3GPP TSG-RAN WG3 #128 R3-253790

Malta, MT, 19th – 23rd , May, 2025

Agenda Item: 12.2

Source: NTTDOCOMO (moderator)

Title: Summary of Offline Discussion on additional topological enhancement

Document for: Approval

# For chair notes

 XXXX

# Introduction

This document provides a summary of the offline discussion on additional topological enhancements.

**CB: # Femto**

**- Discuss and converge on text for the stage 2 TP capturing security level verifications in RAN3**

**- If viable, discuss on security indication in NG: Initial UE Message**

**- Generate a TP on terminology and rapporteur corrections**

**- Converge on an LS reply to SA3**

**- Discuss remaining issues highlighted in rapporteur summary**

(moderator - DoCoMo)

# Discussion

## Security aspects TP (TS 38.300)

Agree to capture security aspects confirmed by SA3 in a TP to the BLCR to TS38.300

To be continued: discuss and converge on the text for a TP to the BLCR to TS38.300

4.X.2.2 NR Femto GW

The NR Femto GW hosts the following functions:

- Relaying UE-associated NGAP messages between the AMF and the NR Femto serving the UE, applying the following additional functions:

- Terminating the UE Context Release request procedure if an explicit GW Context Release Indication is included. In this case, the NR Femto GW releases the UE context if it determines that the UE identified by the received UE NGAP IDs is no longer served by another NR Femto attached to it.

- At UE context establishment (Initial Context Setup or NG Handover) the NR Femto GW sends to the NR Femto the serving AMF’s GUAMI as well as the AMF UE NGAP ID assigned by the AMF and the AMF UE NGAP ID assigned by the NR Femto GW for the UE.

- At Path Switch, the NR Femto GW sends to the NR Femto the AMF UE NGAP ID assigned by the AMF and the AMF UE NGAP ID assigned by the NR Femto GW for the UE.

- At Initial connection establishment (Initial UE Message, NG Handover, Path Switch) the NR Femto GW verifies, as defined in TS 33.545 [xx], that the reported CAG ID is valid for the indicated NR Femto cell.

- Terminating non-UE associated NGAP procedures towards the NR Femto and towards the AMF, applying the following additional functions:

- At NG Setup, the NR Femto GW verifies, as defined in TS 33.545 [xx], that the identity used by the NR Femto is valid.

- In case of NG PWS Restart Indication and PWS Failure Indication, the NR Femto GW verifies, as defined in TS 33.545 [xx], that the indicated cell identity is valid and replaces the gNB ID of the NR Femto with the NR Femto GW ID before sending the respective message to the AMF.

- At Overload Start/Stop, the NR Femto GW should provide the NR Femto with the identities of the affected AMF node(s). The NR Femto uses the received information to identify the traffic and the AMF to which the overload indication applies. The NR Femto shall apply the defined rejections until reception of an OVERLOAD STOP message applicable to this traffic, or until the NR Femto receives a further OVERLOAD START message applicable to the same traffic, in which case it shall replace the ongoing overload action with the newly requested one.

- Supporting TAC and PLMN ID used by the NR Femto.

- Relaying the PATH SWITCH REQUEST message towards the AMF indicated by the GUAMI of the source AMF received from the NR Femto.

4.X.2.3 AMF

In addition to functions specified in clauses 4.1 and 16.7, the AMF hosts the following functions:

- Routing of handover messages and Downlink RAN Configuration Transfer message towards NR Femto GWs based on the Selected TAI contained in these messages.

- In case of an NR Femto directly connected to AMF:

- At NG Setup, verifying, as defined in TS 33.545 [xx], that the identity used by the NR Femto is valid;

- At Initial connection establishment (Initial UE Message, NG Handover, Path Switch), verifying, as defined in TS 33.545 [xx], that the reported CAG ID is valid for the indicated NR Femto cell;

- At NG PWS Restart Indication and PWS Failure Indication, verifying, as defined in TS 33.545 [xx], that the indicated cell identity is valid.

A TAI used in a NR Femto GW shall not be reused in another NR Femto GW.

