**3GPP TSG-RAN WG3 Meeting #112-e** [**R3-212619**](file:///C:\Program%20Files%20(x86)\zMail\app\temp\Inbox\R3-212619.zip)

**Online, 17 May – 28 May 2021**

Agenda Item: 9.2.2

Source: ZTE

Title: Summary of Discussion for DRXinfoRRC\_INACTIVE

Document for: Discussion, Decision

# Introduction

**CB: # 23\_DRXinfoRRC\_INACTIVE**

**- (HW) Paging DRX IE in XnAP: RAN PAGING message carries the RAN paging cycle; no need for anchor RAN node to provide eDRX information to neighbor RAN nodes in case of RAN paging; if optimization is agreed, UE specific DRX and eDRX need to be included as optional in RAN PAGING message**

**- (ZTE,QC,E///,Nok) Introduce UE Specific DRX and Paging eDRX Information IEs independently in XnAP RAN PAGING message; Introduce CN UE paging DRX IE and UE Radio Capability for Paging of NR IE in the F1AP PAGING message**

**- Chair: We cannot have Cat B CRs for Rel-16**

(ZTE - moderator)

Summary of offline disc [R3-212619](file:///C:\Program%20Files%20(x86)\zMail\app\temp\Inbox\R3-212619.zip)

# For the Chairman’s Notes

**[To be added]**

# Discussion

## First round Email discussion

Based on the TS 36.304[1] description as follows, for UE in RRC\_INACTIVE, if eDRX is configured, DRX cycle (T) is determined by the shortest of the RAN paging cycle, the UE specific paging cycle, if allocated by upper layers and the default paging cycle during the PTW, and DRX cycle (T) is determined by the RAN paging cycle outside the PTW. That means, the DRX Cycle (T) value is different during the PTW and outside the PTW. Thus, the eDRX parameters(to determine the PTW information), the RAN paging cycle and the the shortest of the RAN paging cycle, the UE specific paging cycle, if allocated by upper layers and the default paging cycle are necessary for RAN Node to determine the paging DRX cycle(T) used.

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| 7.1 Discontinuous Reception for paging  //SKIP THE UNRELATED PART//  The following Parameters are used for the calculation of the PF, i\_s, PNB, and the NB-IoT paging carrier:  - T: DRX cycle of the UE.  Except for NB-IoT: If a UE specific extended DRX value of 512 radio frames is configured by upper layers according to 7.3, T =512. Otherwise, T is determined by the shortest of the UE specific DRX value, if allocated by upper layers, and a default DRX value broadcast in system information. If UE specific DRX is not configured by upper layers, the default value is applied. In RRC\_INACTIVE state, if extended DRX is not configured by upper layers as defined in 7.3, T is determined by the shortest of the RAN paging cycle, the UE specific paging cycle, and the default paging cycle, if allocated by upper layers. Otherwise, in RRC\_INACTIVE state when extended DRX is configured by upper layers, T is determined by the shortest of the RAN paging cycle, the UE specific paging cycle, if allocated by upper layers and the default paging cycle during the PTW as defined in 7.3, and by the RAN paging cycle outside the PTW.  //SKIP THE UNRELATED PART// |

Based on the TS38.413 [2], *UE specific DRX* and *Paging eDRX information* can be included in *Core Network Assistance Information for RRC INACTIVE* IE, and *Core Network Assistance Information for RRC INACTIVE* can always be delivered to the anchor RAN node. Based on the current TS38.423 specification [3], only *Paging DRX* IE is included in the RAN PAGING. Currently there is no clear definition of the *Paging DRX* IE in XnAP: RAN PAGING message.

In RAN3#111emeeting, this issue was discussed, but there is not conclusion yet. In this meeting, two contributions are provided [4] [8], and both contributions propose that the *Paging DRX* IE in XnAP: RAN PAGING message is clarified as RAN paging cycle.

