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Document for: Discussion and Decision

# Introduction

In this document, the summary of all the contributions submitted to 7.13.7 agenda item (SON/MDT enhancements for Non-Public Networks) of RAN2#123 meeting as in [1-10] will be presented. Taking the company proposals into account, the 3rd section provides sets of proposals for easy agreement, as well as for further discussions.

# Discussion

## RLF/HOF report enhancement for NPN

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307286 | Nokia, Nokia Shanghai Bell | **Proposal 1.1: No PNI-NPN (CAG ID) should be added to the RLF/HOF reports.****Proposal 1.3: An indication of the UE CAG subscription statues (if the UE has subscription with any of the CAG IDs broadcast by the cell, and whether the UE only allowed to access CAG cells) should be added to the RLF/HOF reports.** |
| R2-2307409 | Xiaomi | **Proposal 1: RAN2 agrees to introduce the CAG ID into the RLF/HOF report.****Proposal 2: Introduce one NID into the RLF report which is applied for multiple IEs, i.e. previousPCellId-r16, failedPCellId-r16, reconnectCellId-r16, reestablishmentCellId-r16.** |
| R2-2307431 | vivo | **Proposal 3: UE includes the registered SNPN (i.e., PLMN ID and NID) in rlf-Report in VarRLF-Report.****Proposal 4: UE includes the allowed CAG list and CAG-only indication (if configured) in rlf-Report in VarRLF-Report.** |
| R2-2307710 | CATT | **Proposal 6: Included PNI-NPN IDs (e.g. cag-IDs) into the RLF/HOF Report of the failed cell and the previous Pcell, respectively.****Proposal 7: Included UE's allowed CAG list at the time of RLF/HOF occurring into the RLF/HOF Report.** |
| R2-2308245 | Samsung | **Proposal 1: RAN2 to decide not to report NID to the network in RLF report, unless clear benefits are seen.** |
| R2-2308627 | Huawei, HiSilicon | **Proposal 1: No need to introduce PNI-NPN ID (e.g., CAG ID) in to RLF report.****Proposal 2: Introduce NID information related IE with reserved extension for both IE failedPCellId and previousPCellId.** |

**Rapporteur Summary:**

*For PNI-NPN ID in RLF report*

2 companies of Xiaomi and CATT support to introduce the PNI-NPN ID (e.g. CAG ID) into the RLF/HOF report; 2 companies of Nokia and Huawei do not support to include it.

**Proposal 1: RAN2 to discuss whether to include PNI-NPN ID (e.g. CAG ID) in the RLF/HOF report.**

3 companies of Nokia, vivo and CATT support to include the information about UE CAG subscription information (e.g. CAG subscription statues indication, allowed CAG list or CAG-only indication) in RLF/HOF reports.

**Proposal 2: RAN2 to discuss whether and which to include UE CAG subscription information in the RLF/HOF report:**

* **CAG subscription statues indication;**
* **Allowed CAG list;**
* **CAG-only indication.**

*For SNPN ID in RLF report*

It has been agreed in RAN2#120 meeting that “Introduce SPNP ID (e.g., NID) to RLF/HOF report. Details of how to introduce it are FFS”.

2 companies of Xiaomi and Huawei support only to introduce NID into the RLF report for multiple IEs (e.g. previousPCellId-r16, failedPCellId-r16, reconnectCellId-r16, reestablishmentCellId-r16);

1 company of vivo supports to introduce PLMN ID and NID into variable VarRLF-Report;

1 company of Samsung does not support to report NID in RLF report unless clear benefits are seen.

**Proposal 3: RAN2 to confirm whether only to include nid in the RLF/HOF report to apply for multiple legacy fields (e.g. failedPCellId, previousPCellId, etc.).**

