**3GPP TSG-RAN WG2 Meeting #109bis-eR2-200xxxx**

**Online, 20th - 30th April 2020**

**Agenda Item: 7.2.x**

**Source: Huawei, HiSilicon**

**Title: TP on WUS resource pattern for eMTC**

**Document for: Discussion and Decision**

# Introduction

Proposed change to the signalling and procedure text for WUS resource pattern in eMTC

# TP for RRC

6.3.2 Radio resource control information elements

*– GWUS-Config*

The IE *GWUS-Config* is used to specify the Group WUS configuration. For the UEs supporting GWUS, E-UTRAN uses GWUS to indicate that the UE shall attempt to receive paging in that cell, see TS 36.304 [4].

***GWUS-Config* information element**

-- ASN1START

GWUS-Config-r16 ::= SEQUENCE {

 gwus-GroupAlternation-r16 ENUMERATED {true} OPTIONAL, -- Need OR

 gwus-CommonSequence-r16 ENUMERATED {legacyWUS, groupWUS} OPTIONAL, -- Need OR

 gwus-TimeParameters-r16 GWUS-TimeParameters-r16 OPTIONAL, -- Cond NoWUSr15

 gwus-ResourceConfigDRX-r16 GWUS-ResourcePerGapConfig-r16,

 gwus-ResourceConfig-eDRX-Short-r16 CHOICE {

 useDRX NULL,

 explicit GWUS-ResourcePerGapConfig-r16

 } OPTIONAL, -- Need OR

 gwus-ResourceConfig-eDRX-Long-r16 CHOICE {

 use-DRX-or-eDRX-Short NULL,

 explicit GWUS-ResourcePerGapConfig-r16

 } OPTIONAL, -- Need OR

 gwus-ProbaThreshList-r16 GWUS-ProbThreshList-r16 OPTIONAL, -- Need OR

 gwus-GroupNarrowBandList-r16 SEQUENCE (SIZE (1..maxAvailNarrowBands-r13)) OF BOOLEAN OPTIONAL -- Need OR

}

GWUS-TimeParameters-r16 ::= SEQUENCE {

 maxDurationFactor-r16 ENUMERATED {one32th, one16th, one8th, one4th},

 numPOs-r16 ENUMERATED {n1, n2, n4, spare1} DEFAULT n1,

 timeOffsetDRX-r16 ENUMERATED {ms40, ms80, ms160, ms240},

 timeOffset-eDRX-Short-r16 ENUMERATED {ms40, ms80, ms160, ms240},

 timeOffset-eDRX-Long-r16 ENUMERATED {ms1000, ms2000} OPTIONAL, -- Need OP freqLocation-r16 ENUMERATED {n0, n2},

 ...

}

GWUS-ResourcePerGapConfig-r16 ::= SEQUENCE {

 gwus-ResourcePattern-r16 ENUMERATED {rp-ID0, rp-ID1, rp-ID2, rp-ID3, rp-ID4, rp-ID5, rp-ID6, rp-ID7},

 gwus-NumGroupsList-r16 SEQUENCE (SIZE (1..maxGWUS-Resources-r16)) OF GWUS-NumGroups-r16 OPTIONAL, -- Need OP

 gwus-GroupsForServiceList-r16 SEQUENCE (SIZE (1..maxGWUS-ProbThresholds-r16)) OF INTEGER (1..maxGWUS-Groups-1-r16) OPTIONAL -- Need OR

}

GWUS-NumGroups-r16 ::= ENUMERATED {n1, n2, n4, n8}

GWUS-ProbThreshList-r16 ::= SEQUENCE (SIZE (1..maxGWUS-ProbThresholds-r16)) OF GWUS-PagingProbThresh-r16

