3GPP TSG-RAN WG3 #129 R3-255828

Bengaluru - India, 25 – 29 August 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

# Introduction

paging capability loss issue:

HW: whether the NG-RAN node can check with any UE Radio Capability paging feature is missing in the current work.

Nokia: similar views with HW. Check with SA2 solution first.

CMCC, E///: CMCC CR provides one solution.

HW: CMCC CR only refers to SA2 spec.

whether the NG-RAN node can check with any UE Radio Capability paging feature is missing in the current work.

Discuss VDF optimization solutions.

Draft the LS to SA2 on the above issue.

CATT: For some case, SA2 potential solution can not solve the issue totally.

ZTE: SA2 potential solution can not apply for RRC\_IDLE mode UE.

VDF: can not agree with ZTE.

**The range of CN based subgroup ID in NG/Xn/F1 message is 0.. 30.**

NTT: RAN3 understand that AMF consider no to use the common codepoint for different PO per LO as defined in 38.213 while assign the CN based subgroup ID.

**Further Extended UE Identity Index Value IE is used in case that LP-WUS is used regardless of the use of eDRX/PEI.**

**Further Extended UE Identity Index Value IE is sent with Extended UE Identity Index Value IE if sending node does not know receiving node’s capability of R19 IEs.**

CB: # LPWUS

- Check with the above issue and draft the LS(s) to SA2.

- capture the agreement in the TPs and check with CRs.

(moderator- NTT Docomo)

Summary of offline discussion in [R3-255828](Inbox\R3-255828.zip)

# For the Chairman’s Notes

[Paging capability loss issue]

* **The solution for missing UE capability for paging features will be introduced from rel 17 for initial context setup.**
* **The following may be captured in the reply LS sent in the next meeting: RAN3 note that the possibility of paging loss due to paging capability mismatch may still exist in case that paging message is sent to the gNB before paging capability mismatch resolution.**
* **RAN3 will agree corresponding CRs and reply LS in the next meeting based on the above, considering following aspects:**
  + **Whether the extension of the solution for Path Switch Request procedure and Handover Resource Allocation procedure is needed or not.**
  + **Whether the optimization for the solution proposed by Vodafone in R3-255529/R3-255530/R3-255531 is supported or not.**

[Assignment of CN based subgroup ID]

* LS to SA2 in R3-255880 [NTT Docomo]

[Last Used Cell]

* **The anchor gNB provides the new LP-WUS paging subgrouping assistance information IE into the Xn RAN paging message including CN assigned subgroup ID.**

[TPs to be agreed]

* TP to 38.413 in R3-255231 revised in R3-255879 [ZTE]
  + Include procedure text for FE UE\_ID.
* TP to 38.423 in R3-255220 revised in R3-255877 [Nokia]
  + Remove editor’s note.
* TP to 38.473 in R3-255238 revised in R3-255878 [Huawei]

# 2nd Round of Discussions

## Resolution of URCP mismatch and Paging loss issue

We had following conclusions during the offline discussion:

Question 1: Does the 1st CR (CMCC) resolve the paging capability mismatch issue on LP-WUS?

* **Conclusion: No.**

Question 2: Do we need to cover Path Switch and Handover Request?

* **Conclusion: No. (postpone)**

Question 3: Do we support the optimized solution proposed by VDF (3rd CR)?

* **Conclusion: to be continued**

Question 4: From which release are the CRs needed?

* **Conclusion: we will have CRs for URCP loss issue inside of the container from release 17 which are separate from the CRs from CMCC discussed in AI 8.1.**

Based on proposals from other companies, moderator would like to suggest following directions:

* Capture agreements on the common understanding of the way forward for paging loss issue.
* We will agree corresponding CRs and reply LS in the next meeting based on the agreements what we will have in this meeting, considering following aspects:
  + Whether the extension of the solution for Path Switch Request procedure and Handover Resource Allocation procedure is needed or not.
  + Whether the optimization for the solution proposed by Vodafone in R3-255529/R3-255530/R3-255531 is supported or not.

