**SA WG2 Meeting #159S2-2311030**

**October 09th – 13th, 2023; Xiamen, China (revision of S2-xxxxxxx)**

**Source: NTT DOCOMO**

**Title: New SID on Architecture aspects of 5G Femto**

**Document for: Approval**

**Agenda Item: 30.1**

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: Study on Architecture aspects of 5G Femto

Acronym: FS\_5G\_Femto

Unique identifier: TBD

Potential target Release: Rel-19

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

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

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

## 2.2 Parent Work Item

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

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 830042 | Vertical\_LAN | CAG introduction |
| 900015 | Enhanced support of Non-Public Networks | CAG enhancements |

# 3 Justification

Home eNodeB (HeNB)/Home NodeB (HNB) (or Femto/Femtocell is synonymous of HeNB/HNB in 3GPP and is also well-defined by other STD organizations such as Broadband Forum TR-196) is a well-known and well-defined concept in TS 22.220 and TS 36.300 that enables small access points deployed in customer premises (on a campus or at home) for access to operator, Internet and local services like local printers or local servers.

This study item defines the overall architecture and required functional and procedural impacts for supporting deployments of 5G NR Femto with focus on enabling access control for “5G NR Femto” use cases. For example, 5G NR Femto extends coverage using higher frequency bands (e.g., FR2 bands), resulting in efficient and effective use of higher frequency spectrums such as mmWave, and also improves 5G indoor coverage, offloads traffic from the macro network, enables better voice quality, and better supports enterprise mobility. This will improve the overall customer service experience. In fact, it is already possible for operator to deploy 5G NR Femto for the purpose of coverage improvement. However, some enhancements for 5G NR Femto are required so that customers are willing to put it at their premises. For example, 5G NR femto enhanced such that it starts working in a plug-and-play manner and the owner needs to be able to control who can use cells of the enhanced 5G NR Femto.

Furthermore, LTE femto without a local GW (LIPA) has actually caused a problem in forwarding traffic to the central network, because the traffic is too high compared to the capacity of the wireline connection that the customer has to the Internet at home. This has often led to a change in the wireline connection. A UPF (local GW) alongside 5G NR femto can at least free the operator from having to worry about solving this problem and realize always desired traffic offloading. For example, SMF determine the availability of L-UPF (local UPF) and perform the L-UPF selection. In fact, the L-PSA selection mechanism is defined as part of the edge, but the L-PSA selection is based on the EAS information as described in Section 6.2.3.2.2, TS 23.548. Therefore, it is necessary to investigate how the SMF finds the L-UPF and makes the selection from Femto deployment (i.e., femto enabled with UPF for traffic offload). For example, whether or not the existing procedure (e.g., L-PSA selection mechanism defined for Edge) needs any enhancements.

In addition, for mixed 4G/5G femtos in a multi-cell deployment, the mobility management should also be investigated when the UE changes from CSG to CAG or vice versa, and to/from 5GC that do not support CSG subscription.

Following are the justifications for the study objectives:

* Concept of a 5G NR Femto is currently not explicitly specified in 3GPP standards. For example, whether and how to define the overall architecture and required functional and procedural impacts for supporting 5G NR Femto deployment.
* How to define the 5G NR Femto access control mechanism based on the existing CAG concept such that the 5G NR Femto owner able to control the access.
* How to enable provisioning of subscribers allowed to access 5G NR Femto cells and how to manage 5G NR Femto access control by the Closed Access Group (CAG) owner or an authorized administrator.
* How to enable access to DN and local services (like printers or servers) i.e., offload traffic locally from the 5G NR Femto.

# 4 Objective

The following aspects will be studied:

WT#1: Identify and analyze operators’ requirements for 5G NR Femto. Based on the identified requirements, study whether and how the architecture, functional and procedural need to be improved to support 5G NR Femto, taking into account the observations from RAN3.

**Drafting discussion: way forward for WT1 could be:**

* **Option#1:** rewording WT1 as “*Based on the outcome of RAN3 work, identify whether and how the architecture and procedures need to be modified to support 5G NR Femto*”.
* **Option#2:** We can convert WT1 into a NOTE, i.e., at least render the note in such a way that we can use the note as a placeholder for an alignment with RAN3.
* **Option#3:** Remove the WT1 and do the work as an alignment (using alignment TUs) before the stage 2 freeze i.e., it is assumed that the impact on SA2 specifications is minimal (simple) and can be resolved with alignment TU(s).

WT#2: Study whether and how to enable SMF to selectively, identify and trigger, offload of traffic from (near) the 5G NR Femto.

**Drafting discussion: way forward for WT2 could be:**

* **Option#1:** We remove the WT2 and assume that we can solve the problem with the current specification mechanism (or implementation or out of scope of SA2).
* **Option#2:** Allocate TU (0.5 + 0.25) and investigate whether functional and procedural enhancements are needed to support the scenario.

WT#3: Investigate how UE mobility between CSG and CAG or vice versa, and handover to/from 5GC that do not support CSG subscription.

WT#4: Study whether and how to support enabling the provisioning of subscribers allowed to access CAG cell and to manage access control by the CAG owner or an authorized administrator.

NOTE 1: Ownership of the 5G NR Femto (or CAG or both) concept and a mechanism will be defined in coordination with SA3.

## TU estimates and dependencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Work Task ID | TU Estimate(Study) | TU Estimate(Normative) | RAN Dependency(Yes/No/Maybe)  | Inter Work Tasks Dependency Editor’s Note: This column should highlight if WT#x is self-contained, or it depends on the completion of other WTs |
| WT#1 | 1 | 0.5 | Yes | self-contained |
| WT#2 | 0.5 | 0.25 | No | self-contained |
| WT#3 | 2 | 1 | Maybe | self-contained |
| WT#4 | 1 | 0.5 | No | self-contained |

Total TU estimates for the study phase: 4.5

Total TU estimates for the normative phase: 2.25

Total TU estimates: 4.5 + 2.25 = 6.75

# 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 |
| Internal TR | 23.XXX | Study on Architecture aspects of 5G Femto | TSG#xx | TSG#xx | TBD |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

TBD

# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

RAN impacts covered by RAN WGs (RAN3).

Security impacts covered by SA3.

Charging aspects covered by SA5.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| NTT DOCOMO |
| Nokia |
| Nokia Shanghai Bell |
| Verizon |
| T-Mobile USA |
| AT&T |
| Samsung |
| Casa Systems |
| BT |
| Oracle |
| SK Telecom |
| Cisco |
| MATRIXX Software |
| Charter Communications |
| NEC |
| Rakuten Mobile |
| Reliance Jio |
| Telefonica |
| KPN |
| DISH Network |