3GPP SA WG1 Meeting #97e S1-220013r3

Electronic Meeting, 14 Feb –24 Feb 2022 (revision of S1-22XXXX)

**Source: China Unicom, China Telecom, Charter Communications, vivo Mobile Communications Ltd**

**Title: New study on network sharing in 5GS**

**Document for: Agreement**

**Agenda Item: 4**

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: New study on network sharing in 5GS

Acronym: FS\_NetShare

Unique identifier:

Potential target Release: *{Rel-19}*

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

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

## 2.2 Parent Work Item

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

### 2.3 Other related Work Items and dependencies

|  |  |  |
| --- | --- | --- |
| Other related Work /Study Items (if any) | | |
| Unique ID | Title | Nature of relationship |
|  |  | {optional free text} |

# 3 Justification

Network sharing is a way for operators to share the heavy deployment for mobile networks. There has been functionality that supports a basic type of network sharing since the Release 5 versions of the 3GPP specifications, which had discussions over five scenarios related to GERAN and UTRAN, on the basis of R99 version, and relevant normative work were incorporated into 3GPP TS 22.011, TS 22.101, TS 22.115 and TS 22.129, etc.

Especially, 3GPP TS 23.251 allows different core network operators to connect to a shared radio access network, and the operators can not only share the radio network elements, but may also share the radio resources themselves. Considering supporting UE and non-supporting UE, which was introduced in the stage 2 details and descriptions of how these requirements are supported in the 3GPP GERAN and UTRAN networks. To scope with Release 8 in 3GPP E-UTRAN, RAN Sharing Enhancements are further updated in TS 22.101.

Therefore the expanding 5G coverage area, license and access network infrastructure, as well as mergers, acquisitions will arise more network-sharing scenarios depending on different operators’ strategies and on many rules and legislation in different countries. In this sense the interest in network sharing tools may extend to the vast majority of the existing 4G operators who intend to deploy a NG Radio Access Network to complement the existing E-UTRAN coverage.

When developing 5G network with higher frequency band, the emerging energy-saving and resource saving policies will prompt operators to change their network configurations and wireless parameters of the 5G base station, to support access sharing. In order to compensate normal market coverage behavior, operators work hard to extend the delivery complexity, including business negotiation, joint procurement, collaborative network planning, construction of geographical areas, network expansion and maintenance, etc. In addition, they cause some adjustment of wireless parameters of commercial networks, and increase the wireless artificial operations and maintenances. They happen more often when there is a direct link between shared wireless access and two or more core networks, especially for the vast coverage and millions of base stations, which are not always applicable to every geographic area and use cases.

Then that may arise the indirect links idea, as another natural next step that can be considered for cooperation, to avoid the security risk over N2 interface, when exposure of base stations in remote LTA areas to multiple operators, to improve the utilization of core network elements through sharing and expand resource sharing, including transmission resources. The idea also reduced the scope of wireless equipment maintenance generated by sharing (e.g., numbers of N2 and base stations) and related human resources, and increased flexibility of business partners and business cooperation.

For these reasons we suggest to investigate the shortcomings currently in the specifications in order to prevent an approach to the deployment of shared networks, for example only the standards of access network sharing in 5G being completed in TS 23.501, without considering other scenarios, such as lack of connection between shared access and core network.

After having compared with the existing technology, the following scenarios are in the problem scope of the study:

- Resource sharing among multiple operators for deploying 5G without a direct link between shared access and core network (e.g. N2 link), which network slice focus mainly within one network by using mapping of slices in roaming scenario.

- After UE moving out of home network, a user can access and enjoy services through serving node and shared PLMN equivalent to HPLMN, as it never left. Unlike inter-national roaming, while users access the network with serving PLMN of VPLMN.

- Users do not need to register with the visiting party and home network both, for example in SNPN scenario, and still use the subscribed services as they usually have in the home network.

- UE is not aware of the quiet changes in the network, not to say the impact of service and continuity, as long as the UE supports 5G and identifies shared PLMN.

- If the network sharing is used within geographical area which is divided into regions. Regions related information needs to be identified by multiple operators, which may also be used by charging, etc.

Actually, this study is based on the lessons of 4G and 5G network sharing deployment, which could help us realize that access sharing right now is ready to be updated. And more scenarios need to be introduced, in order to improve the resource utilization of existing wireless access, provide users with seamless service experience in remote areas, and etc.

# 4 Objective

This technical report is to collate all requirements, considerations, deployment scenarios in a single document. We want to highlight the expected user experiences that operators and users can benefit from the shared network . It mainly focuses on the following:

- Extended 5G network sharing deployment scenario, e.g., a supplement scenario to geographical areas or use cases where only access sharing are not enough.

- whether there is any impact on UE, for example, it is necessary to point out any visible risks in this scenario whether the regular UE could identify the shared PLMN as the equivalent PLMN, even it is not stored in the HPLMN, EHPLMN, RPLMN or any PLMN lists.

- The possible mobility and service continuity requirements, any differences from existing technology between 4G/5G and 5G/5G, for example, handover or reselection.

- If the communication between two PLMN’s network through the interface generates potential security requirements, for example, the necessary decoding information of element or UE in topology hiding.

- Charging requirements or principles if needed.

- Analyze how to ensure the usage of services (e.g. voice and SMS), in comparison of the existing access sharing, or network service experiences (e.g., communication latency).

- Investigate the impact of RAN sharing on PWS maybe included.

And serves for the existing 4G operators who intend to deploy a NG Radio Access Network to complement the existing E-UTRAN coverage.

# 5 Expected Output and Time scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| New specifications {One line per specification. Create/delete lines as needed} | | | | | |
| Type | TR number | Title | For info  at TSG# | For approval at TSG# | Rapporteur |
| Internal TR | 22.XXX | New study on network sharing in 5G | TSG#97  (Sept 2022) | TSG#98  (Dec 2022) | Qun Wei, China Unicom; |
|  |  |  |  |  |  |

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

# 6 Work item Rapporteur(s)

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# 7 Work item leadership

SA1

# 8 Aspects that involve other WGs

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# 9 Supporting Individual Members

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| Supporting IM name |
| China Unicom |
| China Telecom |
| CAICT |
| CATT |
| Tencent |
| Spreadtrum Communications |
| vivo Mobile Communications Ltd |
| Xiaomi |
| ZTE Corporation |
| CITC |
| OPPO |
| Qualcomm? |
| Charter Communications |
| one2many |
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