3GPP TSG-RAN WG3 #128 R3-253804

St. Julian - Malta, 19 – 23 May. 2025

Agenda Item: 18.2. Support LP-WUS Indicating Paging Monitoring

Source: NTT DOCOMO INC.

Title: Summary of offline discussion on LP-WUS

Document for: Discussion, agreement

# For chair notes

Agree to following TPs:

TP to TS 38.420 is R3-253739 rev in R3-25xxxx (ZTE)

* Provide revision tdoc number.

**TP to TS 38.413 is R3-253458 rev in R3-253830 (E///)**

**TP to TS 38.423 is R3-253232 rev in R3-253809 (Nok)**

**TP to TS 38.473 is R3-253257 rev in R3-25xxxx (HW)**

* Provide revision tdoc number.

TP to TS 38.300 is R3-253831 (E///)

* “NOTE: Paging to the UE may be lost in case the UE moves from a gNB which does not support forwarding the ~~PEI or~~ LP-WUS radio paging capability to the AMF. It is up to the network implementation to avoid the issue, e.g., relying on homogeneous gNB support of this forwarding in the network. “

Agree to following LSs:

**LS to RAN2 is R3-253216 rev in R3-253846 (NEC)**

**LS to SA2 is R3-253643 rev in R3-25xxxx (HW)**

* Provide revision tdoc number.
* Update the tdoc number of attached TP (R3-253831).

Remaining open issues:

**FFS on the range of *LP-WUS CN Subgroup ID* IE included in LP-WUSPS Assistance Information pending on RAN1 decision on which subgroup ID(s) would be reserved for common codepoint.**

**FFS on whether to capture that the eDRX and LP-WUS may be used together by the gNB for RAN paging and CN paging.**

**The issue on UE battery drain during LP-WUS monitoring and very long eDRX cycles can be discussed based on companies’ contributions.**

# Introduction

During first round online session, we had following chair notes:

**CB: # LPWUS**

**- check with open issues, update the stage-3 TPs, and capture the agreements in stage-2 and stage-3 CRs.**

**- work on the draft LS to RAN2 and take 3026 as baseline LS, and capture RAN3 agreements.**

**- work on the draft LS to SA2.**

**- list the open issues for next meeting.**

(Moderator – NTT DCM)

Summary of offline discussion in [R3-253804](Inbox\R3-253804.zip)

# Discussion

## **TP to TS 38.420**

Work on the draft TP directly in draft folder:

<http://10.10.10.10/ftp/RAN/RAN3/Inbox/Drafts/CB%20%23%20LPWUS/TP%20to%20TS%2038.420>

* **TP to TS 38.420 is R3-253739 rev in R3-25xxxx (ZTE)**

## **LS to RAN2 (UE\_ID)**

Work on the draft LS directly in draft folder:

<http://10.10.10.10/ftp/RAN/RAN3/Inbox/Drafts/CB%20%23%20LPWUS/LS%20to%20RAN2%20(UE_ID)>

* **LS to RAN2 is R3-253216 rev in R3-253846 (NEC)**

## **Further Extended UE Identity Index**

During online session, it was agreed to introduce new Further Extended UE Identity Index Value and it includes 20 bits UE\_ID. Then, how to capture it in stage3 should be discussed. Also, F1AP/XnAP/NGAP should be aligned.

**Option 1 (based on R3-253257/Nokia for 38.423)**

#### 9.3.1.285 Extended UE Identity Index Value

This IE is used by the gNB-DU to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID as specified in TS 38.304 [24].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Extended UE Identity Index Value | M |  | BIT STRING (SIZE(16)) |  |

<<<<<<<<<<<<<<<<<<<< Unmodified Text Omitted >>>>>>>>>>>>>>>>>>>>

9.2.3.x Further Extended UE Identity Index Value

This IE is used by the NG-RAN node to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID for PEI and LP-WUS as specified in TS 38.304 [33].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| Further Extended UE Identity Index Value | M |  | BIT STRING (SIZE(20)) | Encoded as 5G-S-TMSI mod 1048576. |

**Option 2 (based on R3-253257/HW for 38.473)**

#### 9.3.1.285 Extended UE Identity Index Value

This IE is used by the gNB-DU to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID for PEI as specified in TS 38.304 [24].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Extended UE Identity Index Value | M |  | BIT STRING (SIZE(16)) |  |

<<<<<<<<<<<<<<<<<<<< Unmodified Text Omitted >>>>>>>>>>>>>>>>>>>>

#### 9.3.1.bbb Further Extended UE Identity Index Value

This IE is used by the gNB-DU to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID for PEI and LP-WUS as specified in TS 38.304 [24].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Further Extended UE Identity Index Value | M |  | BIT STRING (SIZE(20)) | Encoded as 5G-S-TMSI mod 1048576. |

**Option 3 (based on online discussion)**

#### 9.3.1.285 Extended UE Identity Index Value

This IE is used by the gNB-DU to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID as specified in TS 38.304 [24] if LP-WUS is not supported by the UE.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Extended UE Identity Index Value | M |  | BIT STRING (SIZE(16)) |  |

<<<<<<<<<<<<<<<<<<<< Unmodified Text Omitted >>>>>>>>>>>>>>>>>>>>

#### 9.3.1.bbb Further Extended UE Identity Index Value

This IE is used by the gNB-DU to calculate the Paging Frame and Paging Occasion for eDRX, and the UE\_ID based subgroup ID for PEI and LP-WUS as specified in TS 38.304 [24] if LP-WUS is supported by the UE.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| Further Extended UE Identity Index Value | M |  | BIT STRING (SIZE(20)) | Encoded as 5G-S-TMSI mod 1048576. |

Also, during TP checking, following modification for procedure text was proposed:

8.2.5 RAN Paging

…

8.2.5.2 Successful operation

…

If the *Further Extended UE Identity Index Value* IE is included in the RAN PAGING message, the NG-RAN node2 shall, if supported, use it according to TS 38.304 [33] when LP-WUS is supported.

