**3GPP TSG- Meeting #**

**February 20-24, 2023, Athens**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **4077** | **Rev** | **1?** | **Current version:** | **18.0.0** |  |
|  | | | | | | | | |
| *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 |  | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | reduced network slice availability | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | , Nokia, Nokia shanghai bell? | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | | 2023-02-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The eNS\_Ph3 WID includes the following objectives for a reduced network slice availability:  *-To support network slices which have Area of Service (see NG.116) that is not matching existing TAs: Enhance the system to provide network slice validity policy to the supporting UE which includes location information, via Registration Procedure or UE Configuration Update Procedure.*  *- Clarify that RRM policies for S-NSSAIs can be configured per cell basis as defined in TS 28.541 while the CN support the slice per TA level.*  *- To support temporary network slices: Enhance the system to provide network slice validity policy to the supporting UE which includes timing information, via Registration Procedure or UE Configuration Update Procedure.*  *- AMF enforcement of the S-NSSAI availability policies e.g. when the UE does not support the policies based on AMF subscribing to AoI.*  The TR 23.700-41 conclusions for above objectives are:  - **For support of limited AoS slices not matching deployed TAs it is proposed that:**  - Reconfiguration of TAs while keeping the uniform support of S-NSSAIs in cells within the TA unchanged, but if an operator do not want to change the TA borders, the operator configures the cells of a TA that are outside AoS to have no or limited resources using existing NG-RAN OAM configuration.  - S-NSSAI availability policies with the validity set to location information (e.g. a set of cells, or combination of cells and TAs), that are sent to the UE. The UE uses the policies and when the availability are not valid, the UE considers the S-NSSAI to be 1) not registered or 2) registered while no UP are allowed to be activated based on information in the received policy.  NOTE 1: Whether S-NSSAI validity policies is sent to the UE in the Configured NSSAI or separate is to be determined during normative phase.  NOTE 2: How the handover can be optimized to prevent the UE from leaving the slice service area (or entering into the slice service area) will be considered during normative phase based on RAN WG feedback.  NOTE 3: The AMF enforcement of the S-NSSAI availability policies e.g. when the UE does not support the policies will be described during normative phase based on AMF subscribing to AoI. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introducing the functionality required according to the above WID objectives as per TR 23.700-41 conclusions for location. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.2, 5.4.4a, 5.15.1, 5.15.4.1.1, 5.15.8, 5.15.y (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*

# 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 22.261: "Service requirements for next generation new services and markets; Stage 1".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 23.203: "Policies and Charging control architecture; Stage 2".

[5] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS); Stage 2".

[6] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface: Stage 3".

[7] IETF RFC 7157: "IPv6 Multihoming without Network Address Translation".

[8] IETF RFC 4191: "Default Router Preferences and More-Specific Routes".

[9] IETF RFC 2131: "Dynamic Host Configuration Protocol".

[10] IETF RFC 4862: "IPv6 Stateless Address Autoconfiguration".

[11] ITU‑T Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[12] ITU‑T Recommendation Q.65: "The unified functional methodology for the characterization of services and network capabilities".

[13] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS): Stage 3".

[14] IETF RFC 3736: "Stateless DHCP Service for IPv6".

[15] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[16] 3GPP TS 22.173: "IMS Multimedia Telephony Service and supplementary services; Stage 1".

[17] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station in idle mode".

[18] 3GPP TS 23.167: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; IP Multimedia Subsystem (IMS) emergency sessions".

[19] 3GPP TS 23.003: "Numbering, Addressing and Identification".

[20] IETF RFC 7542: "The Network Access Identifier".

[21] 3GPP TS 23.002: "Network Architecture".

[22] 3GPP TS 23.335: "User Data Convergence (UDC); Technical realization and information flows; Stage 2".

[23] 3GPP TS 23.221: "Architectural requirements".

[24] 3GPP TS 22.153: "Multimedia priority service".

[25] 3GPP TS 22.011: "Service Accessibility".

[26] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[27] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description".

[28] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specification".

[29] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[30] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[31] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Stage 2".

[32] 3GPP TS 23.214: "Architecture enhancements for control and user plane separation of EPC nodes; Stage 2".

[33] 3GPP TS 22.101: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Service aspects; Service principles".

[34] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[35] 3GPP TS 33.126: "Lawful Interception Requirements".