## Reply LS to SA3

Agree to send a reply LS to SA3. Detailed LS text to be discussed and converged upon

Base LS on R3-253566

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**1. Overall Description:**

RAN3 thanks SA3 for their LS on security verification related to NR Femtos.

RAN noticed SA3’s assumption of CAG ID verification being located at the NR Femto GW, if deployed. According to PNI-NPN functionality specified in Rel-16, such verification is always performed at the AMF and RAN3 does not foresee to change this functional split.

RAN3 also noticed that the normative text agreed by SA3 in S3-251699 refers to “Femtos operating in closed access mode” (2 instances), and would like to point out the following:

* NR Femtos reuse already specified PNI-NPN functionality (Secs. 4.6, 4.8 and 16.7.4 of TS 38.300), without modification. RAN3 agreed not to introduce new definitions for access control in NR Femtos in normative text; hence, no definition of “closed access mode” is expected to be added to TS 38.300.
* Furthermore, an NR Femto may have more than one cell.

For this reason, RAN3 suggests to SA3 to consider amending the agreed text in S3-251699 (e.g. changing “Femtos operating in closed access mode” to e.g. “Femtos with NPN-only cell(s)” seems better aligned toward Stage 2 text endorsed by RAN3 (see Sec. 4.x.4 of R3-253076, endorsed BL CR to TS 38.300).

**2. Actions:**

**To SA3 group.**

**ACTION:** RAN3 asks SA3 group to take the above into account, and to consider amending their agreed text according to the above.

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## Naming of Requested S-NSSAI IE

**Proposal 9: RAN3 to discuss the following proposal. (R3-253346)**

RAN3 to replace the term “requested S-NSSAI” with “requested S-NSSAI list” in the BL CR to TS 38.413.

## IP version selection

**Proposal 6: RAN3 to discuss the following proposal for IP version selection.**

**Option1: avoid the IP version selection for UP at NR femto GW. (R3-253346)**

Option2: When NR Femto GW is deployed, the Femto GW may perform IP version selection for NG-U transport by implementation. No stage 3 impact. (R3-253741)

## Mobility issue

**Proposal 8: RAN3 to discuss the following proposal.(R3-253225)**

Enhance TS 38.413 to inform gNB of CAG time validity before it expires in order to enable handovers before CAG expiry.

**Proposal 1: For the routing of HANDOVER REQUEST message from target NR Femto GW to correct target Femto node in case of NG-based HO, the AMF includes the information about target gNB (e.g., global gNB ID) in the HANDOVER REQUEST message before sending it to the target NR Femto GW. （R3-253346）**

## Specific Femto indication in the NG

To be further discussed: whether to send a specific Femto indication in the NG: Initial UE message, from NR Femto to enable control of sending Allowed PNI NPN List or not.

# References

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| **12.3. 5G Femto** **QUOTA: 2***The objectives of the 5G Femto work are as follows:* * *Specification to support NR Femto architecture with optional NR Femto GW for NG interface [RAN3].*
* *Specification to support access control for NR Femtos operating in open, hybrid and closed modes reusing existing CAG functionality [RAN3].*

