**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: xxxxxxxx

NOTE: For new WIs/SIs leave the Unique identifier empty and make a proposal for an Acronym.

 For a revised WI/SI: Take Unique identifier and acronym as shown in 3GPP workplan.

 If this is a RAN WID including Core and Perf. part, then Title, Acronym and Unique identifier refer to the feature WI.

 Please tick (X) the applicable box(es) in the table below:

 Either:

|  |  |
| --- | --- |
| **This WID includes a Core part** | **X** |
| **This WID includes a Performance part** |  |

 or:

|  |  |
| --- | --- |
| **This WID includes a Testing part** |  |
| **and it addresses the following 3GPP work area:** | **Radio Access** |  |
| **Core Network** |  |
| **Services** |  |

Potential target Release: Rel-19

NOTE: In case of contradiction with the target dates of clause 5, clause 5 determines the target release.

# 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 …

|  |  |
| --- | --- |
| X | Feature |
|  | Building Block |
|  | *Work Task* |
|  | Study Item |

NOTE: Normally, Core/Perf./Testing parts in RAN WIDs are Building Blocks. Only if they are under an SA or CT umbrella, they are defined as work tasks. If you are in doubt, please contact MCC.

### 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  |  |

NOTE: RAN agreed some time ago, that it describes the feature WI + Core/Perf. part WI or Testing part WI in one WID. Therefore the table above should include the feature WI data (In case the feature covers Core and Perf. part, please list under Working Group the leading WG of the Core part).

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work/Study Items (if any) |
| **Acronym** | Unique ID | Title | Nature of relationship |
| FS\_NR\_WAB\_5GFemto | 1020082 | Study on additional topological enhancements for NR | Preceding study Item |

NOTE: Also related or dependent WIs/SIs in other TSGs shall be indicated here.

# 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

### 4.1 Objective of SI or Core part WI or Testing part WI

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 as defined in TR 38.799.

- 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.

- 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.

- Procedures to 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 removal.

- Enhancements to the support of WAB should be specified, if needed, including [RAN3]:

- Handling of backhaul link degradation by the backhaul network and the WAB-gNB.

- Xn connection management (e.g., potential avoidance of setting up Xn between WAB-gNBs, dynamic establishment/removal of Xn connectivity with BH-RAN-node and surrounding NG-RAN-nodes).

- NG connection management (e.g., procedures for NG connection suspension).

- QoS parameters determination (e.g., PDB, PER).

- Handling of RRC\_INACTIVE UEs.

NOTE 1: No impact on the UE.

NOTE 2: Coordination with other WGs (e.g. SA2, RAN2) when needed.

NOTE 3: Access link for WAB backhaul can be TN or NTN.

NOTE 4: 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 5: The interface between the WAB-MT and the co-located WAB-gNB is out-of-scope for the normative phase.

NOTE 6: Split architecture of the WAB-gNB is out-of-scope for the normative phase.

The objectives of the 5G Femto work are as follows:

- Specification to support NR Femto architecture option 2 as captured in TR 38.799 [RAN3].

- Specification to support access control and mobility involving NR Femtos operating in open, hybrid and closed modes [RAN3].

NOTE 7: For NR Femto access control, only stage 2 impact expected on this objective.

### 4.2 Objective of Performance part WI

NOTE: Leave empty if the WI proposal does not contain a RAN performance part.

N/A

### 4.3 RAN time budget request (not applicable to RAN5 WIs/SIs)

NOTE: For all new RAN related WIs/SIs which are not led by RAN WG5 the WI/SI rapporteur has to fill out the attached Excel table to request time budgets for corresponding RAN WG meetings.
The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI.
One time unit (TU) corresponds to ~ 2 hours in the meeting.
If no TU is needed, then leave the field empty otherwise enter a number >0 in the field.

 For revisions of already approved WI/SI descriptions: Please remove the Excel table from the WID/SID's zip file. The time budgets are already recorded. If you want to modify them, then this has to be done via the status report and not via a revised WID/SID.

 If this WID is covering Core and Performance part, then please fill out one line for each part in the attached Excel table.

**additional comments to the time budget request in the attached Excel table:**

# 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# | Remarks |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
By default a new specs can only be new for one of both parts.

|  |
| --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| TS 38.300 | Feature introduction. | RAN#109 | Core part |
| TS 38.413 | Feature introduction. | RAN#109 | Core part |
| TS 38.423 | Feature introduction. | RAN#109 | Core part |

NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
If an existing spec is affected by both (Core part and Perf. part), then it has to be listed twice with appropriate approval dates.

# 6 Work item Rapporteur(s)

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

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

NOTE: The first listed Rapporteur has the overall responsibility for this WI (incl all secondary tasks).

# 7 Work item leadership

RAN3

Secondary responsible Working Group(s): RAN2

# 8 Aspects that involve other WGs

NOTE: For RAN WIs: Section 8 applies only toWGs outside of TSG RAN because all RAN WG aspects have to be covered in section 4.

# 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 |
| NTT DOCOMO, INC. |
| AT&T |
| CableLabs |