Proposed agreements:

* **The solution for missing UE capability for paging features will be introduced from rel 17 for initial context setup.**
* **The following may be captured in the reply LS sent in the next meeting: RAN3 note that the possibility of paging loss due to paging capability mismatch may still exist in case that paging message is sent to the gNB before paging capability mismatch resolution.**

**Conclusion: capture the agreement and have note above. RAN3 will agree the CRs and LS in the next meeting.**

Another related issue is whether we capture above note in 38.300.

TP to 38.300 from CATT: R3-255250

NOTE: Paging to the UE may be lost in case the UE moves from a gNB which does not support forwarding the Rel-17 PEI or Rel-19 LP-WUS radio paging capability to the AMF. It is up to the network implementation to avoid the issue. For example, a gNB supporting PEI or LP-WUS can check whether the UE Radio Capability for Paging IE contains the full content of paging related information included in the UE Radio Capability IE at reception of each NGAP INITIAL CONTEXT SETUP REQUEST message. If not, the gNB may determine a missing of radio paging capability and initiate a radio capability retrieving procedure to UE to update the UE radio capability for paging.

**Conclusion: postpone. This should be discussed with the CRs for 38.413.**

## Assignment of CN based subgroup ID

Moderator provided draft LS in the FTP server. Please find the file in following link:

<http://10.10.10.10/ftp/RAN/RAN3/Inbox/drafts/CB%20%23%20LPWUS/LS%20to%20SA2%20(CN%20based%20subgroup%20ID)>

Also, I provide example of the relationship between subgroup ID and codepoints:

In case 2 PO are mapped to one LO, subgroup #0 to #14 are available.

Here, each codepoint is used as follows:

* codepoint #0: [PO#0, subgroup#0]
* codepoint #1: [PO#0, subgroup#1]

…

* codepoint #14: [PO#0, subgroup#14]
* codepoint #15: [PO#0, common codepoint]
* codepoint #16: [PO#1, subgroup#0]
* codepoint #17: [PO#1, subgroup#1]

…

* codepoint #30: [PO#1, subgroup#14]
* codepoint #31: [PO#1, common codepoint]

Content:

Regarding the range of CN based subgroup ID for LP-WUS, RAN3 made the following agreements in RAN3#129 meeting:

**The range of CN based subgroup ID in NG/Xn/F1 message is 0.. 30.**

This agreement assumes that AMF allocates CN based subgroup ID considering the least range of subgroup ID available on the cells corresponding the AMF and reserved subgroup ID for common codepoint. For example, in case PO/LO can be 1, 2, or 4 on the cells corresponding to the AMF, it can use subgroup ID #0 to #6 for CN assigned subgroup IDs. In case PO/LO can be 1 or 2 but cannot be 4, the AMF can use subgroup ID #0 to 14.

RAN3 kindly ask SA2 to discuss whether and how to specify above mentioned AMF behavior in SA2 specifications.

Question 7: Is there any comment on the content of the LS?

* **Conclusion: Checked in the draft folder.**

## Xn interface/Last Used Cell Only

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| --- | --- |
| Company | Proposals from contributions |
| Nokia | Proposal 2: Turn the Working Assumption into agreement and remove the editor’s note concerning the presence of the LP-WUSPS Assistance Information IE in the XnAP RAN Paging message. |
| Huawei | Proposal 5: No further issue on the last used cell from RAN3 perspective (removing the editor’s note in XnAP BLCR). |
|  |  |

The WA we had in the past meeting is below:

**WA: the anchor gNB provides the new LP-WUS paging subgrouping assistance information IE into the Xn RAN paging message including CN assigned subgroup ID.**

Comments:

* TBD

**Conclusion:**

* **Turn the WA into agreement.**
* **Remove the editor’s note from XnAP TP**

## RRM relaxation/offloading configuration

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| --- | --- |
| Company | Proposals from contributions |
| Huawei | Proposal 3: There is no RAN3 impact on the RRM relaxation/offloading configuration. |
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Comments:

* TBD

**Conclusion:**

* **It is align with RAN3 understanding. No need to capture as an agreement.**

## LP-WUS and eDRX

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| --- | --- |
| Company | Proposals from contributions |
| Huawei | 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. |
| Qualcomm | Proposal 4: RAN3 to agree that LP-WUS and eDRX can be used together and there is no impact to RAN3 specifications to support LP-WUS and eDRX together. |
|  |  |

Comments:

* TBD

**Conclusion:**

* **Agree that LP-WUS and eDRX can be used together.**
* **No need to capture it in 38.300.**

## TPs

List of TPs

* TP to 38.413: ZTE [R3-255231]
* TP to 38.423: Nok [R3-255220]
* TP to 38.473: HW [R3-255238]
* ~~TP to 38.300: CATT [R3-255250]~~

**Comments:**

* **TP to 38.413 should include procedure text for FE UE\_ID.**

# 1st Round of Discussions

## Resolution of URCP mismatch

Regarding the solution proposed by SA2 in the incoming LS [R3-255026], RAN3 needs to discuss whether and how to specify the solution in RAN3 specifications.

There are three related CRs on the table, one from CMCC is discussed in AI8.1, it specifies how to resolve **the missed URCP for any RAT** which UE supports. On the other hand, for LP-WUS we should specify how to resolve **the missed URCP within the URCP for NR**. This is the difference among these CRs.

Some companies think 1st CR can also resolve the issue for LP-WUS (i.e. can resolve the mismatch within the URCP). Other companies think it cannot resolve the issue for LP-WUS.

Moderator’s view is that, 1st CR is for the case where hole URCP for some RAT is not included, but it does not work in case of LP-WUS. In case of LP-WUS, URCP for NR is already there, but LP-WUS capability is missing. 1st CR is not applicable for this case. Therefore, we need another procedure text. This principle is also applicable for CN Assistance Information IE mentioned in 1st CR.

1. The release 16 CR for 38.413 proposed by CMCC in AI 8.1: Inbox/drafts/CB # 3\_UEradioCapPaging

**Interactions with UE Radio Capability Info Indication procedure:**

If the *UE Radio Capability for Paging* IE is included in the INITIAL CONTEXT SETUP REQUEST message, which does not include UE radio capability for paging of all the NG-RAN RAT(s) that the UE supports, the NG-RAN node may (/shall, if supported) send the UE RADIO CAPABILITY INFO INDICATION message to the AMF containing the UE radio capability for paging of all the NG-RAN RAT(s) the UE supports in the serving PLMN.

1. The release 16 CR for 38.413 proposed by HW: R3-255653

**Interactions with UE Radio Capability Info Indication procedure:**

If the *UE Radio Capability for Paging* IE or the *UE Radio Capability for Paging* IE contained in the *Core Network Assistance Information for RRC INACTIVE* IE is included in the INITIAL CONTEXT SETUP REQUEST message, which does not include all UE radio capability for paging that the UE supports according to the received *UE Radio Capability* IE, the NG-RAN node shall, if supported, send the UE RADIO CAPABILITY INFO INDICATION message to the AMF including the *UE Radio Capability for Paging* IE which contains all supported UE radio capability for paging.

1. The release 17 CR for 38.413 proposed by VDF: R3-255529

**Interactions with UE Radio Capability Info Indication procedure:**

If the UE Radio Capability for Paging IE contained in INITIAL CONTEXT SETUP REQUEST message does not include *UE Radio Capability for Paging check status* IE set to *“*CheckedbygNBofRelease17”*,* the NG-RAN node shall, if supported, send the UE RADIO CAPABILITY INFO INDICATION message to the AMF including the UE Radio Capability for Paging IE containing all supported UE radio capabilities for paging and include the *UE Radio Capability for Paging check status* IE set to *“*CheckedbygNBofRelease17”.

Regarding above issue, moderator ask some companies following questions.

Question 1: Does the 1st CR resolve the paging capability mismatch issue on LP-WUS?