**Q1: Do companies agree that the *Paging DRX* IE in XnAP: RAN PAGING message is clarified as RAN paging cycle?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes |  |
| Huawei | Yes | See R3-211538. |
| Qualcomm | Yes |  |
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In contribution [5], the clarification is put at the paging DRX definition as following:

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| 9.2.3.66 Paging DRX This IE indicates the RAN Paging DRX as defined in TS 38.304 [33] and TS 36.304 [34]. |

In contribution [10], the clarification is put at the *paging DRX* Semantics description as following:

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| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** | | Message Type | M |  | 9.2.3.1 |  | YES | reject | | CHOICE *UE Identity Index Value* | M |  |  |  | YES | reject | | *>Length-10* |  |  |  |  |  |  | | >>Index Length-10 | M |  | BIT STRING (SIZE(10)) | Coded as specified in TS 38.304 [33] and TS 36.304 [34]. | – |  | | UE RAN Paging Identity | M |  | 9.2.3.43 |  | YES | ignore | | Paging DRX | M |  | 9.2.3.66 | Includes the RAN Paging cycle. | YES | ignore | |

From moderator’s point of view, both CRs [5] and [10] are used to indicate that the Paging DRX IE in XnAP: RAN PAGING message is clarified as RAN paging cycle and the difference is very minor.

Since contribution [10] has many co-sourced companies, moderator kindly wishes to go to the change in [10].

**Q2: if the answer for Q1 is yes, do companies prefer the modification style in contribution [5] or contribution [10], or any other comments?**

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| **Company** | **Options：**  **Contribution[5];**  **Contribution[10];**  **Other.** | **Comments** |
| ZTE | Contribution[10] | Since there will have multiple DRX parameters in RAN PAGING message, we prefer to describe their meanings in the semantics description clearly as in contribution [10]. But we are ok to add reference to the definition in TS 38.304 [33] and TS 36.304. E.g. the description changes to “Includes the RAN Paging cycle as defined in TS 38.304 [33] and TS 36.304 [34]”. |
| Huawei | [5] | [10] includes other things not only to clarify the RAN Paging Cycle, those other things are solution for optimization instead of correction.  Note so far there is no paging missing required to be solved by RAN3. The i\_s issue is pending to RAN2 discussion, the Rel-16 Cat F correction CR is needed if RAN2 confirms to solve it via signaling way instead of proper network configuration in Rel-16. |
| Qualcomm | Possibly merge | One other option would be to change the name of the IE (e.g. “RAN paging cycle”, or “RAN Paging DRX”), in any case semantics are useful to ensure it is clear this is the same as provided to the UE. |
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Based on the current specification, how to configure the RAN Paging DRX to UE, is up to the anchor RAN node. The anchor RAN node can make the decision based on the eDRX information and UE specific DRX, the anchor RAN node can set the RAN Paging DRX to the UE with the value same as UE specific DRX, smaller than the UE specific DRX, or bigger value than the UE specific DRX. Considering that UE will determine the DRX cycle (T) for paging frame calculation as follows:

* If eDRX is configured by higher layers, the DRX cycle(T) is determined by the shortest of the RAN paging cycle, the UE specific paging cycle, if allocated by upper layers and the default paging cycle during the PTW, and DRX cycle (T) is determined by the RAN paging cycle outside the PTW RAN paging.
* If eDRX is not configured by higher layers, the DRX cycle (T) is determined by the shortest of the RAN paging cycle, the UE specific paging cycle, if allocated by upper layers and the default paging cycle.

To avoid paging delay, paging eNB should use the PO as that UE monitors to send RAN paging. Thus, the paging eNB should know the *UE specific DRX* and *Paging eDRX information*, if configured by higher layers. And in contribution [8], it is also mentioned that *UE specific DRX* and *Paging eDRX information* are necessary in paging eNB to deal with the i\_s misalignment issue. Thus, in contribution [8], it is proposed to introduce *UE Specific DRX* and *Paging eDRX Information* IEs independently in the RAN PAGING message of XnAP specification.

