**3GPP TSG-SA WG1 Meeting #99e S1-222018**

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**Source: ZTE, China Unicom**

**pCR Title: Pseudo-CR on New Requirements to Network Sharing**

**Draft Spec: 3GPP TR 22.851 V0.1.0**

**Agenda item: 7.5**

**Document for: Approval**

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*Abstract: This pCR is to solve the Editor’s note in 5.1.6 and add new requirements in TR 22.851 V0.1.0*

**1. Introduction**

Editor’s note to be resolved

Definition of new requirements.

**2. Reason for Change**

The terms of direct and indirect connection need to be clarified.

Description of new requirements.

**3. Conclusions**

Some clarifications added.

The terms direct and indirect connection clarified.

Other new requirements defined.

**4. Proposal**

It is proposed to agree the following changes to 3GPP TR 22.851 V0.1.0

\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

* References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.
* For a specific reference, subsequent revisions do not apply.
* For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.101: "Service principles".

[3] 3GPP TS 22.261: "Service requirements for the 5G system".

[xx] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

\* \* \* Second Change \* \* \* \*

# 5 Use cases

## 5.1 Use case without direct connections between the shared access and the core networks of the participating operators

### 5.1.1 Description

As stated in TS 22.261 [3] the increased density of access nodes needed to meet future performance objectives pose considerable challenges in deployment and acquiring spectrum and antenna locations. RAN sharing is seen as a technical solution to these issues.

Sharing networks and network infrastructure has become more important part of 3GPP systems.

When two or more operators acquire 5G licenses and have respectively deployed or plan to deploy 5G access networks and core networks, a MOCN configuration can be considered for network sharing between these operators, i.e. a Multi-Operator Core Network (MOCN) in which multiple CN nodes are connected to the same radio access and the CN nodes are operated by different operators.

One of the challenges for the partners’ network operators is the maintenance generated by the interconnection (e.g., number of network interfaces) between the shared RAN and two or more core networks, especially for a large number of shared base stations.

For these reasons it is suggested to investigate other type of network sharing scenarios, where a 5G RAN is shared among multiple operators without necessarily assuming a direct connection between shared access and the core networks of the participating operators.

### 5.1.2 Pre-conditions

Two (or more) operators provide coverage with their respective radio access networks in different parts of a country but together cover the entire country.

There is an agreement between all the operators to work together and to build a shared network, but utilizing the different operator’s allocated spectrum appropriately in different parts of the coverage area (for example, Low Traffic Areas, LTA and High Traffic Areas, HTA).

The Hosting RAN operator 1, as illustrated below, can share its NG-RAN with the Participating Operators with or without direct connections between the shared access and the core networks of the participating operators.

The following pre-conditions apply:

1. OP1 owns the NG-RAN to be shared with three other operators; OP2, OP3, and OP4.

2. NG-RAN is shared with certain conditions, e.g., within a specific 5G frequency band or within specific area.

3. NG-RAN does not have direct connections between the shared access and the core networks of the participating operators OP2 and OP3.

4. NG-RAN does have direct connections between the shared access and the core network of the participating operator OP4.

5. In this example UE 1 is subscribed to OP1, UE 2 is subscribed to OP 2, UE 3 is subscribed to OP3, and UE 4 is subscribed to OP4.

OP 2 network

OP 3 network

OP 4 network

OP 1 network

no N2

no N2

N2

N2

UE 2 of OP2

UE 3 of OP3

UE 4 of OP4

UE 1 of OP 1

UE2's screen:

name of

OP 2

Figure 5.1.2-1: Different options both with and without direct connections between the shared access and the core networks of the participating operators

### 5.1.3 Service Flows

1. UE1 can successfully attach to NG-RAN, and the display of the network operator name is the name of OP1.

2. UE2 can successfully attach to NG-RAN, and the display of the network operator name is the name of OP2.

3. UE3 can successfully attach to NG-RAN, and the display of the network operator name is the name of OP3.

4. UE4 can successfully attach to NG-RAN, and the display of the network operator name is the name of OP4.

5.The service provider of UE 1 is OP1.

6.The service provider of UE 2 is OP2.

7.The service provider of UE 3 is OP3.

8.The service provider of UE 4 is OP4.

When the shared NG-RAN provides services for at least two different UEs, such as the UE2 of OP2 and UE4 of OP4, while OP2’s and OP4’s networks connect with shared NG-RAN of OP1 with two different connection methods, the network of OP1 may need to identify to which operators the UEs accessing the shared NG-RAN are registered to, and what kind of connection methods the UE’s operator connects with OP1’s shared NG-RAN. The UEs, accessing the shared NG-RAN, of the two participating operators which have different connection methods with the shared NG-RAN arise this scenario.

