**3GPP TSG-WG SA2 Meeting #164S2-240xxxx**

**Maastricht, NL, 19th Aug – 23rd Aug, 2024 (revision of S2-240xxxx)**

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| *CR-Form-v12.3* |
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|  | **23.304** | **CR** | **XXXX** | **rev** | **X** | **Current version:** | **19.0.0** |  |
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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 | **X** | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:***  | Updates on UE-satellite-UE communicaitons |
|  |  |
| ***Source to WG:*** | vivo |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | 5G SAT\_Ph3 |  | ***Date:*** | 2024-08-09 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *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)* |
|  |  |
| ***Reason for change:*** | Addition of features to support UE-satellite-UE communications for satellite communications based on the conclusions for KI#3 in TR 23.700-29. |
|  |  |
| ***Summary of change:*** | 1. Update the definitions to include UE-satellite-UE communication
2. Add a new clause to show the architecture of UE-satellite-UE communication
3. Add a new clause to describe the feature of UE-satellite-UE communication
4. Add a new clause to describe the feature of when UPF and AGW onboard
5. Add a new clause to describe the feature of activation of UE-S-UE communication
6. Add a new clause to describe the feature of deactivation of UE-S-UE communication
7. Add a new clause to describe the feature of simultaneously change of UPF and IMS-AGW
 |
|  |  |
| ***Consequences if not approved:*** | UE-satellite-UE communication will not be supported. |
|  |  |
| ***Clauses affected:*** | 3.1, 4.x(new), 5.4.x(new), 5.4.x.2(new), 5.4.x.2.1(new), 5.4.x.2.2 (new), 5.4.x.2.3 (new) |
|  |  |
|  | **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 \* \* \* \*

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

**5G VN Group:** A set of UEs using private communication for 5G LAN-type service.

**5G Access Network:** An access network comprising a NG-RAN and/or non-3GPP AN connecting to a 5G Core Network.

**5G Access Stratum-based Time Distribution:** A time synchronization distribution method that is used by an NG-RAN to provide the 5GS time to the UE(s) over the radio interface using procedures specified in TS 38.331 [28].

**5G Core Network:** The core network specified in the present document. It connects to a 5G Access Network.

**5G LAN-Type Service:** A service over the 5G system offering private communication using IP and/or non-IP type communications.

**5G LAN-Virtual Network:** A virtual network over the 5G system capable of supporting 5G LAN-type service.

**5G NSWO:** The 5G NSWO is the capability provided by 5G system and by UE to enable the connection to a WLAN access network using 5GS credentials without registration to 5GS.

**5G QoS Flow or QoS Flow:** The finest granularity for QoS forwarding treatment in the 5G System. All traffic mapped to the same 5G QoS Flow receive the same forwarding treatment (e.g. scheduling policy, queue management policy, rate shaping policy, RLC configuration, etc.). Providing different QoS forwarding treatment requires separate 5G QoS Flow.

**5G QoS Identifier:** A scalar that is used as a reference to a specific QoS forwarding behaviour (e.g. packet loss rate, packet delay budget) to be provided to a 5G QoS Flow. This may be implemented in the access network by the 5QI referencing node specific parameters that control the QoS forwarding treatment (e.g. scheduling weights, admission thresholds, queue management thresholds, link layer protocol configuration, etc.).

**5G System:** 3GPP system consisting of 5G Access Network (AN), 5G Core Network and UE.

**5G-BRG:** The 5G-BRG is a 5G-RG defined in BBF.

**5G-CRG:** The 5G-CRG is a 5G-RG specified in DOCSIS MULPI [89].

**5G-RG:** A 5G-RG is a RG capable of connecting to 5GC playing the role of a UE with regard to the 5G core. It supports secure element and exchanges N1 signalling with 5GC. The 5G-RG can be either a 5G-BRG or 5G-CRG.

