**3GPP TSG SA WG 1 Meeting #107 S1-242480**

**Maastricht, The Netherlands, 19-23 August 2024** *(revision of S1-242074, 2319)*

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0795** | **rev** | **2** | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:***  | New requirements for satellite access network sharing via Indirect Network Sharing  |
|  |  |
| ***Source to WG:*** | , China Unicom, LG Uplus |
| ***Source to TSG:*** | SA1 |
|  |  |
| ***Work item code:*** | INS\_SAT |  | ***Date:*** | 2024-08-23 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | The satellite network and the terrestrial network can effectively complement each other when they can’t offer available services in their respective areas. The sharing of satellite based NG-RAN via Indirect Network Sharing enables new business models and cooperation between terrestrial network operators and satellite MNOs (as defined in TR28.844). However, compared with the terrestrial network, the coverage of the satellite NG-RAN is managed in larger granularity of geographic region so that one cell or tracking area will cover the area expected or allowed to be shared and the areas not expected or allowed to be shared. Thus, this CR intends to address such network access control issue to facilitate the deployment of Indirect Network Sharing in different SLAs and business models. |
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| ***Summary of change:*** | This CR clarifies the definition of Shared NG-RAN in 3.1, and introduces new requirements to support the use case of satellite based NG-RAN sharing via Indirect Network Sharing in 6.21. |
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| ***Consequences if not approved:*** | There are potential issues when MNOs and satellite network operators cooperate by sharing satellite based NG-RAN via Indirect Network Sharing. |
|  |  |
| ***Clauses affected:*** | 3.1, 6.21 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [29] and the following apply.
A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [29].

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**5G enhanced positioning area:** a subset of the 5G positioning service area that is assumed to be provided with additional infrastructure or deploy a particular set of positioning technologies to enhance positioning services.

NOTE 1: The enhanced positioning service area represents for example a factory plant, a dense urban area, an area along a road or railway track, a tunnel and covers both indoor and outdoor environments.

**5G LAN-type service**: a service over the 5G system offering private communication using IP and/or non-, i.e. UEs that are members of the same 5G LAN-VN IP type communications.

**5G LAN-virtual network**: a virtual network capable of supporting 5G LAN-type service.

**5G satellite access network**: 5G access network using at least one satellite.

**5G positioning service area:** a service area where positioning services would solely rely on infrastructures and positioning technologies that can be assumed to be present anywhere where 5G is present (e.g. a country-wide operator-supplied 5G network, GNSS, position/motion sensors).

NOTE 2: This includes both indoor and any outdoor environments.

**active communication:** a UE is in active communication when it has one or more connections established. A UE may have any combination of PS connections (e.g. PDP contexts, active PDN connections).

**activity factor:** percentage value of the amount of simultaneous active UEs to the total number of UEs where active means the UEs are exchanging data with the network.

**Ambient IoT device**: An ambient power-enabled Internet of Things device is an IoT device powered by energy harvesting, being either battery-less or with limited energy storage capability (e.g., using a capacitor).

**aggregated QoS:** QoS requirement(s) that apply to the traffic of a group of UEs.

**area traffic capacity:** total traffic throughput served per geographic area.

**authorised administrator:** a user or other entity authorised to partially configure and manage a network node in a CPN (e.g. a PRAS, or eRG) or a PIN element in a PIN.

**carbon emission:** quantity of equivalent carbon dioxide emitted (e.g. kg of CO2 equivalent).

**communication service availability**: percentage value of the amount of time the end-to-end communication service is delivered according to a specified QoS, divided by the amount of time the system is expected to deliver the end-to-end service.

NOTE 3: The end point in "end-to-end" is the communication service interface.

NOTE 4: The communication service is considered unavailable if it does not meet the pertinent QoS requirements. For example, the communication service is unavailable if a message is not correctly received within a specified time, which is the sum of maximum allowed end-to-end latency and survival time.

**Customer Premises Network:** a network located within a premise (e.g. a residence, office or shop), which is owned, installed and/or (at least partially) configured by the customer of a public network operator.

**direct device connection:** the connection between two UEs without any network entity in the middle.

**direct network connection:** one mode of network connection, where there is no relay UE between a UE and the 5G network.

**Disaster Condition:** This is the condition that a government decides when to initiate and terminate, e.g. a natural disaster. When this condition applies, users may have the opportunity to mitigate service interruptions and failures.

**Disaster Inbound Roamer:** A user that (a) cannot get service from the PLMN it would normally be served by, due to failure of service during a Disaster Condition, and (b) is able to register with other PLMNs.

**Disaster Roaming:** This is the special roaming policy that applies during a Disaster Condition.

**DualSteer device:** A device supporting traffic steering and switching of user data (for different services) across two 3GPP access networks; it can be a single UE, in case of non-simultaneous data transmission over the two networks, or two separate UEs in case of simultaneous data transmission over the two networks.