GWUS-PagingProbThresh-r16 ::= ENUMERATED {tbd}

-- ASN1STOP

| ***GWUS-Config* field descriptions** |
| --- |
| ***gwus-CommonSequence***Presence of the field indicates common WUS sequence is configured. Value *legacyWUS* indicates common WUS sequence for the shared WUS resource is the legacy WUS sequence. Value *groupWUS* indicates common WUS sequence for the shared WUS resource is the group WUS sequence, see TS 36.211 [21]. |
| ***gwus-GroupAlternation***Enables hopping between the two or more WUS resources for the gap type, see TS 36.304 [4]. |
| ***gwus-GroupNarrowBandList***List indicating which narrowbands support group WUS see TS 36.304 [4]. First entry in the list indicates WUS support for first narrowband, second entry in the list indicates WUS support for second narrowband, and so on. If this list is absent, group WUS supported on all narrowbands. |
| ***gwus-GroupsForServiceList***Number of WUS groups for each paging probability group see TS 36.304 [4]. The first entry is for the first probability group, second entry is for the second paging probability group, and so on. Any WUS groups from the list if WUS groups defined in the *numWUS-GroupsPerResourceList* that are not assigned to a probability group is considered to be part of the UE ID based group only list. If this field is absent, paging probability based WUS group selection is not configured. |
| ***gwus-FreqLocation***Frequency location of group WUS within paging narrowband for BL UEs and UEs in CE. Value *n0* corresponds to WUS in the 1st and 2nd PRB and value *n2* represents the 3rd and 4th PRB. |
| ***gwus-NumGroupsList***List of WUS groups for each WUS resource see TS 36.304 [4]. First entry corresponds to the first resource, second entry corresponds to the second resource, and so on. *gwus-NumGroupsList* shall be present in *gwus-ResourceConfigDRX*. If *gwus-NumGroupsList* is not present in *gwus-ResourceConfig-eDRX-Short*, *gwus-NumGroupsList* from *gwus-ResourceConfigDRX* applies. If *gwus-NumGroupsList* is not present in *gwus-ResourceConfig-eDRX-Long* and *gwus-NumGroupsList* is present in *gwus-ResourceConfig-eDRX-Short*, *gwus-NumGroupsList* from *gwus-ResourceConfig-eDRX-Short* applies. If *gwus-NumGroupsList* is not present in *gwus-ResourceConfig-eDRX-Long* and *gwus-NumGroupsList* is not present in *gwus-ResourceConfig-eDRX-Short*, *gwus-NumGroupsList* from *gwus-ResourceConfigDRX* applies. |
| ***gwus-ProbThreshList***Paging probability thresholds corresponding to the paging probability groups, see TS 36.304 [4]. If this field is absent, paging probability based WUS group selection is not configured. |
| ***gwus-ResourceConfigDRX, gwus-ResourceConfig-eDRX-Short, gwus-ResourceConfig-eDRX-Long***WUS resource configured for each gap type see TS 36.304 [4]. If *gwus-ResourceConfig-eDRX-Long* is not present but *timeOffset-eDRX-Long* is present and *gwus-ResourceConfig-eDRX-Short* is present, *gwus-ResourceConfig-eDRX-Short* parameters apply for long eDRX group WUS resource. If *gwus-ResourceConfig-eDRX-Long* is not present but *timeOffset-eDRX-Long* is present and *gwus-ResourceConfig-eDRX-Short* is not present, *gwus-ResourceConfigDRX* parameters apply for long eDRX group WUS resource. |
| ***gwus-ResourcePattern***Identifies the group WUS resource mapping to time/frequency as defined in TS 36.304 [4].Value *rp-ID0* corresponds to resource pattern ID 0, value *rp-ID1* corresponds to resource pattern ID 1 and so on.E-UTRAN may configure value *rp-ID1*, value *rp-ID3,* value *rp-ID5 or* value *rp-ID7* onlyif *wus-Config-r15* is present in *SystemInformationBlockType2.* |

| **Conditional presence** | **Explanation** |
| --- | --- |
| *NoWUSr15* | The field is mandatory present if *wus-Config-r15* is not present in *SystemInformationBlockType2*; otherwise the field is not present, and the UE shall delete any existing value for this field. |

# TP for TS 36.304 section 7.5.4

### 7.5.4 WUS Resource Location for BL UEs and UEs in Enhanced coverage

A BL UE or UE in enhanced coverage determines the time/frequency location of the WUS resources based on *freqLocation,* which indicates the frequency location of WUS Resource ID 0 (. The frequency location of other WUS Resources (WUS Resource ID 1,2,3) is derived from *freqLocation* as shown in Table 7.5.4-1.

Table 7.5.4-1: WUS Resource frequency location

|  |  |
| --- | --- |
| ***WUS Resource******()*** | ***freqLocation***  |
| ***NB below centre frequency*** | ***NB above centre frequency*** |
| ***n0*** | ***n2*** | ***n4 (Note 1)*** | ***n0*** | ***n2*** | ***n4 (Note 1)*** |
| WUS Resource 1 | n2 | n0 | n2 | n2 | n4 | n2 |
| WUS Resource 2 | n0 | n2 | n4 | n0 | n2 | n4 |
| WUS Resource 2(Note 2) | n4 | n4 | n0 | n4 | n0 | n0 |
| WUS Resource 3 | n2 | n0 | n2 | n2 | n4 | n2 |
| Note 1: This column is applicable if *wus-Config* is present.Note 2 : This row is applicable if *gwus-ResourcePattern* is set to *rp-ID7*. |

The time offset, *g*0, from the end of WUS resource 0 and WUS resource 1 to the start of corresponding PO is determined as defined in subclause 7.4 If *gwus-ResourcePattern* is set to *rp-ID7,* the time offset g0 for WUS resource 2 is the same as WUS resource 0 and 1. Otherwise, the time offset from the end of WUS resource 2 and WUS resource 3 to the start of corresponding PO is the sum of the time offset *g*0 and the maximum WUS duration.

The WUS Resource IDs for WUS Groups are selected based on gwus-ResourcePattern as given in Table 7.5.4-2.

|  |  |
| --- | --- |
|  | **Resource Pattern ID(**gwus-ResourcePattern) |
| ***0*** | ***1*** | ***2*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** |
| **WUS Resource*****()*** | ***0*** | X |  | X |  | X |  | X | X |
| ***1*** |  | X | X | X | X | X | X | X |
| ***2*** |  |  |  | X | X | X | X | X |
| ***3*** |  |  |  |  |  | X | X |  |
| ***Number of******WUS Resources*** | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 3 |

If = 0 is not used the first entry in the *gwus-NumGroupsList*. corresponds to = 1. Otherwise, is the index of the WUS resources in *gwus-NumGroupsList*.