[36] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[37] 3GPP TS 22.280: "Mission Critical Services Common Requirements (MCCoRe); Stage 1".

[38] 3GPP TS 23.379: "Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2".

[39] 3GPP TS 23.281: "Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2".

[40] 3GPP TS 23.282: "Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2".

[41] 3GPP TS 32.240: "Charging management; Charging architecture and principles".

[42] 3GPP TS 38.401: "NG-RAN Architecture description".

[43] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[44] IETF RFC 4960: "Stream Control Transmission Protocol".

[45] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[46] 3GPP TS 23.041: "Public Warning System".

[47] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[48] 3GPP TS 24.502: "Access to the 5G System (5GS) via non-3GPP access networks; Stage 3".

[49] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[50] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".

[51] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[52] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".

[53] Void.

[54] IETF RFC 4861: "Neighbor Discovery for IP version 6 (IPv6)".

[55] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[56] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[57] IETF RFC 4555: "IKEv2 Mobility and Multihoming Protocol (MOBIKE)".

[58] 3GPP TS 29.510: "5G System: Network function repository services; Stage 3".

[59] 3GPP TS 29.502: "5G System: Session Management Services: Stage 3".

[60] IETF RFC 7296: "Internet Key Exchange Protocol Version 2 (IKEv2) ".

[61] 3GPP TS 23.380: "IMS Restoration Procedures".

[62] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[63] 3GPP TS 23.292: "IP Multimedia Subsystem (IMS) centralized services; Stage 2".

[64] 3GPP TS 23.222: "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs".

[65] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane Nodes; Stage 3".

[66] 3GPP TS 32.421: "Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements".

[67] 3GPP TS 32.290: "5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[68] 3GPP TS 32.255: "5G Data connectivity domain charging; Stage 2".

[69] 3GPP TS 38.306: "NR; User Equipment -UE) radio access capabilities".

[70] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access -E-UTRA); User Equipment -UE) radio access capabilities".

[71] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[72] 3GPP TS 23.285: "Architecture enhancements for V2X services".

[73] IETF RFC 2865: "Remote Authentication Dial In User Service (RADIUS)".

[74] IETF RFC 3162: "RADIUS and IPv6".

[75] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)".

[76] 3GPP TS 26.238: "Uplink streaming".

[77] 3GPP TR 26.939: "Guidelines on the Framework for Live Uplink Streaming (FLUS)".

[78] International Telecommunication Union (ITU), Standardization Bureau (TSB): "Operational Bulletin No. 1156"; http://handle.itu.int/11.1002/pub/810cad63-en (retrieved October 5, 2018).

[79] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[80] 3GPP TS 24.250: "Protocol for Reliable Data Service; Stage 3".

[81] IETF RFC 8684: "TCP Extensions for Multipath Operation with Multiple Addresses".

[82] IETF RFC 8803: "0-RTT TCP Convert Protocol".

[83] IEEE Std 802.1CB-2017: "IEEE Standard for Local and metropolitan area networks-Frame Replication and Elimination for Reliability".

[84] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[85] WiFi Alliance Technical Committee, Hotspot 2.0 Technical Task Group: "Hotspot 2.0 (Release 2) Technical Specification".

[86] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[87] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[88] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

[89] CableLabs DOCSIS MULPI: "Data-Over-Cable Service Interface Specifications DOCSIS 3.1, MAC and Upper Layer Protocols Interface Specification".

[90] BBF TR-124 issue 5: "Functional Requirements for Broadband Residential Gateway Devices".

[91] BBF TR-101 issue 2: "Migration to Ethernet-Based Broadband Aggregation".

[92] BBF TR-178 issue 1: "Multi-service Broadband Network Architecture and Nodal Requirements".

[93] BBF TR-456 issue 2: "AGF Functional Requirements".

[94] BBF WT-457: "FMIF Functional Requirements".

Editor's note: The reference to BBF WT-457 will be revised when finalized by BBF.

[95] IEEE Std 802.1Qcc-2018: "IEEE Standard for Local and metropolitan area networks - Bridges and Bridged Networks - Amendment: Stream Reservation Protocol (SRP) Enhancements and Performance Improvements".

[96] Void.

[97] IEEE Std 802.1AB-2016: "IEEE Standard for Local and metropolitan area networks -- Station and Media Access Control Connectivity Discovery".