**Access Traffic Steering:** The procedure that selects an access network for a new data flow and transfers the traffic of this data flow over the selected access network. Access traffic steering is applicable between one 3GPP access and one non-3GPP access.

**Access Traffic Switching:** The procedure that moves all traffic of an ongoing data flow from one access network to another access network in a way that maintains the continuity of the data flow. Access traffic switching is applicable between one 3GPP access and one non-3GPP access.

**Access Traffic Splitting:** The procedure that splits the traffic of a data flow across multiple access networks. When traffic splitting is applied to a data flow, some traffic of the data flow is transferred via one access and some other traffic of the same data flow is transferred via another access. Access traffic splitting is applicable between one 3GPP access and one non-3GPP access.

**Allowed NSSAI**: Indicating the S-NSSAIs values the UE could use in the Serving PLMN in the current Registration Area.

**Allowed Area:** Area where the UE is allowed to initiate communication as specified in clause 5.3.2.3.

**Alternative S-NSSAI:** Indicating a compatible S-NSSAI for an S-NSSAI in the Allowed NSSAI that the AMF uses to replace an S-NSSAI when the S-NSSAI is not available or congested, as specified in clause 5.15.19.

**AMF Region:** An AMF Region consists of one or multiple AMF Sets.

**AMF Set:** An AMF Set consists of some AMFs that serve a given area and Network Slice(s). AMF Set is unique within an AMF Region and it comprises of AMFs that support the same Network Slice(s). Multiple AMF Sets may be defined per AMF Region. The AMF instances in the same AMF Set may be geographically distributed but have access to the same context data.

**Application Identifier:** An identifier that can be mapped to a specific application traffic detection rule.

**AUSF Group ID:** This refers to one or more AUSF instances managing a specific set of SUPIs. An AUSF Group consists of one or multiple AUSF Sets.

**Binding Indication:** Information included by a NF service producer to a NF service consumer in request responses or notifications to convey the scope within which selection/reselection of target NF/NF Services may be performed, or information included by the NF service consumer in requests or subscriptions to convey the scope within which selection/reselection of notification targets or the selection of other service(s) that the NF consumer produces for the same data context may be performed. See clause 6.3.1.0.

**BSF Group ID:** This refers to one or more BSF instances managing a specific set of SUPIs or GPSIs. A BSF Group consists of one or multiple BSF Sets.

**Configured NSSAI:** NSSAI provisioned in the UE applicable to one or more PLMNs.

**CHF Group ID:** This refers to one or more CHF instances managing a specific set of SUPIs.

**Credentials Holder:** Entity which authenticates and authorizes access to an SNPN separate from the Credentials Holder.

**Data Burst:** A set of multiple PDUs generated and sent by the application in a short period of time.

NOTE 1: A Data Burst can be composed of one or multiple PDU Sets.

**Default UE credentials:** Information configured in the UE to make the UE uniquely identifiable and verifiably secure to perform UE onboarding.

**Default Credentials Server (DCS):** An entity that can perform authentication based on the Default UE credentials or provide means for another entity to perform authentication based on the Default UE credentials.

**Delegated Discovery:** This refers to delegating the discovery and associated selection of NF instances or NF service instances to an SCP.

**Direct Communication:** This refers to the communication between NFs or NF services without using an SCP.

**Disaster Condition:** See definition in TS 22.261 [2].

**Disaster Inbound Roamer:** See definition in TS 22.261 [2].

**Disaster Roaming:** See definition in TS 22.261 [2].

**DN Access Identifier (DNAI):** Identifier of a user plane access to one or more DN(s) where applications are deployed.

**Emergency Registered:** A UE is considered Emergency Registered over an Access Type in a PLMN when registered for emergency services only over this Access Type in this PLMN.

**Endpoint Address:** An address in the format of an IP address or FQDN, which is used to determine the host/authority part of the target URI. This Target URI is used to access an NF service (i.e. to invoke service operations) of an NF service producer or for notifications to an NF service consumer.