## Logged MDT enhancement for NPN

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307286 | Nokia, Nokia Shanghai Bell | **Proposal 1.2: No PNI-NPN (CAG ID) should be added to the logged MDT reports.****Proposal 1.4: An indication of the UE CAG subscription statues (if the UE has subscription with any of the CAG IDs broadcast by the cell, and whether the UE only allowed to access CAG cells) should be added to the logged MDT reports.****Proposal 2.1: Include the SNPN ID (PLMN ID and NID) into the logged MDT report.** **Proposal 2.2: Include the SNPN ID (PLMN ID and NID) into logged MDT configuration.** |
| R2-2307409 | Xiaomi | **Proposal 3: No need to introduce the SNPN ID (e.g. NID) into logged MDT area configuration.****Proposal 4: No need to introduce the SNPN ID (e.g. NID) into logged MDT report.****Proposal 5: RAN2 agrees to introduce the CAG ID into the logged MDT report.** |
| R2-2307431 | vivo | **Proposal 5: SNPN ID is not needed to be introduced for MDT area scope in the logged MDT configuration. UE in SNPN access mode stores registered SNPN in VarLogMeasReport upon receiving LoggedMeasurementConfiguration, and a new IE similar to plmn-IdentityList should be introduced for storing registered SNPN in VarLogMeasReport.** |
| R2-2307710 | CATT | **Proposal 1: RAN2 should include the 3 cases of PNI-NPN only/PN only/ both PN and PNI-NPN in the MDT area scope, and a critical extension (i.e. AreaConfiguration-r18) can be considered in R18.****Proposal 2: Introduce the definition of MDT SNPN list, and add a NOTE to clarify that “MDT SNPN list can only include one SNPN ID in this Release”.** **Proposal 3: Only the UE registered in SNPN can be configured with this SNPN related logged MDT, and the UE can continue logging across the MDT SNPN list.****Proposal 4: The solution of adding the SNPN ID in the area scope configuration should align with the RAN3 BLCR.****Proposal 5: Do not add NPN ID related information (e.g. NID/CAG-ID) or cell type (e.g. NPN cell indicator) into the logged MDT report.** |
| R2-2307798 | ZTE Corporation, Sanechips | **Proposal 1: For logged MDT, UE stores SNPN ID/CAG ID(s) in logged MDT report.****Proposal 2: CGI-Info-Logging is enhanced to allow logging NPN identity info included in npn-IdentityInfoList of SIB1.****Proposal 3: SNPN Identity (e.g., NID) is included into the areaScope configuration for SNPN** |
| R2-2308245 | Samsung | **Proposal 1a: There is no need to report NID in logged measurement report.****Proposal 2: CAG/ cell type information is not included in RLF report or logged measurement report.** |
| R2-2308426 | Ericsson | **Proposal 9 RAN2 to enhance the logged MDT report with cell type indication (e.g., NPN cell) as part of the measurement results.****Proposal 10 UE in anyCellSelection state logs cell identity and measurements of the last suitable cell if the CAG identities broadcasted by the cell is part of the CAGConfigList received in LoggedMeasurementConfiguration.****Proposal 11 RAN2 to enhance the MDT configuration (interFreqTargetInfo) to enable logging only NPN or PN cells per frequency.****Proposal 12 RAN2 to enhance the MDT area configuration with the list of SNPN identities as agreed in RAN3.** |
| R2-2308627 | Huawei, HiSilicon | **Proposal 3: RAN2 to follow RAN3 discussion and include SNPN ID in the logged MDT area configuration.** |

**Rapporteur Summary:**

*For SNPN ID in Logged MDT Configuration*

2 companies of Xiaomi and vivo do not support to introduce the SNPN ID into the logged MDT area configuration;

5 companies of Nokia, CATT, ZTE, Ericsson, and Huawei support to introduce the SNPN ID to align with RAN3’s progress to align with the future NPN evolution.

It is supported by RAN3 to support separate SNPN Cell Based MDT and SNPN TAI Based MDT area scope. Most companies support to include the SNPN ID (list) into the logged MDT configuration following RAN3 agreement.

**Proposal 4: Include SNPN ID (list) in the** **logged MDT area configuration following RAN3 agreement to align with the future NPN evolution.**

Furthermore, CATT proposes to consider equivalent SNPN list which has been agreed in R18 eNPN item, and limit to one SNPN ID in this Release. This issue has relationship with the above proposal 4. So if the above proposal 4 can be agreed:

**Proposal 5: For the SNPN ID (list) in the** **logged MDT area configuration, limit to one SNPN ID in Release18.**

*For PNI-NPN ID in Logged MDT Configuration*

For the already agreed CAG ID(s) in the logged MDT area configuration, CATT proposes to use a critical extension (i.e. AreaConfiguration-r18) to include all of configuring PNI-NPN only/PN only/ both cases in RAN3 BLCR to TS 38.413 (R3-233470).

**Proposal 6: RAN2 to discuss whether to use a critical extension (i.e. AreaConfiguration-r18) to include all of configuring PNI-NPN only/PN only/ both cases to align with RAN3 BLCR.**

*For SNPN ID in Logged MDT Report*

3 companies of Xiaomi, CATT and Samsung do not support to introduce the SNPN ID into the logged MDT report; 2 companies of Nokia and ZTE support to introduce the SNPN ID into the logged MDT report.