When multiple participating operators use the same connection method, such as indirect connection sharing method, the network of OP1 may still need to identify to which operators the UEs accessing the shared NG-RAN are registered to.

### 5.1.4 Post-conditions

The hosting network will be able to provide services to all participating operators' users.

### 5.1.5 Existing feature partly or fully covering use case functionality

Network sharing has been studied in previous releases, where related normative stage 1 requirements are introduced in 3GPP TS 22.101 [2] and 22.261[3].

3GPP TS 22.101 [2] introduces general requirements of network sharing, stated as follows:

*Network sharing shall be transparent to the user.*

*The specifications shall support both the sharing of:*

*(i) radio access network only;*

*(ii) radio access network and core network entities connected to radio access network.*

*NOTE: In a normal deployment scenario only one or the other option will be implemented.*

The provisioning of services and service capabilities is described in 3GPP TS 22.101 [2].

*The provision of services and service capabilities that is possible to offer in a network shall not be restricted by the existence of the network sharing It shall be possible for a core network operator to differentiate its service offering from other core network operators within the shared network.*

*It shall be possible to control the access to service capabilities offered by a shared network according to the core network operator the user is subscribed to.*

As described in 3GPP TS 22.261 [3] the UE uses the list of PLMN/RAT combinations for PLMN selection, if available, typically during roaming situations. In non-roaming situations, the UE and subscription combination typically matches the HPLMN/EHPLMN capabilities and policies, from a SST (slice/service type) perspective. That is, a 5G UE accessing its HPLMN/EHPLMN should be able to access SSTs according to UE capabilities and the related subscription.

Furthermore, the 5G system shall support selection among any available PLMN/RAT combinations, identified through their respective PLMN identifier and Radio Access Technology identifier, in a prioritised order. The priority order may, subject to operator policies, be provisioned in an Operator Controlled PLMN Selector lists with associated RAT identifiers, stored in the 5G UE.

The 5G system shall support, subject to operator policies, a User Controlled PLMN Selector list stored in the 5G UE, allowing the UE user to specify preferred PLMNs with associated RAT identifier in priority order.

\* \* \* Third Changes \* \* \* \*

### 5.1.6 Potential New Requirements needed to support the use case

[PR 5.A.6-001] The 5G system shall be able to support network sharing with indirect connection between the shared access network and a participating operator’s core network.

[PR 5.A.6-002] The 5G system shall be able to support multiple sharing methods, e.g., network sharing where the shared access network may have both direct and indirect connections to participating operators’ core networks.

Editor’s Note: In the requirements above the terms of direct and indirect connection need to be clarified and consistency of the terminology shall be checked.

NOTE1: Direct connection means the communication between the shared NG-RAN and the participating operator’s core network is seamless (point-to-point), i.e. a shared NG-RAN connecting to the participating operator’s core network via N2 interface.

Indirect connection means the communication between the shared access NG-RAN and the participating operator’s core network is routed via other instances or nodes, i.e. N3IWF, N14/N26, SEPPs /IPUPs. For the definition of the different interfaces or functions see 3GPP TS 23.501 [xx]

NOTE 2: Depending on the type of connection (direct or indirect) between the shared NG-RAN access and the participating operator’s core networks the mobility can be managed by the home network of the participating operators or by the NG-RAN access network. Services can be provided by the NG-RAN shared access network to the participating operators UEs.

[PR 5.A.6-003] The 5G system shall be able to provide indirect connection of shared NG-RAN to more than one participating operators at the same time. UEs from each participating operator communicate with their home network via the shared NG-RAN access.

[PR 5.A.6-004] In deployment scenarios, only one of the above two methods shall be used in the same region for each participating operators.

[PR 5.A.6-005] The 5G system shall be able to provide a mechanism to identify the connection method of each participating operator communicating with the shared NG-RAN, when the participating operators are using different sharing methods.

[PR 5.A.6-006] The 5G system shall be able to provide a mechanism to identify to which participating operator communicating with the shared NG-RAN and using the same sharing method the UEs are registered to.

[PR 5.A.6-007] Subject to regional or national regulatory requirements and operators’ policy, the 5G system shall allow participating operators to display the corresponding operator name on the user terminal upon mutual agreement.

 \* \* \* End of Changes \* \* \* \*