* VF, QC, CATT: No.
* CATT: do we need to check URCP for all RATs?
* VF: no.
* **Conclusion: No.**

Question 2: Do we need to cover Path Switch and Handover Request?

* Nok, ZTE: only Initial Context Setup
* QC: need to support HO cases
* HW: how can we reply to SA2?
* Nok: we do not need all cases in this meeting
* VF: it is needed, but ok to postpone
* **Conclusion: No. (postpone)**

Question 3: Do we support the optimized solution proposed by VDF (3rd CR)?

* TBD
* **Conclusion: to be continued**

Question 4: From which release are the CRs needed?

* VF: from R17. From R16 is also ok.
* Nok: from R17. No R16.
* QC: R17.
* CMCC:
* **Conclusion: we will have CRs for URCP loss issue inside of the container from release 17 which are separate from the CRs from CMCC discussed in AI 8.1.**

Question 5: Is there any necessary update on 2nd/3rd CR?

* TBD
* Conclusion:

## Paging loss issue

As explained during online session, even if RAN3 support URCP mismatch resolution, paging loss would be lost in some cases. In the LS from SA2, the mismatch resolution mechanism is proposed as a potential solution for the paging loss issue, and it can mitigate this issue. However, this issue is not completely resolved, therefore some implementation or deployment based solution is needed.

RAN3 needs to send reply LS to SA2. From moderator perspective, either draft LS can be a baseline.

1. Draft LS proposed by Ericsson [R3-255567]

RAN3 thanks SA2 for their LS response.

RAN3 would like to inform SA2, as they may have already noticed from the ongoing LS exchange in R3-255025/S2-2506082 between SA2 and RAN3, that RAN3 has agreed to capture in NGAP since Rel-16 the description where an NG-RAN node shall, if supported, verify and provide the UE Radio Capability for Paging as a single IE if it found out that the received UE Radio Capability for Paging from AMF during Initial Context Request Setup does not include the necessary paging information for a function to work properly.

RAN3 considers that this standardization solution can address the concern of operators in SA2 to enable mixed deployments in case the network implementation solution, e.g., relying on homogeneous gNB support forwarding the new UE capabilities, is not sufficient.

1. Draft LS proposed by VDF [R3-255528]

RAN3 thanks SA2 for providing a potential solution for the paging capability loss issue. RAN3 further discussed and agreed an efficient solution to resolve any mismatch between UE Radio Access Capabilities and UE Radio Capability for Paging (see attached CR).

RAN3 note that the possibility of paging loss due to omitted paging capabilities may still exist in certain very limited scenarios. Specifically, if a UE initially attaches to an old e.g. Release 15 gNB and subsequently reselects in idle mode to a new Release 19 gNB (that is within the TAI list allocated to the UE by the AMF) then, prior to initiating any RRC connection to a new gNB, the issue of missing capabilities may arise.

Note: The entire reason to define capability for paging is to avoid sending the entire RAC inside paging message.

Nevertheless, RAN3 considers this a marginal issue, given that most modern devices frequently initiate mobile-originated connections (e.g., heartbeat messages). Once such a connection is established, the capability exchange occurs, effectively resolving the issue as per the enhancements outlined above.

1. Draft LS proposed by ZTE [R3-255230]

RAN3 thanks SA2 and RAN2 for the discussion of the paging capability loss issue.

In the latest LS, SA2 state that:

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| SA2 are investigating whether a solution that builds on the current process in TS 23.501 clause 5.4.4.3 for handling UEs that support both “LTE connected to 5GC” and NR can be used to solve the problem.  For example, when (as already specified) the UE Radio Capability for Paging is sent in the NGAP Initial UE Context Setup Request to the gNB, the gNB could use the UE Radio Access Capabilities (received in the same message) to check that the UE Radio Capability for Paging contains the full information on paging related features. If the gNB detects an omission, then the gNB should ensure that an update of the UE Radio Capability for Paging Information is sent to the AMF. |

RAN3 understands that the solution proposed by SA2 requires the UE being triggered to access to a new gNB who is able to transfer the paging capability to the core network when UE moves from an old gNB to a new gNB. This introduces a new UE access trigger. RAN/SA may need to evaluate whether to support this trigger, as it could entail significant specification impacts.