**En-gNB:** as defined in TS 37.340 [31].

**Expected UE Behaviour:** Set of parameters provisioned by an external party to 5G network functions on the foreseen or expected UE behaviour, see clause 5.20.

**Feeder link:** As defined in TS 38.300 [27].

**Fixed Network Residential Gateway:** A Fixed Network RG (FN-RG) is a RG that it does not support N1 signalling and it is not 5GC capable.

**Fixed Network Broadband Residential Gateway:** A Fixed Network RG (FN-BRG) is a FN-RG specified in BBF TR‑124 [90].

**Fixed Network Cable Residential Gateway:** A Fixed Network Cable RG (FN-CRG) is a FN-RG with cable modem specified in DOCSIS MULPI [89].

**Forbidden Area:** An area where the UE is not allowed to initiate communication as specified in clause 5.3.2.3.

**GBR QoS Flow:** A QoS Flow using the GBR resource type or the Delay-critical GBR resource type and requiring guaranteed flow bit rate.

**Group ID for Network Selection (GIN):** An identifier used during SNPN selection to enhance the likelihood of selecting a preferred SNPN that supports a Default Credentials Server or a Credentials Holder.

**(g)PTP-based Time Distribution:** a method to distribute timing among entities in a (g)PTP domain using PTP messages generated by a GM (in the case the GM is external to 5GS) or by 5GS (in the case the 5GS acts as a GM for a given (g)PTP domain). Possible dependencies between (g)PTP-based Time Distribution and 5G Access Stratum-based Time Distribution are described in clause 5.27.1. The synchronization process is described in clause 5.27.1 and follows the applicable profiles of IEEE Std 802.1AS [104] or IEEE Std 1588 [126].

**Home Network Public Key Identifier:** An identifier used to indicate which public/private key pair is used for SUPI protection and de-concealment of the SUCI as specified in TS 23.003 [19].

**IAB-donor:** This is a NG-RAN node that supports Integrated access and backhaul (IAB) feature and provides connection to the core network to IAB-nodes. It supports the CU function of the CU/DU architecture for IAB defined in TS 38.401 [42].

**IAB-node:** A relay node that supports wireless in-band and out-of-band relaying of NR access traffic via NR Uu backhaul links. It supports the UE function and the DU function of the CU/DU architecture for IAB defined in TS 38.401 [42].

**Indirect Communication:** This refers to the communication between NFs or NF services via an SCP.

**Initial Registration:** UE registration in RM-DEREGISTERED state as specified in clause 5.3.2.

**Intermediate SMF (I-SMF):** An SMF that is inserted to support a PDU session as the UE is located in an area which cannot be controlled by the original SMF because the UPF(s) belong to a different SMF Service Area.

**Local Area Data Network:** a DN that is accessible by the UE only in specific locations, that provides connectivity to a specific DNN, and whose availability is provided to the UE.

**Local Break Out (LBO):** Roaming scenario for a PDU Session where the PDU Session Anchor and its controlling SMF are located in the serving PLMN (VPLMN).

**LTE-M:** a 3GPP RAT type Identifier used in the Core Network only, which is a sub-type of E-UTRA RAT type, and defined to identify in the Core Network the E-UTRA when used by a UE indicating Category M.

**MA PDU Session:** A PDU Session that provides a PDU connectivity service, which can use one access network at a time, or simultaneously one 3GPP access network and one non-3GPP access network.

**Mobile Base Station Relay:** A mobile base station acts as a relay between a UE and the 5G network. Such mobile base station relay can for example be mounted on a moving vehicle and serve UEs that can be located inside or outside the vehicle (or entering/leaving the vehicle). See description of TS 22.261 [2]. A mobile Base Station Relay is supported in 5GS with the IAB-architecture with mobility as specified in clause 5.35A and that described in TS 38.401 [42].