*For PNI-NPN ID in Logged MDT Report*

3 companies of Nokia, CATT and Samsung do not support to introduce the CAG ID(s) into the logged MDT report; 2 companies of Xiaomi and ZTE support to introduce the CAG ID(s) into the logged MDT report.

Considering that the number of companies supporting carrying NPN IDs is similar to the number not supporting it, Rapporteur suggests:

**Proposal 7: RAN2 to discuss whether to include the SNPN ID/CAG ID(s) in the** **logged MDT report.**

*Other information for configuration*

**Neighboring cell NPN/PN type indication**: Ericsson proposes to enhance the MDT configuration (interFreqTargetInfo) to enable logging only NPN or PN neighboring cells per frequency.

*Other information for report*

**Indication of the UE CAG subscription statues**: Nokia proposes to include an indication of the UE CAG subscription statues in Logged MDT Report.

**Cell type indication**: Ericsson proposes to enhance the logged MDT configuration and the report with cell type indication (e.g., NPN cell); CATT, Samsung do not support to introduce the cell type information into the logged MDT report

**Last suitable cell information**: Ericsson proposes UE in anyCellSelection state logs cell identity and measurements of the last suitable cell if the CAG identities broadcasted by the cell is part of the CAGConfigList received in LoggedMeasurementConfiguration.

Rapporteur thinks these issues can be discussed together with above ones.

## Co-existence of NPN and PNs

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307286 | Nokia, Nokia Shanghai Bell | **Proposal 3.1: Not to introduce new NPN specific variables for PNI-NPNs.****Proposal 3.2: Introduce a new SNPN specific variable for logged MDT. FFS if the introduction of any storage limitation is needed.****Proposal 3.3: Send a reply LS to RAN3 LS (R3-232118 that RAN2 agreed to introduce a new SNPN specific variable for logged MDT, which enables keeping the logged MDT reports when the UE moves from one network type to another network type. (See draft reply LS in the Annex.)** |
| R2-2307409 | Xiaomi | **Proposal 6: No need to introduce the new NPN specific variables for PNI-NPNs and SNPNs.** |
| R2-2307410 | Xiaomi | **Proposal 1: The motivation to have the enhancement for logged MDT report for the mobility between the SNPN and PLMN upon deregistration needs to be further clarified by RAN3. Otherwise, it can also be left to network implementation.****Proposal 2: RAN2 considers the draft LS reply to RAN3 in the annex.** |
| R2-2307431 | vivo | **Proposal 6: Reply LS to RAN3 to inform that RAN2 will not discuss and specify any enhancement to avoid the loss of stored logged MDT reports upon moving from a network of one type to another type.** |
| R2-2307710 | CATT | **Proposal 10: Do not introduce separate SON/MDT related UE variable(s) for SNPN or for PNI-NPN.****Proposals 11: The current UE variable structure can be enhanced with some SNPN/PNI-NPN specific parameters.****Proposal 12: RAN2 does not enhance the continuous logged MDT recording between PN and SNPN networks, and send RAN2 decision to RAN3.** |
| R2-2307798 | ZTE Corporation, Sanechips | **Proposal 6: RAN2 further discuss solutions to avoid the loss of stored logged MDT reports upon moving from a network of one type to another type with considerations on logged MDT types, memory size and specs impact.** |
| R2-2308245 | Samsung | **Proposal 3: Common report is used for PN and PNI-NPN.****Proposal 4: Keep the existing principle that UE releases any logged MDT report after deregistration for NPN.** |
| R2-2308426 | Ericsson | **Proposal 3 Upon moving to SNPN (and deregistration in PN) UE stores logged MDT report collected in PN in a separate variable, and releases the MDT configuration received in PN.****Proposal 4 RAN2 to agree on the draft LS reply in the Annex****Proposal 5 RAN2 discuss whether to consider additional memory (e.g., additional 64KB) for co-existence of PN and SNPN MDT measurement results.** |

**Rapporteur Summary:**

For PNI-NPN:

5 companies of Xiaomi, vivo, CATT, Samsung and Nokia do not support to introduce separate UE variables for PNI-NPNs.

No company supports to introduce separate UE variables for PNI-NPNs.

Considering all companies providing document do not support to introduce UE variables for PNI-NPNs, the Rapporteur suggests no new UE variables will be introduced for PNI-NPN.

