3GPP TSG RAN Meeting #105 RP-242359

Melbourne, Australia, September 9-12, 2024

**Source: NTT DOCOMO, INC., AT&T**

**Title: New WID on additional topological enhancements for NR**

**Document for: Approval**

**Agenda Item: 9.2.7**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Additional topological enhancements for NR

Acronym: NR\_WAB\_5GFemto

Unique identifier: xxxxxxxxx

Potential target Release: Rel-19

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X | X | X |  |
| No | X |  |  |  | X |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Study  |
|  | Normative – Stage 1 |
| X | Normative – Stage 2 |
| X | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| FS\_NR\_WAB\_5GFemto | RAN3 | 1020082 | Study on additional topological enhancements for NR |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
|  |  |  |

**Dependency on non-3GPP (draft) specification:**

# 3 Justification

The justification for the work on additional topological enhancements for NR will be categorized into a set of justifications for Wireless Access Backhaul (WAB) and a set of justifications for 5G Femto.

Wireless Access Backhaul (WAB):

The legacy building blocks for 5G RAN topologies should be enhanced to provide a broader range of use cases, such as:

- 5G access for UEs onboard aircrafts, cruise ships, helicopters, and vehicles in remote areas with limited sky visibility via an onboard gNB.

- Backhauling of NG and Xn via TN and NTN, including support of NTN <-> TN handover for backhaul.

- Support for onboard/on-site MEC and local services.

- Support for backhauling without RAN-sharing or roaming agreements between access PLMN(s) and backhaul PLMN(s).

- Backhauling for local gNB deployed in public safety or disaster recovery scenarios.

A study on WAB has been conducted and the results are reflected in TR 38.799. Therefore, a new work item is proposed to carry the conclusion of the FS\_NR\_WAB\_5GFemto study item and specify the solutions enabling NR to support WAB.

5G Femto:

5G Femto is analogous to the LTE concept of HeNB, deployed at e.g. home or at enterprise premises. HeNB has been widely deployed in many LTE markets across multiple regions with great success. It is important to enable 5G Femto use cases to provide NR access at home or at enterprise premises. 5G Femto is expected to play an important role to provide various services as follows:

- 5G Femto offers a cost-effective way to improve 5G indoor coverage, offload macro gNB network traffic, enable better voice quality, and better support for Enterprise mobility.

- 5G Femto extends coverage using higher frequency bands, leading to efficient and effective usage of higher frequency spectrum.

- High number of mobile sessions are indoor and inside coverage with 5G mid and high-bands is limited. Need for a solution that enables simple end user plug and play and allowing for customized access control.

- High bandwidth and throughput with 5G are required at home and at campus locations to enable new immersive applications such as AR/VR/MR gaming, e-sports, UHD 8K video, telepresence, etc.

A study on 5G Femto has been conducted and the results are reflected in TR 38.799. Therefore, a new work item is proposed to carry the conclusion of the FS\_NR\_WAB\_5GFemto study item and specify the solutions enabling NR to support 5G Femto.

# 4 Objective

The objectives for the work on additional topological enhancements for NR will be categorized into a set of objectives for Wireless Access Backhaul (WAB) and a set of objectives for 5G Femto.

The normative work for WAB should be based on the functionalities, terminology and requirements captured in TR 38.799. Addition of further details during normative phase is not precluded.

The objectives of the Wireless Access Backhaul (WAB) work are as follows:

- Specifications for the support of WAB including [RAN3]:

- Support of a WAB-node including a WAB-gNB and a WAB-MT.

- Support of backhauling of the WAB-gNB’s NG, Xn and OAM traffic over the WAB-MT’s PDU session(s).

- Support of Xn interface(s) by the WAB-gNB with the WAB-MTs serving BH RAN node and with other surrounding gNBs, including how to avoid setting up Xn between WAB-gNBs.

- Defining the behaviour of WAB-node in case the authorization status of WAB-MT and/or WAB-gNB changes.

- Network integration procedures for WAB nodes.

- Handling of WAB-gNB’s traffic (including Xn, NG and OAM traffic) during WAB-node mobility, including the case where the WAB-MT’s BH PDU session changes.

- Support the UE’s AMF change for UEs connected to, or camped on, a WAB-gNB.

- UE’s ULI that reflect the WAB node’s location.

- The handling of:

- PCI collision avoidance.

- Reconfiguration of TAC and RANAC on WAB-gNBs.

- Mechanisms to avoid multi-hop WAB topology.

- Radio-resource coordination between access and backhaul links.

- NG connection management.

NOTE 1: For PCI collision avoidance and reconfiguration of TAC and RANAC on WAB-gNBs, follow the conclusion of mobile IAB.

NOTE 2: NG connection management should take the NTN conclusion into account, avoiding parallel discussions.

NOTE 3: No impact on the UE.

NOTE 4: Coordination with other WGs (e.g. SA2, RAN2) when needed.

NOTE 5: Backhaul link for WAB-MT can be TN or NTN.

NOTE 6: Mobility procedures to be used for the UEs served by a WAB-gNB are legacy UE mobility procedures. Mobility of the WAB-MTs is based on legacy UE mobility procedures.

NOTE 7: The interface between the WAB-MT and the co-located WAB-gNB is out-of-scope for the normative phase.

NOTE 8: Split architecture of the WAB-gNB is out-of-scope for the normative phase.

NOTE 9: RAN2 impact should be identified as early as possible, and should be minimal.

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 involving 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 expected on this objective.

NOTE 11: Coordination with other WGs (e.g. SA2, SA3) when needed.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| TS 38.413 | Feature introduction. | RAN#109 | Core part |
| TS 38.413 | Feature introduction. | RAN#109 | Core part |
| TS 38.423 | Feature introduction. | RAN#109 | Core part |
| TS 38.410 | Feature introduction. | RAN#109 | Core part |
| TS 38.401 | Feature introduction. | RAN#109 | Core part |

# 6 Work item Rapporteur(s)

Min, Tianyang, NTT DOCOMO, tianyang.min.ex@nttdocomo.com

Schumacher, Joe, AT&T, joseph.schumacher@att.com

# 7 Work item leadership

RAN3

# 8 Aspects that involve other WGs

None

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| NTT DOCOMO, INC. |
| AT&T |
| CableLabs?? |
| Verizon?? |
| New H3C?? |
| NEC |
| Fujitsu |
| FirstNet?? |
| Nokia |
| Nokia Shanghai Bell |
| Qualcomm Incorporated |
| Lenovo |
| Motorola Mobility?? |
| Ericsson |
| Xiaomi?? |
| KT Corp.?? |
| LG Electronics?? |
| Samsung |
| ZTE Corporation |
| Vivo?? |
| CHTTL?? |
| DISH Network?? |
| CATT |
| Kyocera Corporation?? |
| Charter Communications Inc?? |
| China Unicom?? |
| SONY?? |
| Intel Corporation?? |
| Huawei |
| HiSilicon |
| VIAVI?? |
| Interdigital?? |
| Ruijie Networks?? |
| BT?? |
| Futurewei?? |
| TCL?? |