**Master RAN node:** A Master node as defined in TS 37.340 [31].

**Mobility Pattern:** Network concept of determining within the AMF the UE mobility parameters as specified in clause 5.3.2.4.

**Mobility Registration Update:** UE re-registration when entering new TA outside the TAI List as specified in clause 5.3.2.

**MPS-subscribed UE:** A UE having a USIM with MPS subscription.

**Multi-USIM UE:** A UE with multiple USIMs, capable of maintaining a separate registration state with a PLMN for each USIM at least over 3GPP Access and supporting one or more of the features described in clause 5.38.

**NB-IoT UE Priority:** Numerical value used by the NG-RAN to prioritise between different UEs accessing via NB-IoT.

**NGAP UE association:** The logical per UE association between a 5G-AN node and an AMF.

**NGAP UE-TNLA-binding:** The binding between a NGAP UE association and a specific TNL association for a given UE.

**Network Function:** A 3GPP adopted or 3GPP defined processing function in a network, which has defined functional behaviour and 3GPP defined interfaces.

NOTE 2: A network function can be implemented either as a network element on a dedicated hardware, as a software instance running on a dedicated hardware, or as a virtualised function instantiated on an appropriate platform, e.g. on a cloud infrastructure.

**Network Instance**: Information identifying a domain. Used by the UPF for traffic detection and routing.

**Network Slice:** A logical network that provides specific network capabilities and network characteristics.

**Network Slice Area of Service (NS-AoS):** The area where a network slice is available i.e. the UE can access and get service of a particular network slice as more than zero resources are allocated to the network slice in the NG-RAN cells. This area may be, depending on the specific network slice, the whole PLMN, one or more TAs, or one or more cells when the NS-AoS does not match deployed TAs as defined in clause 5.15.18.

**Network Slice instance:** A set of Network Function instances and the required resources (e.g. compute, storage and networking resources) which form a deployed Network Slice.

**Non-GBR QoS Flow:** A QoS Flow using the Non-GBR resource type and not requiring guaranteed flow bit rate.

**NSI ID:** an identifier for identifying the Core Network part of a Network Slice instance when multiple Network Slice instances of the same Network Slice are deployed, and there is a need to differentiate between them in the 5GC.

**NF instance:** an identifiable instance of the NF.

**NF service:** a functionality exposed by a NF through a service-based interface and consumed by other authorized NFs.

**NF service instance:** an identifiable instance of the NF service.

**NF service operation:** An elementary unit a NF service is composed of.

**NF Service Set:** A group of interchangeable NF service instances of the same service type within an NF instance. The NF service instances in the same NF Service Set have access to the same context data.

**NF Set:** A group of interchangeable NF instances of the same type, supporting the same services and the same Network Slice(s). The NF instances in the same NF Set may be geographically distributed but have access to the same context data.

**NG-RAN:** A radio access network that supports one or more of the following options with the common characteristics that it connects to 5GC:

1) Standalone New Radio.

2) New Radio is the anchor with E-UTRA extensions.

3) Standalone E-UTRA.

4) E-UTRA is the anchor with New Radio extensions.

**Non-3GPP QoS Assistance Information:** A set of QoS assistance information provided to the UE (e.g. PEGC) to enable the UE to perform QoS differentiation for the connected devices in the non-3GPP network behind the UE.

**Non-Allowed Area:** Area where the UE is allowed to initiate Registration procedure but no other communication as specified in clause 5.3.2.3.

Non-Public Network: See definition in TS 22.261 [2].

**Non-Seamless Non-3GPP offload:** The offload of user plane traffic via non-3GPP access without traversing either N3IWF/TNGF or UPF.

**Non-Seamless WLAN offload:** Non-Seamless Non-3GPP offload when the non-3GPP access network is WLAN.

**Onboarding Network:** Either a PLMN enabling Remote Provisioning for a registered UE, or an Onboarding SNPN.

**Onboarding Standalone Non-Public Network:** An SNPN providing Onboarding access and enabling Remote Provisioning for a UE registered for Onboarding as specified in clause 4.2.2.2.4 of TS 23.502 [3].