[98] IEEE Std 802.1Q-2018: "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks".

[99] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".

[100] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[101] 3GPP TS 29.274: "Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[102] 3GPP TS 23.632: "User Data Interworking, Coexistence and Migration; stage 2".

[103] 3GPP TS 29.563: "5G System (5GS); HSS services for interworking with UDM; Stage 3".

[104] IEEE Std 802.1AS-2020: "IEEE Standard for Local and metropolitan area networks--Timing and Synchronization for Time-Sensitive Applications".

[105] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains".

[106] IEEE Std 802.11-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[107] IEEE Std 1588-2008: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems".

[108] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[109] 3GPP TS 24.193: "Access Traffic Steering, Switching and Splitting; Stage 3".

[110] 3GPP TS 24.526: "User Equipment (UE) policies for 5G System (5GS); Stage 3".

[111] 3GPP TS 22.186: "Enhancement of 3GPP support for V2X scenarios; Stage 1".

[112] 3GPP TR 38.824: "Study on physical layer enhancements for NR ultra-reliable and low latency case (URLLC)".

[113] IEEE: "Guidelines for Use of Extended Unique Identifier (EUI), Organizationally Unique Identifier (OUI), and Company ID (CID)", https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/tutorials/eui.pdf.

[114] 3GPP TS 32.256: "Charging Management; 5G connection and mobility domain charging; Stage 2".

[115] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

[116] 3GPP TS 38.415: "PDU Session User Plane Protocol".

[117] 3GPP TS 24.535: "Device-side Time-Sensitive Networking (TSN) Translator (DS-TT) to network-side TSN Translator (NW-TT) protocol aspects; Stage 3".

[118] 3GPP TS 32.274: "Charging Management; Short Message Service (SMS) charging".

[119] 3GPP TS 23.008: "Organization of subscriber data".

[120] 3GPP TS 38.314: "NR; Layer 2 measurements".

[121] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[122] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[123] 3GPP TS 32.254: "Charging management; Exposure function Northbound Application Program Interfaces (APIs) charging".

[124] 3GPP TS 33.535: "Authentication and Key Management for Applications based on 3GPP credentials in the 5G System (5GS)".

[125] 3GPP TS 38.410: "NG-RAN; NG general aspects and principles".

[126] IEEE Std 1588: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems", Edition 2019.

[127] ST 2059-2:2015: "SMPTE Standard - SMPTE Profile for Use of IEEE-1588 Precision Time Protocol in Professional Broadcast Applications".

[128] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

[129] 3GPP TS 23.247: "Architectural enhancements for 5G multicast-broadcast services".

[130] 3GPP TS 23.548: "5G System Enhancements for Edge Computing; Stage 2".

[131] IEEE Std 802.3: "Ethernet".

[132] 3GPP TS 29.561: "5G System; Interworking between 5G Network and external Data Networks; Stage 3".

[133] 3GPP TS 29.513: "Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[134] 3GPP TS 23.558: "Architecture for enabling Edge Applications (EA)".

[135] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[136] 3GPP TS 23.256: "Support of Uncrewed Aerial Systems (UAS) connectivity, identification and tracking; Stage 2".

[137] GSMA NG.116: "Generic Network Slice Template".

[138] IETF RFC 3948: "UDP Encapsulation of IPsec ESP Packets".

[139] 3GPP TS 24.539: "5G System (5GS); Network to TSN translator (TT) protocol aspects; Stage 3".

[140] 3GPP TS 33.220: "Generic Authentication Architecture (GAA); Generic bootstrapping architecture".

[141] 3GPP TS 33.223: "Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA) Push function".

[142] 3GPP TS 23.540: "Technical realization of Service Based Short Message Service; Stage 2".

[143] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[144] 3GPP TS 29.525: "5G System; UE Policy Control Service; Stage 3".

[145] 3GPP TS 29.505: "5G System; Usage of the Unified Data Repository Services for Subscription Data; Stage 3".

[146] IEEE Std P802.1Qdj-d0.3: "IEEE Draft Standard for Local and metropolitan area networks - Bridges and Bridged Networks - Amendment XX: Configuration Enhancements for Time-Sensitive Networking".

[147] 3GPP TS 23.700‑05: "Study on architecture enhancements for vehicle-mounted relays".