**end-to-end latency:** the time that it takes to transfer a given piece of information from a source to a destination, measured at the communication interface, from the moment it is transmitted by the source to the moment it is successfully received at the destination.

**energy charging rate**: a means of determining the energy consumption consequence (use of energy credit) associated with charging events.

**energy credit**: a quantity of energy credit associated with the subscriber that can be used for credit control by the 5G system.

**energy state:** state of a cell, a network element and/or a network function with respect to energy, e.g. (not) energy saving states, which are defined in TS 28.310 [47].

**evolved Residential Gateway:** a gateway between the public operator network (fixed/mobile/cable) and a customer premises network.

**holdover:** A clock A, previously synchronized/syntonized to another clock B (normally a primary reference or a Master Clock) but whose frequency is determined in part using data acquired while it was synchronized/syntonized to B, is said to be in holdover or in the holdover mode as long as it is within its accuracy requirements.

NOTE 4a: holdover is defined in [31]

**Holdover time:** the time period that is available to repair the first priority timing source when it is lost (e.g., when the primary GNSS reference is lost). During this period the synchronization accuracy requirement should be guaranteed, e.g., by means of defining multiple synchronization references.

**Hosted Service:** a service containing the operator's own application(s) and/or trusted third-party application(s) in the Service Hosting Environment, which can be accessed by the user.

**Hosting NG-RAN Operator:** the operator that has operational control of a Shared NG-RAN.

NOTE 4b: Hosting NG-RAN Operator is a Hosting RAN Operator.

**Hosting RAN Operator:** as defined in 3GPP TS 22.101 [6].

**hybrid access:** access consisting of multiple different access types combined, such as fixed wireless access and wireline access.

**indirect network connection:** one mode of network connection, where there is a relay UE between a UE and the 5G network.

**Indirect Network Sharing:** a type of NG-RAN Sharing in which the communication between the Shared NG-RAN and the Participating Operator’s core network is routed through the Hosting NG-RAN Operator’s core network.

**IoT device:** a type of UE which is dedicated for a set of specific use cases or services and which is allowed to make use of certain features restricted to this type of UEs.

NOTE 5: An IoT device may be optimized for the specific needs of services and application being executed (e.g. smart home/city, smart utilities, e-Health and smart wearables). Some IoT devices are not intended for human type communications.

**maximum energy consumption**: a policy establishing an upper bound on the quantity of energy consumption [47] by the 5G system in a specific period of time, or space, e.g. energy consumption inside a given service area.

**maximum energy credit limit**: a policy establishing an upper bound on the aggregate quantity of energy consumption by the 5G system to provide services to a specific subscriber, e.g. in kilowatt hours.

NOTE: The terms maximum energy credit limit is distinct from 'maximum energy consumption' because the credit limit is a total amount of energy consumed, where maximum energy consumption is a limit to the consumption in a given interval of time.

**network slice:** a set of network functions and corresponding resources necessary to provide the required telecommunication services and network capabilities.

**NG-RAN:** a radio access network connecting to the 5G core network which uses NR, E-UTRA, or both.

**NG-RAN Sharing:** the sharing of NG-RAN among a number of operators.

**non-public network:** a network that is intended for non-public use.

**NR:** the new 5G radio access technology.

**Participating NG-RAN Operator:** authorized operator that is using Shared NG-RAN resources provided by a Hosting NG-RAN Operator.

NOTE 5a: Participating NG-RAN Operator is a Participating Operator.

**Participating Operator:** as defined in 3GPP TS 22.101 [6].

**Personal IoT Network:** A configured and managed group of at least one UE PIN Element and one or more PIN Element that communicate with each other.

**PIN Element:** UE or non-3GPP device that can communicate within a PIN.

**PIN direct connection:** the connection between two PIN Elements without any 3GPP RAN or core network entity in the middle.

NOTE 5A: A PIN direct connection could internally be relayed by other PIN Elements.

NOTE 5B: When a PIN direct connection is between two PIN Elements that are UEs this direct connection is typically known as a direct device connection.

**PIN Element with Gateway Capability:** a UE PIN Element that has the ability to provide connectivity to and from the 5G network for other PIN Elements.

NOTE 5C: A PIN Element can have both PIN management capability and Gateway Capability.

**PIN Element with Management Capability:** A PIN Element with capability to manage the PIN.

**positioning service availability:** percentage value of the amount of time the positioning service is delivering the required position-related data within the performance requirements, divided by the amount of time the system is expected to deliver the positioning service according to the specification in the targeted service area.

**proximity-based work task offloading:** a relay UE receives data from a remote UE via direct device connection and performs calculation of a work task for the remote UE. The calculation result can be further sent to network server.