**Proposal 8: No new UE variables will be introduced for PNI-NPNs.**

For SNPN:

4 companies of Xiaomi, vivo, CATT and Samsung do not support to introduce separate UE variables for SNPNs.

2 companies of Nokia and Ericsson support to introduce a new SNPN specific variable for logged MDT, based on the request by RAN3 LS;

1 company of ZTE suggests further discussion on this issue.

This issue is related to LS from R3. According to RAN3’s LS, RAN3 would like to check with RAN2 if there are any solutions to avoid the loss of stored logged MDT reports upon moving from a network of one type to another type, even upon deregistration. The Rapporteur thinks we can discuss whether and how to address the loss issue of logged MDT report when UE switches between SNPN and PN and then send our decision to RAN3.

**Proposal 9: RAN2 to discuss whether and how to address the loss issue of logged MDT report when UE switches between SNPN and PN and then send RAN2 decision to RAN3.**

* **Option 1: Introducing new variables for SNPNs;**
* **Option 2: Storing only the collected MDT measurements report (UE deletes the MDT configuration as legacy);**
* **Option 3：No enhancement is needed;**

## Other aspects

***SNPN ID double checking***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307431 | vivo | **Proposal 1: SNPN ID checking is needed before transmitting the information for the corresponding SON and MDT reports.****Proposal 2a: The following steps can be adopted for SNPN ID checking for RLF report:*** **UE stores registered SNPN (i.e, PLMN ID and NID) when determining the content in the *VarRLF-Report*; a new IE similar to *plmn-IdentityList* should be introduced for storing registered SNPN in *VarRLF-Report*.**
* **If the registered SNPN is the same as the stored SNPN in *VarRLF-Report* and if the UE has radio link failure or handover failure information available in *VarRLF-Report*, UE shall include the available indication of RLF report in the RRC Complete message;**
* **If the registered SNPN is the same as the stored SNPN in *VarRLF-Report*, UE reports RLF-report upon the network requests for it.**

**Proposal 2b: The following steps can be adopted for SNPN ID checking for logged MDT report:*** **UE stores registered SNPN (i.e, PLMN ID and NID) when receiving *LoggedMeasurementConfiguration*; a new IE similar to *plmn-IdentityList* should be introduced for storing registered SNPN in *VarLogMeasReport*.**
* **If the registered SNPN is the same as the stored SNPN in *VarLogMeasReport* and if the UE has logged measurements available for NR, UE shall include the available indication of logged measurements in the RRC Complete message;**
* **If the registered SNPN is the same as the stored SNPN in *VarLogMeasReport*, UE reports logged measurement report upon the network requests for it.**
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***OOC indication***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307409 | Xiaomi | **Proposal 7: UE access mode (e.g. SNPN access mode or with CAG-only indication) can be reported to network for the OOC analysis.** |
| R2-2307798 | ZTE Corporation, Sanechips | **Proposal 4: Support logging of OOC instance in logged MDT for NPN in R18.** **Proposal 5: Support further differentiation OOC cause (e.g., whether due to weak coverage or due to cell being barred) when logging any cell selection state in NPN MDT results.**  |
| R2-2307826 | Apple | **Proposal 1: to address the NPN OOC issue with relevant SON enhancements.** **Proposal 2: to extend the RLF-Report to cover NPN OOC scenario.****Proposal 3: upon T311 timer expiry, if the UE found a cell which would otherwise be suitable, but is not considered so due to NPN restrictions, the UE sets in VarRLF-Report the information about that cell.** |
| R2-2308426 | Ericsson | **Proposal 6 RAN2 discuss to log an SNPN out-of-coverage (OoC) indication either in****a. an RA report, or****b. a CEF report, or****c. a new report.** |

***Other use cases enhancement for NPN***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2307286 | Nokia, Nokia Shanghai Bell | **Proposal 2.3: Include the SNPN ID (PLMN ID and NID) into the VarConnEstFailReport and the UE shall check the stored SNPN ID before sending the availability indication of CEF report(s) to the SNPN.** |
| R2-2307710 | CATT | **Proposal 8: Report the NPN related information to the TCE together with the L2 measurement, e.g. throughput or data volume measurement.****Proposal 9: NPN enhancements for other SON related use cases (e.g. SHR, MHI) can be further studied after the enhancement to RLF/HOF report and logged MDT are identified.** |
| R2-2308426 | Ericsson | **Proposal 1 UE checks if NID of the current SNPN matches the SNPN of the previously logged RA reports****a. Before logging a new RA report****b. Before transmitting a RA report to the network.****Proposal 2 UE logs NID in the RA report.****Proposal 7 UE logs time spent in the SNPN network in an entry in the existing PN MHI report.****Proposal 8 UE performs PLMN check before transmitting MHI report to network.** |

**Rapporteur Summary:**

vivo suggests the SNPN ID checking is also needed before transmitting the corresponding report, besides the checking before sending the availability indication for SON and MDT report. Because that's how legacy UE behavior is for PLMN checking, Rapporteur thinks for NPN checking, the similar UE behavior should be performed.