[y] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM)".

*NEXT 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.

**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.

**Area of Service:** The area where a UE can access and get service of a particular network slice e.g. as more than zero resources are allocated to the network slice in the NG-RAN cells. It is matching the Coverage Area in the service profile (See TS 28.541 [x]).

Editor’s note: coverageArea in TS 28.541 is defined on a per TA level and defines where the NSI can be selected or a 3GPP communication service is accessible i.e. FFS whether coverageArea or a different area will be used.

**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.

**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.

**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].

**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 1: 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 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-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].

**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.

**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.

**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.

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

**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.

**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.

**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.

**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.

**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.

**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 2: 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 3: UE-DS-TT Residence Time is the same for uplink and downlink traffic and applies to all QoS Flows.

**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 4: 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.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core Network

5G DDNMF 5G Direct Discovery Name Management Function

5G LAN 5G Local Area Network

5GS 5G System

5G-AN 5G Access Network

5G-AN PDB 5G Access Network Packet Delay Budget

5G-EIR 5G-Equipment Identity Register

5G-GUTI 5G Globally Unique Temporary Identifier

5G-BRG 5G Broadband Residential Gateway

5G-CRG 5G Cable Residential Gateway

5G GM 5G Grand Master

5G NSWO 5G Non-Seamless WLAN offload

5G-RG 5G Residential Gateway

5G-S-TMSI 5G S-Temporary Mobile Subscription Identifier

5G VN 5G Virtual Network

5QI 5G QoS Identifier

ADRF Analytics Data Repository Function

AF Application Function

AKMA Authentication and Key Management for Applications

AnLF Analytics Logical Function

AMF Access and Mobility Management Function

AoI Area of Interest

AoS Area of Service

AS Access Stratum

ATSSS Access Traffic Steering, Switching, Splitting

ATSSS-LL ATSSS Low-Layer

AUSF Authentication Server Function

BMCA Best Master Clock Algorithm

BSF Binding Support Function

CAG Closed Access Group

CAPIF Common API Framework for 3GPP northbound APIs

CH Credentials Holder

CHF Charging Function

CN PDB Core Network Packet Delay Budget

CP Control Plane

DAPS Dual Active Protocol Stacks

DCCF Data Collection Coordination Function

DCS Default Credentials Server

DL Downlink

DN Data Network

DNAI DN Access Identifier

DNN Data Network Name

DRX Discontinuous Reception

DS-TT Device-side TSN translator

EAC Early Admission Control

ePDG evolved Packet Data Gateway

EBI EPS Bearer Identity

EUI Extended Unique Identifier

FAR Forwarding Action Rule

FN-BRG Fixed Network Broadband RG

FN-CRG Fixed Network Cable RG

FN-RG Fixed Network RG

FQDN Fully Qualified Domain Name

GBA Generic Bootstrapping Architecture

GEO Geostationary Orbit

GFBR Guaranteed Flow Bit Rate

GIN Group ID for Network Selection

GMLC Gateway Mobile Location Centre

GPSI Generic Public Subscription Identifier

GUAMI Globally Unique AMF Identifier

HMTC High-Performance Machine-Type Communications

HR Home Routed (roaming)

IAB Integrated access and backhaul

IMEI/TAC IMEI Type Allocation Code

IPUPS Inter PLMN UP Security

I-SMF Intermediate SMF

I-UPF Intermediate UPF

LADN Local Area Data Network

LBO Local Break Out (roaming)