**Partially Allowed NSSAI:** Indicating the S-NSSAIs values the UE could use in the Serving PLMN or SNPN in some of the TAs in the current Registration Area. Each S-NSSAI in the Partially Allowed NSSAI is associated with a list of TAs where the S-NSSAI is supported.

**PCF Group ID:** This refers to one or more PCF instances managing a specific set of SUPIs. A PCF Group consists of one or multiple PCF Sets.

**PDU Connectivity Service:** A service that provides exchange of PDUs between a UE and a Data Network.

**PDU Session:** Association between the UE and a Data Network that provides a PDU connectivity service.

**PDU Session Type:** The type of PDU Session which can be IPv4, IPv6, IPv4v6, Ethernet or Unstructured.

**PDU Set:** One or more PDUs carrying the payload of one unit of information generated at the application level (e.g. frame(s) or video slice(s) etc. for eXtended Reality (XR) Services). All the PDUs of a PDU set are transmitted within the same QoS Flow.

**Pending NSSAI:** NSSAI provided by the Serving PLMN during a Registration procedure, indicating the S-NSSAI(s) for which the network slice-specific authentication and authorization procedure is pending.

**Periodic Registration Update:** UE re-registration at expiry of periodic registration timer as specified in clause 5.3.2.

**Personal IoT Network (PIN):** A network with group of elements (i.e. UE or non-3GPP device) that are able to communicate with each other directly, communicate with each other via intermediate element(s), communicate with each other via 5GS, or communicate with external DN via 5GS.

**PIN Element (PINE):** A UE or non-3GPP device that is part of the group of elements in a PIN.

**PIN Element with Gateway Capability (PEGC):** A PINE with the ability to provide DN connectivity via the 5G network for other PINEs and/or a PINE with the ability to provide relay functionality for communication between PINEs. Only a UE is able to act as a PEGC. A PIN includes at least one PEGC.

NOTE 3: In the context of PIN, the terms PEGC and UE with PEGC capability are synonymous, therefore when the term PEGC is used, it is also intended as UE.

**PIN Element with Management Capability (PEMC):** A PINE with capability to manage the PIN and the management is supported by an AF if deployed. A PIN includes at least one PEMC.

NOTE 4: A UE that is a PINE may both act as PEMC and PEGC in a PIN.

**PIN management traffic:** The traffic among PINE, PEGC, PEMC and AF for PIN related to the management of PIN.

**PIN-DN communication:** The communication between PINE and DN via a PEGC and 5G network, as well as the communication between PEGC and DN via 5G network. The communication includes both the data traffic and the PIN management traffic (e.g. the data traffic towards the internet or the PIN management traffic towards the AF for PIN).

**PIN direct communication:** The communication without traversing 5G network between two PINEs (e.g. between a PINE and a PEGC, between a PINE and a PEMC, between a PEMC and a PEGC and between two PEGCs). The communication traverses intermediate PINE(s) or not. The communication includes both the data traffic and the PIN management traffic (e.g. the data traffic between 2 PINEs or the PIN management traffic between PINE and PEMC).

**PIN indirect communication:** The communication with traversing 5G network between PINEs connected to different PEGCs of the same PIN, and between a PINE and a PEMC via PEGC and 5G network. The communication includes both the data traffic and the PIN management traffic (e.g. the data traffic between 2 PINEs or the PIN management traffic between PINE and PEMC).

**PLMN with Disaster Condition:** A PLMN to which a Disaster Condition applies.

**Pre-configured 5QI:** Pre-defined QoS characteristics configured in the AN and 5GC and referenced via a non-standardized 5QI value. Corresponding to Operator-specific 5QI in TS 24.501 [47].