RAN3 think there is not a good solution to solve the paging capability missing issue and prefer to stick to RAN2’s previous agreement that rely on network implementation. For example, if a tracking area contains any gNBs from Release 16 or earlier, LP-WUS cannot be configured in any gNB within that tracking area.

If question 1 is yes, 1st one should be a baseline, otherwise, 2nd one should be a baseline. We can work on the reply LS based on either in offline.

Question 6: Is there any comment on the content of the LS?

* TBD
* Conclusion:

Regarding this issue, Nokia and CATT provided TP to capture the paging loss issue in TS 38.300. Moderator also agree to capture it.

TP to 38.300 from CATT: R3-255250

NOTE: Paging to the UE may be lost in case the UE moves from a gNB which does not support forwarding the Rel-17 PEI or Rel-19 LP-WUS radio paging capability to the AMF. It is up to the network implementation to avoid the issue. For example, a gNB supporting PEI or LP-WUS can check whether the UE Radio Capability for Paging IE contains the full content of paging related information included in the UE Radio Capability IE at reception of each NGAP INITIAL CONTEXT SETUP REQUEST message. If not, the gNB may determine a missing of radio paging capability and initiate a radio capability retrieving procedure to UE to update the UE radio capability for paging.

## Assignment of CN based subgroup ID

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Also, I provide example of the relationship between subgroup ID and codepoints:

In case 2 PO are mapped to one LO, subgroup #0 to #14 are available.

Here, each codepoint is used as follows:

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* codepoint #14: [PO#0, subgroup#14]
* codepoint #15: [PO#0, common codepoint]
* codepoint #16: [PO#1, subgroup#0]
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* codepoint #30: [PO#1, subgroup#14]
* codepoint #31: [PO#1, common codepoint]

Content:

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This agreement assumes that AMF allocates CN based subgroup ID considering the least range of subgroup ID available on the cells corresponding the AMF and reserved subgroup ID for common codepoint. For example, in case PO/LO can be 1, 2, or 4 on the cells corresponding to the AMF, it can use subgroup ID #0 to #6 for CN assigned subgroup IDs. In case PO/LO can be 1 or 2 but cannot be 4, the AMF can use subgroup ID #0 to 14.

RAN3 kindly ask SA2 to discuss whether and how to specify above mentioned AMF behavior in SA2 specifications.

Question 7: Is there any comment on the content of the LS?

* TBD
* Conclusion:

## Xn interface/Last Used Cell Only

|  |  |
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| Company | Proposals from contributions |
| Nokia | Proposal 2: Turn the Working Assumption into agreement and remove the editor’s note concerning the presence of the LP-WUSPS Assistance Information IE in the XnAP RAN Paging message. |
| Huawei | Proposal 5: No further issue on the last used cell from RAN3 perspective (removing the editor’s note in XnAP BLCR). |
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Comments:

* TBD

Conclusion:

* TBD

## RRM relaxation/offloading configuration

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| --- | --- |
| Company | Proposals from contributions |
| Huawei | Proposal 3: There is no RAN3 impact on the RRM relaxation/offloading configuration. |
|  |  |

Comments:

* TBD

Conclusion:

* TBD

## LP-WUS and eDRX

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| Company | Proposals from contributions |
| Huawei | 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. |
| Qualcomm | Proposal 4: RAN3 to agree that LP-WUS and eDRX can be used together and there is no impact to RAN3 specifications to support LP-WUS and eDRX together. |
|  |  |

Comments:

* TBD

Conclusion:

* TBD

## TPs

List of TPs

* TP to 38.413: ZTE [R3-255231]
* TP to 38.423: Nok [R3-255220]
* TP to 38.473: HW [R3-255238]
* ~~TP to 38.300: CATT [R3-255250]~~

Comments:

* TBD

# Conclusions

TBD

# References

1. TBD