* DCM: have no strong preference. But, we think Option 2 does not help anything. Option 3 clarifies which IE would be used, however, it seems too much, and it is already indicated in the IE description that legacy UE\_ID is ignored if new UE\_ID is present. Therefore, Option 1 seems enough.
* Nok, HW, QC: Option 2?
* HW, CATT: add “when LP-WUS is supported” in procedure text.
* **Go for option 2 with the modification on procedure text.**
* **TP to TS 38.413 is R3-253458 rev in R3-253830 (E///)**
* **TP to TS 38.423 is R3-253232 rev in R3-253809 (Nok)**
* **TP to TS 38.473 is R3-253257 rev in R3-25xxxx (HW)**

## **LS to SA2/RAN2 (paging loss issue)**

Question 1: Do we need to send the LS [R3-253643] to SA2 in this meeting?

* DCM: Basically, we think the LS is not unnecessary because RAN2 already concluded to rely on network implementation to resolve this issue and rapporteur has similar view. However, if we agree stage2 TP and attach it in the LS, it would be helpful for SA2 to avoid discussing whether/how to capture something regarding this issue.
* xxx
* **LS to SA2 is R3-253643 rev in R3-25xxxx (HW)**

Question 2: Do we need to capture the note in TS 38.300?

E.g. **“it is up to the network implementation to avoid the paging loss issue for LP-WUS in non-homogeneous deployment”** in TS 38.300. TP would be provided in inbox, if necessary.

Latest version:

NOTE: Paging to the UE may be lost in case the UE moves from a gNB which does not support forwarding the PEI or LP-WUS radio paging capability to the AMF. It is up to the network implementation to avoid the issue, e.g., relying on homogeneous gNB support of this forwarding in the network.

* DCM: this issue was raised by SA2 and RAN2/3 also acknowledged this issue, so that we should capture some notes in stage2 to indicate it.
* xxx
* **TP to TS 38.300 is R3-253831 (E///)**

## **Range of CN Subgroup ID**

#### 9.3.1.aaa LP-WUSPS Assistance Information

This IE provides the LP-WUS Paging Subgrouping information related to CN assigned subgrouping for a particular UE, as specified in TS 38.304 [24].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| LP-WUS CN Subgroup ID | M |  | INTEGER (0..30, …) |  |

* TP for TS 38.473 [R3-253256/HW]
* TP for TS 38.423 [R3-253233/Nokia]
* TP for TS 38.413 [R3-253255/HW]
* TP for TS 38.413 [R3-253739/ZTE] (1..31, ...)
* DCM: have a concern to capture it at this time because RAN1 now discusses among following alternatives which subgroup ID is used for common codepoint. In our understanding, 1/2/4 PO can be associated to one LO, and the common codepoint requires to reserve one subgroup ID **for each POs**, this means that up to 4 subgroup IDs would be reserved for the common codepoint.

Alt 1: (the last few codepoints are common codepoints)

Alt 2: (the codepoints for each PO are consecutive)

Alt 3: (PO index + subgroup index)

Also, RAN1 had following agreement in the last meeting.

**Agreement**

For Option 2, a common codepoint per PO is always used and the maximum number of subgroups supported per PO is

* **7 for the case where 4 POs are mapped to one LO**
* 15 for the case where 2 POs are mapped to one LO
* xxx
* **FFS on the range of *LP-WUS CN Subgroup ID* IE included in LP-WUSPS Assistance Information pending on RAN1 decision on which subgroup ID(s) would be reserved for common codepoint.**

## **Co-existence with eDRX**

Proposal 4: RAN3 can consider to have a stage 2 TP to capture that the eDRX and LP-WUS may be used together by the gNB for RAN paging and CN paging. No further RAN3 signalling impact is foreseen. [R3-253255/HW]

* RAN3 can consider to have a stage 2 TP to capture that the eDRX and LP-WUS may be used together by the gNB for RAN paging and CN paging.
* **FFS on whether to capture that the eDRX and LP-WUS may be used together by the gNB for RAN paging and CN paging.**

## **UE\_ID LP-WUS is allowed or not indication**

Proposal 2: RAN3 to discuss the scenario of CN indicating to NG-RAN whether UE-ID LPWUS should be allowed or not to prevent UE battery drain during LP-WUS monitoring and very long eDRX cycles. [R3-253746/Ericsson]

* RAN3 to acknowledge the issue on UE battery drain during LP-WUS monitoring and very long eDRX cycles.
* **The issue on UE battery drain during LP-WUS monitoring and very long eDRX cycles can be discussed based on companies’ contributions.**

Proposal 3: RAN3 to discuss whether the CN can indicate to RAN during Paging and NGAP context setup request that UE-ID based LP-WUS is not allowed (e.g. during an emergency PDU session). [R3-253457/Ericsson]

* RAN3 cannot accept paging delay because of LP-WUS during emergency PDU session is established and have a solution for this issue.
* FFS on how CN indicates to NG-RAN whether UE-ID LPWUS should be allowed or not.
* DCM: If both or either issue are/is acknowledged, we can have FFS on introduction of the indication. Otherwise, we will not have the FFS. For us, battery drain issue is very new so that currently we prefer to have more time to analyze it, but generally, having some function to control LP-WUS function from RAN. We are open to discuss emergency PDU session issue, but this issue was raised long ago and there is still no strong delay requirement from operators. If this issue is not captured, I suggest to agree “RAN3 concludes that the paging delay due to LP-WUS is acceptable in release 19”.

# Conclusions

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Agree to following LSs:

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