**positioning service latency:** time elapsed between the event that triggers the determination of the position-related data and the availability of the position-related data at the system interface.

**Premises Radio Access Station:** a base station installed at a customer premises network.

**priority service:** a service that requires priority treatment based on regional/national or operator policies.

**private communication**: a communication between two or more UEs belonging to a restricted set of UEs**.**

**private network:** an isolated network deployment that does not interact with a public network.

**private slice:** a dedicated network slice deployment for the sole use by a specific third-party.

**ProSe UE-to-UE Relay**: a Public Safety ProSe-enabled UE that acts as a relay between two other Public Safety ProSe-enabled UEs.

**Ranging:** refers to the determination of the distance between two UEs and/or the direction of one UE from the other one via direct device connection.

**relative positioning:** relative positioning is to estimate position relatively to other network elements or relatively to other UEs.

**reliability**: in the context of network layer packet transmissions, percentage value of the packets successfully delivered to a given system entity within the time constraint required by the targeted service out of all the packets transmitted.

**renewable energy**: energy from renewable sources as energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases

NOTE 2: This definition was taken from [48].

**satellite**: a space-borne vehicle embarking a bent pipe payload or a regenerative payload telecommunication transmitter, placed into Low-Earth Orbit (LEO) typically at an altitude between 300 km to 2 000 km, Medium-Earth Orbit (MEO) typically at an altitude between 8 000 to 20 000 k m, or Geostationary satellite Earth Orbit (GEO) at 35 786 km altitude.

**satellite access:** direct connectivity between the UE and the satellite.

**satellite NG-RAN:** a NG-RAN which uses NR in providing satellite access to UEs.

**service area:** geographic region where a 3GPP communication service is accessible.

NOTE 6: The service area can be indoors.

NOTE 7: For some deployments, e.g. in process industry, the vertical dimension of the service area can be considerable.

**service continuity:** the uninterrupted user experience of a service that is using an active communication when a UE undergoes an access change without, as far as possible, the user noticing the change.

NOTE 8: In particular service continuity encompasses the possibility that after a change the user experience is maintained by a different telecommunication service (e.g. tele- or bearer service) than before the change.

NOTE 9: Examples of access changes include the following. For EPS: CS/PS domain change. For EPS and 5G: radio access change, switching between a direct network connection and an indirect network connection.

**Service Hosting Environment:** the environment, located inside of 5G network and fully controlled by the operator, where Hosted Services are offered from.

**serving satellite:** a satellite providing the satellite access to an UE. In the case of NGSO, the serving satellite is always changing due to the nature of the satellite constellation.

**Shared NG-RAN:** as defined in 3GPP TS 22.101 [6].

NOTE: Shared NG-RAN can be a shared satellite NG-RAN.

**Stand-alone Non-Public Network:** A non-public network not relying on network functions provided by a PLMN

**SNPN Credential Provider:** Entity within the 5G system that creates and manages identity information and provides authentication services for those identities for the purpose of accessing a SNPN

NOTE: The SNPN Credential Provider can also authorize access to a non-public network for a subscriber associated with an identity handled by this SNPN Credential Provider.

**S&F Satellite operation**: S&F (Store and Forward) Satellite operation is an operation mode of a 5G system with satellite-access where the 5G system can provide some level of service (in storing and forwarding the data) when satellite connectivity is intermittently/temporarily unavailable, e.g. to provide communication service for UEs under satellite coverage without a simultaneous active feeder link connection to the ground segment.

**S&F data retention period:** it is the data storage validity period for a 5G system with satellite access supporting store and forward operation (e.g. after which undelivered data stored is being discarded).

**synchronization threshold:** A synchronization threshold can be defined as the maximum tolerable temporal separation of the onset of two stimuli, one of which is presented to one sense and the other to another sense, such that the accompanying sensory objects are perceived as being synchronous.

NOTE 10: This definition is based on [41].

**survival time:** the time that an application consuming a communication service may continue without an anticipated message.

**Time to First Fix (TTFF):** time elapsed between the event triggering for the first time the determination of the position-related data and the availability of the position-related data at the positioning system interface.

**Traffic steering:** the procedure that selects an access network and transfers traffic over the selected access network. This can apply to traffic of one or multiple services/applications across two 3GPP access networks, including scenarios where all services use the same network connection (no simultaneous data over the two networks) or different services are steered across different networks (with simultaneous data over the two networks).

**Traffic switching:** the procedure that moves all traffic from one access network to another access network in a way that minimizes service interruption. This can apply to traffic of one or multiple services/applications across two 3GPP access networks, including scenarios where all services use the same network connection (no simultaneous data over the two networks) or different services are moved to different networks (with simultaneous data over the two networks).