**Primary cell:** as defined in TS 36.331 [51].

**Primary RAT:** RAT of the Master RAN node, when Dual Connectivity is used; otherwise RAT of the RAN node.

**Private communication:** See definition in TS 22.261 [2].

**Provisioning Server:** Entity that provisions network credentials and other data in the UE to enable SNPN access.

**PTP domain:** As defined in IEEE Std 1588 [126].

**Public network integrated NPN:** A non-public network deployed with the support of a PLMN.

**(Radio) Access Network**: See 5G Access Network.

**RAT type:** Identifies the transmission technology used in the access network for both 3GPP accesses and non-3GPP Accesses, for example, NR, NB-IOT, Untrusted Non-3GPP, Trusted Non-3GPP, Trusted IEEE 802.11 Non-3GPP access, Wireline, Wireline-Cable, Wireline-BBF, etc.

**NR RedCap:** a 3GPP RAT type Identifier used in the Core Network only, which is a sub-type of NR RAT type, and defined to identify in the Core Network the NR when used by a UE indicating NR RedCap.

**NR eRedCap:** a 3GPP RAT type Identifier used in the Core Network only, which is a sub-type of NR RAT type, and defined to identify in the Core Network the NR when used by a UE indicating NR eRedCap.

**Requested NSSAI:** NSSAI provided by the UE to the Serving PLMN during registration.

**Residential Gateway:** The Residential Gateway (RG) is a device providing, for example voice, data, broadcast video, video on demand, to other devices in customer premises.

**Routing Binding Indication:** Information included in a request or notification and that can be used by the SCP for discovery and associated selection to of a suitable target. See clauses 6.3.1.0 and 7.1.2

**Routing Indicator:** Indicator that allows together with SUCI/SUPI Home Network Identifier to route network signalling to AUSF and UDM instances capable to serve the subscriber.

**RRC\_IDLE, RRC\_CONNECTED, RRC\_INACTIVE:** As defined in TS 38.331 [28] and TS 38.306 [69].

**SCP Domain:** A configured group of one or more SCP(s) and zero or more NF instances(s). An SCP within the group can communicate with any NF instance or SCP within the same group directly, i.e. without passing through an intermediate SCP.

**Secondary RAN node:** A Secondary node as defined in TS 37.340 [31].

**Secondary RAT:** RAT of the secondary RAN node.

**Service link:** As defined in TS 38.300 [27]

**SNPN-enabled UE:** A UE configured to use stand-alone Non-Public Networks.

**SNPN access mode:** A UE operating in SNPN access mode only selects stand-alone Non-Public Networks over Uu, Yt, NWu.

NOTE 5: If there are multiple instances of Uu/Yt/NWu, whether the UE is in SNPN access mode is determined for each instance independently. NWu can be either direct access via untrusted non-3GPP access or access via underlay network (see Annex D, clause D.3).

**Service based interface:** It represents how a set of services is provided/exposed by a given NF.

**Service Continuity:** The uninterrupted user experience of a service, including the cases where the IP address and/or anchoring point change.

**Service Data Flow Filter:** A set of packet flow header parameter values/ranges used to identify one or more of the (IP or Ethernet) packet flows constituting a Service Data Flow.

**Service Data Flow Template:** The set of Service Data Flow filters in a policy rule or an application identifier in a policy rule referring to an application detection filter, required for defining a Service Data Flow.

**Session Continuity:** The continuity of a PDU Session. For PDU Session of IPv4 or IPv6 or IPv4v6 type "session continuity" implies that the IP address is preserved for the lifetime of the PDU Session.

**SMF Service Area:** The collection of UPF Service Areas of all UPFs which can be controlled by one SMF.

**SNPN ID:** PLMN ID and NID identifying an SNPN.

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

**Subscribed S-NSSAI**: S-NSSAI based on subscriber information, which a UE is subscribed to use in a PLMN

**Subscription Owner Standalone Non-Public Network:** A Standalone Non-Public Network owning the subscription of a UE and providing subscription data to the UE via a Provisioning Server during the onboarding procedure.