In contribution [6], there are the following observations:

* there is no paging missing if the *Paging DRX* IE in XnAP: RAN PAGING message is clarified as RAN paging cycle, and
* Sending RAN paging in all the POs which are monitored by the UEs during PTW, is costly and increases RAN node handling complexity

And in contribution [6], it is also agreed to include *UE specific DRX* and *eDRX parameters* as two new optional IEs in the RAN PAGING message.

**Q3: Do companies agree that the *UE Specific DRX* and *Paging eDRX Information* IEs independently in the RAN PAGING message of XnAP specification?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes |  |
| Huawei | - | We do not object to do the optimization, but need to clarify that it is optimization rather than correction, and then use Cat B, like proposed in [7]. |
| Qualcomm | Yes | One comment: to our knowledge in 3GPP history the paging RAN node has always been aware of all the POs of the UE regardless of whether it uses them. So it could be argued that this is just business as usual and not optimization. Anyway we can further discuss. Potentially the situation gets even more confusing as the introduction of the UE Paging DRX may be a correction too even for rel-15 / NR. |
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In contribution [7], parameters are defined as following:

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| 9.1.1.7 RAN PAGING This message is sent by the NG-RAN node1 to NG-RAN node2 to page a UE.  Direction: NG-RAN node1 → NG-RAN node2.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality | | Message Type | M |  | 9.2.3.1 |  | YES | reject | | CHOICE *UE Identity Index Value* | M |  |  |  | YES | reject | | *>Length-10* |  |  |  |  |  |  | | >>Index Length-10 | M |  | BIT STRING (SIZE(10)) | Coded as specified in TS 38.304 [33] and TS 36.304 [34]. | – |  | | UE RAN Paging Identity | M |  | 9.2.3.43 |  | YES | ignore | | Paging DRX | M |  | 9.2.3.66 |  | YES | ignore | | RAN Paging Area | M |  | 9.2.3.38 |  | YES | reject | | Paging Priority | O |  | 9.2.3.44 |  | YES | ignore | | Assistance Data for RAN Paging | O |  | 9.2.3.41 |  | YES | ignore | | UE Radio Capability for Paging | O |  | 9.2.3.91 |  | YES | ignore | | Extended UE Identity Index Value | O |  | 9.2.3.141 | Coded as specified in TS 36.304 [34]. | YES | ignore | | CN Paging DRX | O |  | 9.2.3.xxx |  | YES | ignore | | CN Paging eDRX Information | O |  | 9.2.3.yyy |  | YES | ignore |   ***-----------Start of the Next Change-----------***  9.2.3.141 Extended UE Identity Index Value  This IE is used by the target NG-RAN node to calculate the Paging Frame as specified in TS 36.304[34].   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | Extended UE Identity Index Value | M |  | BIT STRING (SIZE(16)) |  |  9.2.3.xxx CN Paging DRX This IE indicates the CN Paging DRX as defined in TS 38.413 [5].   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | CN Paging DRX | M |  | ENUMERATED (32, 64, 128, 256, …) |  |  9.2.3.yyy CN Paging eDRX Information This IE indicates the CN Paging eDRX parameters as defined in TS 38.413 [5].   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | CN Paging eDRX Cycle | M |  | ENUMERATED (hfhalf, hf1, hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, …) | TeDRX defined in TS 36.304 [29]. Unit: [number of hyperframes]. | | CN Paging Time Window | O |  | ENUMERATED  (s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, …) | Unit: [1.28 second]. | |

In contribution [10], the clarification is put at the *paging DRX* Semantics description as following:

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| 9.1.1.7 RAN PAGING  This message is sent by the NG-RAN node1 to NG-RAN node2 to page a UE.  Direction: NG-RAN node1 → NG-RAN node2.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** | | Message Type | M |  | 9.2.3.1 |  | YES | reject | | CHOICE *UE Identity Index Value* | M |  |  |  | YES | reject | | *>Length-10* |  |  |  |  |  |  | | >>Index Length-10 | M |  | BIT STRING (SIZE(10)) | Coded as specified in TS 38.304 [33] and TS 36.304 [34]. | – |  | | UE RAN Paging Identity | M |  | 9.2.3.43 |  | YES | ignore | | Paging DRX | M |  | 9.2.3.66 | Includes the RAN Paging cycle. | YES | ignore | | RAN Paging Area | M |  | 9.2.3.38 |  | YES | reject | | Paging Priority | O |  | 9.2.3.44 |  | YES | ignore | | Assistance Data for RAN Paging | O |  | 9.2.3.41 |  | YES | ignore | | UE Radio Capability for Paging | O |  | 9.2.3.91 |  | YES | ignore | | UE specific DRX | O |  | 9.2.3.xy | Includes the UE specific DRX as received in the *Core Network Assistance Information* IE in TS 38.413 [5]. | YES | ignore | | Paging eDRX Information | O |  | 9.2.3.xz |  | YES | ignore |   *Next change*  9.2.3.xz Paging eDRX Information  This IE indicates the Paging eDRX parameters for RRC\_IDLE as defined in TS 36.304 [33], if configured by higher layers.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | | Paging eDRX Cycle | M |  | ENUMERATED (hfhalf, hf1, hf2, hf4, hf6, hf8, hf10, hf12, hf14, hf16, hf32, hf64, hf128, hf256, …) | TeDRX defined in TS 36.304 [34]. Unit: [number of hyperframes]. | | Paging Time Window | O |  | ENUMERATED  (s1, s2, s3, s4, s5, s6, s7, s8, s9, s10, s11, s12, s13, s14, s15, s16, …) | Unit: [1.28 second]. |  9.2.3.xy UE Specific DRX This IE indicates the UE specific paging cycle as defined in TS 36.304 [34] and 38.304 [33].   |  |  |  |  |  | | --- | --- | --- | --- | --- | | IE/Group Name | Presence | Range | IE type and reference | Semantics description | | UE Specific DRX | M |  | ENUMERATED (32, 64, 128, 256, …) |  | |

From moderator’s point of view, in both contribution [7] and contribution [10], the *UE Specific DRX* and *Paging eDRX Information* IEs are independently included in the RAN PAGING message of XnAP specification, but the two contributions have a bit different.

Since contribution [10] has many co-sourced companies, moderator kindly wishes to go to the change in [10].

**Q4: if the answer for Q3 is yes, do companies prefer the modification style in contribution [7] or contribution [10], or any other comments?**

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| **Company** | **Options：**  **Contribution[7];**  **Contribution[10];**  **Other.** | **Comments** |
| ZTE | Contribution[10] | Since there are not CN Paging DRX and CN Paging eDRX information definitions in TS 38.413, and the *Paging DRX* and *Paging eDRX information* definitions in TS38.413 also refer to the definitions in TS 38.304 and TS 36.304, we prefer the definition style in contribution [10] that reflects the parameters from CN by parameter description and refers to the definition in TS 38.304 and TS 36.304. |
| Huawei | [7] | As there is no paging missing confirmed so far, carry those two IEs are just to optimize the paging latency (very limited benefit in small chance), Cat F should not be used as proposed in [10]. |
| Qualcomm | [10] | Prefer the IE names and layout in [10], sorry. For the cat we can further discuss, but see also the comment above. |
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**Q5: Companies are kindly invited to provide your view whether the CR [10] can be agreed?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | Yes, the CR [10] shall be agreed, we are also fine to change semantics description of *Paging DRX* to “Includes the RAN Paging cycle as defined in TS 38.304 [33] and TS 36.304 [34]”. |
| Huawei | No | See comments above. |
| Qualcomm | Yes | We could also be ok to change semantics or even the IE name for the RAN Paging DRX. Otherwise see above. |
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In contribution [8], it is also proposed to deal with the i\_s mislignment issue for eLTE and NR,

* The *paging DRX* IE in Rel-15 XnAP: RAN PAGING message is clarified as *RAN paging cycle* in Rel-15;
* Introduce *UE specific DRX* in Rel-15 XnAP: RAN PAGING message.
* Introduce *UE specific DRX* and *UE Radio Capability for Paging* of NR IE in the *PAGING* message of Rel-15 F1AP specification

Based on the proposals, contributions [9] [11] [12] are provided.