*NOTE 10: For NR Femto access control, only stage 2 impact is expected on this objective.**NOTE 11: Coordination with other WGs (e.g. SA2, SA3) when needed.**For NR Femto, the NG-C interface is defined as the interface:**- Between the NR Femto GW and the Core Network;**- Between the NR Femto and the NR Femto GW;**- Between the NR Femto and the Core Network;**An NR Femto may serve more than one cell.**NG-U is defined as specified in clause 4.3.1.1 regardless of whether it is concentrated in the NR Femto GW.* *In case of user plane transport concentration at the Femto GW, the Femto GW takes the role described in Option 3 (routing at the IP).* *TS 38.300 captures reference to the specification section describing NG control plane stack for NR Femto without NR Femto GW.**In cases of NR Femto connecting to a NR Femto GW, the NR Femto shall only connect to a single NR Femto GW at any point in time.**The NR Femto GW supports NG-Flex configuration and can simultaneously connect to multiple AMFs.**Referencing existing definitions and specification is sufficient for access control with CAG – all functionality is already specified.**The text in Sec. 5.3 of TR 38.799 should be adopted as a NOTE; there is no need to explicitly mention “open”, “closed”, and “hybrid” access mode in such NOTE and no need has been currently identified to introduce such definitions.**Send an LS to SA3 to check verification aspects with respect to NR Femto GW architecture.**Considering that NAT is an IP router functionality, and that IP routers are part of the transport network, NAT does not need to be mentioned in the stage 2 description of the NR Femto GW; the FFS below is thus resolved.**To avoid routing ambiguities, a TAI used in a NR Femto GW shall not be reused in another NR Femto GW.**Reuse the Global gNB ID to identify the NR femto node.* *RAN3#127bis:**If the SMF sends both IP versions in the Transport Layer Address IE, the NR Femto node selects the correct IP version.**It is FFS how to harmonise terminology for “NR Femto”, “NR Femto Node”. Terminology shall be consistent.**It is FFS whether the GW can perform IP Version selection in addition to the NR Femto.* *Check the open issue above…* |
|  **Security Aspects** |
| [R3-253021](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253021.zip) | Reply LS on security verification related to NR Femtos (SA3(ZTE)) | LS inNoted |
| [R3-253403](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253403.zip) | (TP to TS 38.300) On security verification related to NR Femtos based on the reply LS from SA3 (ZTE Corporation) | other |
| [R3-253742](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253742.zip) | [draft] Reply LS on security verification related to NR Femtos (ZTE Corporation) | other |
| [R3-253224](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253224.zip) | [TP for BL CR NR Femto 38.300] Completion of Security Aspects of NR Femto (Nokia, TMO US, BT, AT&T, NTT Docomo ) | other |
| [R3-253347](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253347.zip) | (TP for Femto BL CR for TS 38.300) Security related issues for NR Femto (Huawei) | other |
| [R3-253566](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253566.zip) | Aligning SA3 Text to RAN3 Agreements (Ericsson LM) | discussion |
| [R3-253575](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253575.zip) | Security verification related to NR Femtos (LG Electronics) | other |
| [R3-253576](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253576.zip) | (TP to TS 38.300) Support of security verification in NR Femto (LG Electronics) | other |
|   **IP version selection, Corrections, Others** |
| [R3-253413](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253413.zip) | Discussion on 5G femto (NTT DOCOMO INC.) | discussion |
| [R3-253450](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253450.zip) | Stage 2 Rapporteur Corrections for NR Femto (Ericsson) | other |
| [R3-253364](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253364.zip) | On remaining issues for NR Femto (China Telecom) | discussion |
| [R3-253225](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253225.zip) | Completion of other open points of NR Femto (Nokia ) | discussion |
| [R3-253226](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253226.zip) | [TP for BL CR NR Femto TS 38.413] Completion of other open points of NR Femto (Nokia ) | other |
| [R3-253346](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253346.zip) | (TP for Femto BL CR for TS 38.300/38.413) Discussion on remaining issues for NR Femto (Huawei) | other |
| [R3-253304](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253304.zip) | Discussion on remain issue of NR Femto (CATT) | discussion |
| [R3-253305](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253305.zip) | TP for BLCRs to 38.300, 38.410 for NR Femto (CATT) | other |
| [R3-253322](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253322.zip) | Discussion on remaining issues for NR Femto (Lenovo) | discussion |