**Survival Time:** The time that an application consuming a communication service may continue without an anticipated message.

NOTE 6: Taken from clause 3.1 of TS 22.261 [2].

**Target NSSAI:** NSSAI provided by the Serving PLMN to the NG-RAN to cause the NG-RAN to attempt to steer the UE to a cell supporting the Network Slices identified by the S-NSSAIs in this NSSAI. See clause 5.3.4.3.3 for more details.

**Time Sensitive Communication (TSC):** A communication service that supports deterministic communication (i.e. which ensures a maximum delay) and/or isochronous communication with high reliability and availability. It is about providing packet transport with QoS characteristics such as bounds on latency, loss, and reliability, where end systems and relay/transmit nodes may or may not be strictly synchronized.

**TSN working domain:** Synchronization domain for a localized set of devices collaborating on a specific task or work function in a TSN network, corresponding to a gPTP domain defined in IEEE 802.1AS [104].

**UDM Group ID:** This refers to one or more UDM instances managing a specific set of SUPIs. An UDM Group consists of one or multiple UDM Sets.

**UDR Group ID:** This refers to one or more UDR instances managing a specific set of SUPIs. An UDR Group consists of one or multiple UDR Sets.

**UE-DS-TT Residence Time:** The time taken within the UE and DS-TT to forward a packet, i.e. between the ingress of the UE and the DS-TT port in the DL direction, or between the DS-TT port and the egress of the UE in the UL direction. UE-DS-TT Residence Time is provided at the time of PDU Session Establishment by the UE to the network.

NOTE 7: UE-DS-TT Residence Time is the same for uplink and downlink traffic and applies to all QoS Flows.

**UE-Satellite-UE Communication**: The communication among UEs under the coverage of one or more serving satellites without the user plane traffic going through the ground network.

**UPF Service Area**: An area consisting of one or more TA(s) within which PDU Session associated with the UPF can be served by (R)AN nodes via a N3 interface between the (R)AN and the UPF without need to add a new UPF in between or to remove/re-allocate the UPF.

**Uplink Classifier:** UPF functionality that aims at diverting Uplink traffic, based on filter rules provided by SMF, towards Data Network.

**WB-E-UTRA:** In the RAN, WB-E-UTRA is the part of E-UTRA that excludes NB-IoT. In the Core Network, WB-E-UTRA also excludes LTE-M.

**Wireline 5G Access Network:** The Wireline 5G Access Network (W-5GAN) is a wireline AN that connects to a 5GC via N2 and N3 reference points. The W-5GAN can be either a W-5GBAN or W-5GCAN.

**Wireline 5G Cable Access Network:** The Wireline 5G Cable Access Network (W-5GCAN) is the Access Network defined in CableLabs.

**Wireline BBF Access Network:** The Wireline 5G BBF Access Network (W-5GBAN) is the Access Network defined in BBF.

**Wireline Access Gateway Function (W-AGF):** The Wireline Access Gateway Function (W-AGF) is a Network function in W-5GAN that provides connectivity to the 5G Core to 5G-RG and FN-RG.

NOTE 8: If one AUSF/PCF/UDR/UDM group consists of multiple AUSF/PCF/UDR/UDM Sets, AUSF/PCF/UDR/UDM instance from different Set may be selected to serve the same UE. The temporary data which is not shared across different Sets may be lost, e.g. the event subscriptions stored at one UDM instance are lost if another UDM instance from different Set is selected and no data shared across the UDM Sets.

\* \* \* \* Second change \* \* \* \*

### 4.x Architecture for UE-satellite-UE communications

The architecture for Support of UE-satellite-UE communications is defined in TS 23.228 [15].