In contribution [8], it is mentioned that these eLTE/NR i\_s related issue are dependent on the exact detail of the RAN2 decisions. In contribution [13], it is also mentioned whether to introduce UE specific DRX in the F1AP: PAGING message, should be discussed after RAN2 progress, in NR agenda item. Moderator has the same sympathy that it should be discussed after there is progress in RAN2, but moderator thinks that it does not matter whether it is discussed in the LTE agenda item or in NR agenda item, because the XnAP is common for eMTC/eLTE and NR, and the same i-s issue for XnAP is discussed in LTE agenda item. Generally, the same issue should be discussed in the same agenda item.

And in contribution [13], it is mentioned that there is no need to introduce UE Radio Capability for Paging of NR IE in the F1AP: PAGING message, because the presence of the two DRX cycles will implicitly provide such indication for i\_s issue. Moderator thinks this is not correct, because the UE specific DRX may not be allocated by higher layers, in which case, the UE specific DRX will not be included in the F1AP: PAGING message. But the principle to deal with the i\_s issue is to use the DRX cycle (T) for RRC\_IDLE to calculate i\_s for RRC\_INACTIVE, and the DRX cycle (T) for RRC\_IDLE is determined by the shortest of the UE specific DRX value, if configured by RRC and/or upper layers, and a default DRX value broadcast in system information. Thus, even UE specific DRX is not included, the gNB-DU still need to know whether to use the DRX cycle (T) for RRC\_IDLE to calculate PO for RRC\_INACTIVE.

So, moderator suggests to postpone these eLTE/NR i\_s related issue discussion into the second round if there is progress in RAN2, but the related issue for F1AP: PAGING message is still be discussed in LTE agenda item.

**Q6: Do companies agree to postpone these eLTE/NR i\_s related issue discussion into the second round if there is progress in RAN2 and the related issue for F1AP: PAGING message is still be discussed in LTE agenda item, if any?**

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| **Company** | **Yes/No** | **Comments** |
| ZTE | Yes | Agree to delay until progress from RAN2.  Since the issue “UE specific DRX” (within [9], [11] and [12]]) is much related to our current discussion, it is convenient for us to discuss the related issues together when progress from RAN2. |
| Huawei | Yes | Agree to delay the discussion until RAN2 progress. |
| Qualcomm | Yes | As above |
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## Second round Email discussion

<TBD>

# Conclusion, Recommendations

# References

1. 3GPP, TS 36.304, V16.3.0 (2020-12), Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode
2. 3GPP, TS 38.413, V16.4.0 (2020-12), NG-RAN; NG Application Protocol (NGAP)
3. 3GPP, TS 38.423, V16.4.0 (2020-12), NG-RAN; Xn application protocol (XnAP)
4. R3-211537 Consideration on paging DRX in XnAP RAN Paging (Huawei)
5. R3-211538 Correction on Paging DRX in RAN PAGING message (Huawei)
6. R3-211539 Consideration on providing eDRX information in XnAP RAN Paging (Huawei)
7. R3-211540 RAN Paging Optimization (Huawei)
8. R3-211591 Discussion on the UE information delivery for RRC\_INACTIVE UE (ZTE, Qualcomm Incorporated, Ericsson, Nokia, Nokia Shanghai Bell)
9. R3-211592 38.423(Rel-15) UE specific DRX delivery for NR and eLTE (ZTE, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Ericsson)
10. R3-211593 38.423(Rel-16) Correction on the DRX information delivery for RRC\_INACTIVE UE in XnAP (ZTE, Qualcomm Incorporated, Ericsson, Nokia, Nokia Shanghai Bell)
11. R3-211594 38.473(Rel-15) UE information delivery in F1AP PAGING for NR (ZTE, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Ericsson)
12. R3-211595 38.473(Rel-16) UE information delivery in F1AP PAGING for NR (ZTE, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Ericsson)
13. R3-212598 Response to R3-211591, Huawei