| [R3-253323](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253323.zip) | (TP to BL CR 38.300) Function split for NR Femto (Lenovo) | other |
| [R3-253637](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253637.zip) | Discussion on the left issues for NR Femto (Samsung) | discussion |
| [R3-253638](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253638.zip) | (TP to BLCR for TS 38.300) Functional split for NR Femto (Samsung) | other |
| [R3-253741](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253741.zip) | (TP to TS 38.300) Discussion on IP version selection at Femto GW (ZTE Corporation) | other |
|  |  |  |
| [R3-253451](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253451.zip) | Aligning SA3 Text to RAN3 Agreements (Ericsson) | Discussionwithdrawn |
| [R3-253565](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_128%5CDocs%5CR3-253565.zip) | Aligning SA3 Text to RAN3 Agreements (Ericsson) | Discussionwithdrawn |
| RAN3 to discuss and capture the security verifications confirmed by SA3 in the NR Femto BL CR 38.300 as per the TP in R3-253224.Ericsson: we do not need to capture the security descriptions concerning what SA3 has confirmed in 38.300. we should capture in TS38.300 a statement that security isues are addressed in the SA3 spec of concernNokia: TS33.545 does not specify the procedure over which verification happens. For these reasons we need a description that spells out which procedures need to be verified.Huawei: Support the description added in the TP from Nokia 8R3-253224Ericsson: there is going to be no action as a consequence of a security verification failure, there will only be a disconnection. Therefore, RAN3 should not capture veriufication procedure details as there is no action to be captured in RAN3´s specs.Agree to capture security aspects confirmed by SA3 in a TP to the BLCR to TS38.300To be continued: discuss and converge on the text for a TP to the BLCR to TS38.300Samsung: We need to verify also the cell access mode.To be further discussed: whether to send a specific Femto indication in the NG: Initial UE message, from NR Femto to enable control of sending Allowed PNI NPN List or not.Ericsson: what is the reason for this proposal? We reuse PNI-NPN functionalities, this was not raised by SA3Nokia: Femtos may not be trusted. For this reason an Allowed PNI NPN List may not be signalled to the FemtoEricsson: SA3 has wrongly assumed that the situation is the same as in 4G and they have copied the 4G specifications. We should reply to SA3 and point out that there are differences between 4G and 5G.Huawei: the indication from the Femto to the AMF should be a node level indicationNokia: there is no node level message going directly from the Femto to the AMFZTE: the connection between the Femto and the AMF should not be established if the Femto is untrusted. The information that the Femto sends to the AMF is not about whether the Femto is trustable or not but only about the fact that the node is a FemtoEricsson: We should not discuss security in RAN3. We agreed that we should reuse PNI-NPN functionalities as they are. Hence the Allowed PNI-NPN list should e signalled to the Femto.Huawei: Agree that the Allowed PNI-NPN information shall be sent to the Femto. Also agree that the mobility restriction list is sent to the Femto. R3-253566Nokia: we should remove text that challenged SA3. Agree to send a reply LS to SA3. Detailed LS text to be discussed and converged uponBase LS on R3-253566RAN3 to discuss the following two options regarding naming of 5G Femto.Option1: use the terms “NR Femto node” and “NR Femto cell” to designate respectively the node and the cell. (R3-253225)Option2: RAN3 to replace the term “NR Femto Node” with “NR Femto” in the BL CR to TS 38.300. (R3-253346)Ericsson: the justification for replacing NR Femto Node with NR Femto is that a Femto is not a real logical node, but it may contain two entities: the PLMN part and the PNI NPN partNokia: SA2 is using NR Femto node. We have today a gNB that supports PLMN and PNI-NPN and we still identified as one node.ZTE: ok to use NR Femto. We can interpret it as NR Femto node or cell depending on contextHuawei: Both options work. Support slightly Option 1CATT: Option 1 is clearerSamsung: NR Femto Node is only used for access control, while NR Femto is used nearly always. To minimize work NR Femto is betterChina Telecom: Option 1 is better as NR femto Node and NR Femco Cell are more specificNokia: Support Option 1Ericsson: whether to change NR Femto Cell was never discussed. Only focus on NR Femto NodeAgree that terminology alignment is needed between the “NR Femto Node” and NR Femto” termsAgree to adopt the term NR Femto Node and reflect that in a revision of R3-253450 **CB: # Femto****- Discuss and converge on text for the stage 2 TP capturing security level verifications in RAN3****- If viable, discuss on security indication in NG: Initial UE Message****- Generate a TP on terminology and rapporteur corrections****- Converge on an LS reply to SA3****- Discuss remaining issues highlighted in rapporteur summary**(moderator - DoCoMo)Summary of offline disc R3-253790 |