**UE-Satellite-UE communication**: for a 5G system with satellite access, it refers to the communication between UEs under the coverage of one or more serving satellites, using satellite access without the user traffic going through the ground segment.

**User Equipment:** An equipment that allows a user access to network services via 3GPP and/or non-3GPP accesses.

**user experienced data rate:** the minimum data rate required to achieve a sufficient quality experience, with the exception of scenario for broadcast like services where the given value is the maximum that is needed.

**wireless backhaul:** a link which provides an interconnection between 5G network nodes and/or transport network using 5G radio access technology**.**

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

## 6.21 NG-RAN Sharing

### 6.21.1 Description

The increased density of access nodes needed to meet future performance objectives poses considerable challenges in deployment and acquiring spectrum and antenna locations. RAN sharing is seen as a technical solution to these issues.

In RAN Sharing operations, NG-RAN resources can be used by multiple network operators. For the NG-RAN resources deployed on satellites, they can be used by both satellite mobile network operators and terrestrial network operators together by proper network operations. Indirect Network Sharing is one of the possible sharing methods.

During NG-RAN sharing, the security and privacy of shared networks, non-shared networks, and subscribers need to be maintained without negative effects. Especially in the case of Indirect Network Sharing, where the involvement of the core network of the hosting operator e.g. for signalling exchange between the users and the core network of the participating operator could cause exposure of the subscriber’s information to the hosting network, an extra scrutiny of the security mechanism is expected to avoid sharing the information that is not needed for the Indirect Network Sharing operation (e.g. network topology) and protect the information that is needed for the Indirect Network Sharing operation between the hosting operator and the participating operator.

### 6.21.2 Requirements

#### 6.21.2.1 General

Requirements related to NG-RAN sharing are described in 3GPP TS 22.101 [6], mainly in clause 28.2.

A 5G satellite access network shall support NG-RAN sharing.

#### 6.21.2.2 Indirect network sharing

The 5G system shall be able to support Indirect Network Sharing between the Shared NG-RAN and one or more Participating NG-RAN Operators’ core networks, by means of the connection being routed through the Hosting NG-RAN Operator’s core network.

NOTE 1: Requirements of Indirect Network Sharing assume no impact on UE.

NOTE 2: For more information on Indirect Network Sharing see Annex I.

The following requirements apply to Indirect Network Sharing:

Indirect Network Sharing shall be transparent to the user.

NOTE 3: This requirement is aligned with the existing requirement in 3GPP TS 22.101 [6] clause 4.9.

The following existing service requirements related to network sharing in 3GPP TS 22.101 [6] apply:

- clause 4.2.1,

- clause 28.2.3, and

- clause 28.2.5.

Subject to the agreement between the hosting and participating operator, the 5G system shall support a means to

enable a UE of the Participating NG-RAN Operator to:

- access their subscribed PLMN services when accessing a Shared NG-RAN, and/or,

- obtain its subscribed services, including Hosted Services, of participating operator via a Shared NG-RAN.

Based on operator policy, the 5G system shall support a mechanism to enable an authorized UE with a subscription to a Participating Operator to select and access a Shared NG-RAN.

Based on operator policy, the 5G system shall support access control for an authorized UE accessing a Shared NG-RAN and be able to apply differentiated access control for different Shared NG-RANs when more than one Shared NG-RAN are available for the Participating Operator to choose from.

Based on operator policy, the 5G network shall be able to apply different access control for a UE connecting to Participating Operator’s core network when the UE is located in different geographic areas of the coverage of one shared satellite NG-RAN

Based on operator policy, the 5G system shall enable the Participating Operator to provide steering information in order to assist a UE with access network selection amongst the Hosting Operator’s available Shared RAN(s).

Subject to the agreement between operators, the 5G network shall enable the Participating Operator to direct a UE accesing a suitable RAN when this UE is located in the same coverage of one shared satellite NG-RAN and non-Shared RANs. The 5G system shall support service continuity for UEs that are moving between different Shared NG-RANs and/or between a Shared NG-RAN and a non-Shared NG-RAN network.

The 5G system shall be able to provide a UE accessing a Shared NG-RAN network with positioning service in compliance with regulatory requirements.

Subject to regulatory requirements and mutual agreement between the participating operators and the hosting operator, the requirements to support regulatory services, e.g., PWS or emergency calls apply to Indirect Network Sharing.

In case of Indirect Network Sharing and subject to agreement between operators the 5G system shall enable the Shared NG-RAN of a hosting operator to provide services for inbound roaming users.

The 5G core network shall be able to support collection of charging information associated with a UE accessing a Shared NG-RAN using Indirect Network Sharing, which refers to the resource usage of hosting operator’s core network.

NOTE4: When Shared NG-RAN is a shared satellite NG-RAN, the charging information can include the information specific to the shared satellite NG-RAN, e.g. the location of UE, involved satellites.

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