8 of the M-Plane Specification [7] for details on usage of this feature for various scenarios.