**Proposal 10: UE performs SNPN ID checking before transmitting the information for corresponding SON and MDT reports, upon the network requests for it.**

Xiaomi, ZTE, Apple and Ericsson propose to consider some information reporting for SON/MDT out-of-coverage analysis, e.g. UE access mode, OOC cause, SNPN OOC indication;

Nokia, CATT and Ericsson propose to consider other SON/MDT enhancements for NPN, e.g. CEF, L2 measurement, RA-Report, MHI.

**Proposal 11: RAN2 to discuss:**

* **Whether and how to introduce information reporting for OOC analysis involving NPN network;**
* **Whether and which to introduce other SON/MDT enhancements for NPN in this Release.**

# Conclusion

Based on summary of [1-10], following proposals are made for further discussion, and some proposals are only discussed under certain conditions.

**For easy agreement**

*For Logged MDT*

**Proposal 4: Include SNPN ID (list) in the** **logged MDT area configuration following RAN3 agreement to align with the future NPN evolution.**

**Proposal 5: For the SNPN ID (list) in the** **logged MDT area configuration, limit to one SNPN ID in Release18.**

*Co-existence of NPN and PNs*

**Proposal 8: No new UE variables will be introduced for PNI-NPNs.**

*For others*

**Proposal 10: UE performs SNPN ID checking before transmitting the information for corresponding SON and MDT reports, upon the network requests for it.**

**For online discussion**

*For RLF/HOF report*

**Proposal 1: RAN2 to discuss whether to include PNI-NPN ID (e.g. CAG ID) in the RLF/HOF report.**

**Proposal 2: RAN2 to discuss whether and which to include UE CAG subscription information in the RLF/HOF report:**

* **CAG subscription statues indication;**
* **Allowed CAG list;**
* **CAG-only indication.**

**Proposal 3: RAN2 to confirm whether only to include nid in the RLF/HOF report to apply for multiple legacy fields (e.g. failedPCellId, previousPCellId, etc.).**

*For Logged MDT*

**Proposal 6: RAN2 to discuss whether to use a critical extension (i.e. AreaConfiguration-r18) to include all of configuring PNI-NPN only/PN only/ both cases to align with RAN3 BLCR.**

**Proposal 7: RAN2 to discuss whether to include the SNPN ID/CAG ID(s) in the** **logged MDT report.**

*For Co-existence of NPN and PNs*

**Proposal 9: RAN2 to discuss whether and how to address the loss issue of logged MDT report when UE switches between SNPN and PN and then send RAN2 decision to RAN3.**

* **Option 1: Introducing new variables for SNPNs;**
* **Option 2: Storing only the collected MDT measurements report (UE deletes the MDT configuration as legacy);**
* **Option 3：No enhancement is needed;**

**Discussed if time allows**

**Proposal 11: RAN2 to discuss:**

* **Whether and how to introduce information reporting for OOC analysis involving NPN network;**
* **Whether and which to introduce other SON/MDT enhancements for NPN in this Release.**

# Reference

1. R2-2307286 Discussion on open NPN issues in SON/MDT Nokia, Nokia Shanghai Bell
2. R2-2307409 Discussion on the SONMDT enhancement for NPN Beijing Xiaomi Software Tech
3. R2-2307410 Discussion on the “LS on potential override of logged MDT reports upon moving from SNPN to PLMN” from RAN3 (R3-232118) Beijing Xiaomi Software Tech
4. R2-2307431 Discussion on SON enhancements for NPN vivo
5. R2-2307710 SON and MDT Enhancement for NPN CATT
6. R2-2307798 Discussion on SON-MDT support for NPN ZTE Corporation, Sanechips
7. R2-2307826 Out-of-coverage in NPN Apple
8. R2-2308245 SON/MDT enhancements for NPN Samsung
9. R2-2308426 SON Support for NPN Ericsson
10. R2-2308627 Discussion on SONMDT enhancements for NPN Huawei, HiSilicon