\* \* \* \* Third change (new) \* \* \* \*

### 5.4.x Support of UE-Satellite-UE Communications

#### 5.4.x.1 General

The present clause 5.4.x provides enhancements to support UE-satellite-UE communications:

- UPF and IMS-AGW onboard the satellites, see clause 5.4.2.x, with detailed features of

- activation of UE-satellite-UE communication, see clause 5.4.x.2.1; and

- deactivation of UE-satellite-UE communication, see clause 5.4.x.2.2.

- Simultaneously change of UPF and IMS-AGW, see clause 5.4.x.2.3; and

\* \* \* \* Forth change (new) \* \* \* \*

#### 5.4.x.2 UPF and IMS-AGW onboard the satellites

The IMS voice/video service traffic may be locally routed via the UE-Satellite-UE communication link between MO UE and MT UE without traversing back to the gateway on the ground with UPF and IMS-AGW both onboarding the satellite (s).

NOTE 1: in this Release of the specification, only 2 UEs from the same HPLMN are supported.

NOTE 2: in this Release of the specification, the serving satellite is only of LEO and MEO type.

\* \* \* \* Fifth change (new) \* \* \* \*

##### 5.4.x.2.1 Activation of UE-Satellite-UE Communications

This clause applies to the case when a UE has established a PDU session with a UPF on the ground selected as the PDU session anchor for IMS voice/video service using satellite access type (i.e. “NR (LEO)”, or NR (MEO)). The activation of a UE-satellite-UE communication causes the insertion of the satellite onboarding UPF and IMS-AGW into the IMS media path, where the onboarding UPF acts as the functionalities of UL Classifier and the local PSA, as defined in clause 5.6.4, and the onboarding IMS-AGW executes the functionalities as defined in TS 23.228 [15]. The activation of the UE-satellite-UE communication is executed separately at the MO UE side and MT UE side, as described in XY.a in TS 23.228 [15]. Once activated, the IMS media packets are routed locally via the satellite(s).

NOTE: the LI functionalities of the onboarding IMS-AGW are determined by the workgroup SA3-LI.

\* \* \* \* Sixth change \* \* \* \*

##### 5.4.x.2.2 Deactivation of UE-Satellite-UE Communications

The deactivation of UE-satellite-UE communication causes the corresponding N3 tunnel (between the onboarding gNB and UPF) and the anchor IMS-AGW (onboarding) to be deactivated. The onboarding UPF (i.e. UL classifier and local PSA) will be removed from the path as specified in clause 4.3.5.5 in TS 23.502 [3], and the anchor IMS-AGW will be relocated by selecting a new IMS-AGW that is on the ground with the procedure as specified in clause xx.a in TS 23.228 [15].

The deactivation of UE-satellite-UE communication can be used separately at the MO UE side and MT UE side when the serving satellite changes and the new serving satellite (constellation) for the MO UE and MT UE cannot communicate with each other (e.g. ISL interruption). Once deactivated, the IMS media packets are routed back to the ground.

\* \* \* \* 7th changes \* \* \* \*

##### 5.4.x.2.3 Simultaneously change of UPF and IMS-AGW

To ensure service continuity, the onboarding UPF and IMS-AGW can be changed simultaneously when MO or MT UE’s serving satellite changes. The onboarding UPF can be changed accordingly with the gNB by reusing the simultaneous change of BP/UL CL for a PDU session procedure as specified in clause 4.3.5.7 of TS 23.502 [3], and the anchor IMS-AGW can be changed with the AGW relocation procedure as specified in clause xx.b in TS 23.228 [15].

The deactivation of UE-satellite-UE communication can be used separately at the MO UE side and MT UE side when the serving satellite changes and the new serving satellite (constellation) for the MO UE and MT UE can communicate with each other (e.g. via ISL). Once simultaneously changed, the IMS media path is accordingly optimized to avoid packet loss.

\* \* \* \* End of changes \* \* \* \*