LEO Low Earth Orbit

LMF Location Management Function

LoA Level of Automation

LPP LTE Positioning Protocol

LRF Location Retrieval Function

MBS Multicast/Broadcast Service

MBSF Multicast/Broadcast Service Function

MBSR Mobile Base Station Relay

MBSTF Multicast/Broadcast Service Transport Function

MB-SMF Multicast/Broadcast Session Management Function

MB-UPF Multicast/Broadcast User Plane Function

MEO Medium Earth Orbit

MFAF Messaging Framework Adaptor Function

MCX Mission Critical Service

MDBV Maximum Data Burst Volume

MFBR Maximum Flow Bit Rate

MICO Mobile Initiated Connection Only

MINT Minimization of Service Interruption

ML Machine Learning

MPS Multimedia Priority Service

MPTCP Multi-Path TCP Protocol

MTLF Model Training Logical Function

N3IWF Non-3GPP InterWorking Function

N5CW Non-5G-Capable over WLAN

NAI Network Access Identifier

NEF Network Exposure Function

NF Network Function

NGAP Next Generation Application Protocol

NID Network identifier

NPN Non-Public Network

NR New Radio

NRF Network Repository Function

NSAC Network Slice Admission Control

NSACF Network Slice Admission Control Function

NSAG Network Slice AS Group

NSI ID Network Slice Instance Identifier

NSSAA Network Slice-Specific Authentication and Authorization

NSSAAF Network Slice-specific and SNPN Authentication and Authorization Function

NSSAI Network Slice Selection Assistance Information

NSSF Network Slice Selection Function

NSSP Network Slice Selection Policy

NSSRG Network Slice Simultaneous Registration Group

NSWO Non-Seamless WLAN offload

NSWOF Non-Seamless WLAN offload Function

NW-TT Network-side TSN translator

NWDAF Network Data Analytics Function

ONN Onboarding Network

ON-SNPN Onboarding Standalone Non-Public Network

PCF Policy Control Function

PDB Packet Delay Budget

PDR Packet Detection Rule

PDU Protocol Data Unit

PEI Permanent Equipment Identifier

PER Packet Error Rate

PFD Packet Flow Description

PNI-NPN Public Network Integrated Non-Public Network

PPD Paging Policy Differentiation

PPF Paging Proceed Flag

PPI Paging Policy Indicator

PSA PDU Session Anchor

PTP Precision Time Protocol

PVS Provisioning Server

QFI QoS Flow Identifier

QoE Quality of Experience

RACS Radio Capabilities Signalling optimisation

(R)AN (Radio) Access Network

RG Residential Gateway

RIM Remote Interference Management

RQA Reflective QoS Attribute

RQI Reflective QoS Indication

RSN Redundancy Sequence Number

SA NR Standalone New Radio

SBA Service Based Architecture

SBI Service Based Interface

SCP Service Communication Proxy

SD Slice Differentiator

SEAF Security Anchor Functionality

SEPP Security Edge Protection Proxy

SMF Session Management Function

SMSF Short Message Service Function

SN Sequence Number

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SO-SNPN Subscription Owner Standalone Non-Public Network

SSC Session and Service Continuity

SSCMSP Session and Service Continuity Mode Selection Policy

SST Slice/Service Type

SUCI Subscription Concealed Identifier

SUPI Subscription Permanent Identifier

SV Software Version

TA Tracking Area

TAI Tracking Area Identity

TNAN Trusted Non-3GPP Access Network

TNAP Trusted Non-3GPP Access Point

TNGF Trusted Non-3GPP Gateway Function

TNL Transport Network Layer

TNLA Transport Network Layer Association

TSC Time Sensitive Communication

TSCAI TSC Assistance Information

TSCTSF Time Sensitive Communication and Time Synchronization Function

TSN Time Sensitive Networking

TSN GM TSN Grand Master

TSP Traffic Steering Policy

TT TSN Translator

TWIF Trusted WLAN Interworking Function

UAS NF Uncrewed Aerial System Network Function

UCMF UE radio Capability Management Function

UDM Unified Data Management

UDR Unified Data Repository

UDSF Unstructured Data Storage Function

UL Uplink

UL CL Uplink Classifier

UPF User Plane Function

URLLC Ultra Reliable Low Latency Communication

URRP-AMF UE Reachability Request Parameter for AMF

URSP UE Route Selection Policy

VID VLAN Identifier

VLAN Virtual Local Area Network

W-5GAN Wireline 5G Access Network

W-5GBAN Wireline BBF Access Network

W-5GCAN Wireline 5G Cable Access Network

W-AGF Wireline Access Gateway Function

*NEXT CHANGE*

### 5.4.4a UE MM Core Network Capability handling

The UE MM Core Network Capability is split into the S1 UE network capability (mostly for E-UTRAN access related core network parameters) and the UE 5GMM Core Network Capability (mostly to include other UE capabilities related to 5GCN or interworking with EPS) as defined in TS 24.501 [47] and contains non radio-related capabilities, e.g. the NAS security algorithms, etc. The S1 UE network capability is transferred between all CN nodes at AMF to AMF, AMF to MME, MME to MME, and MME to AMF changes. The UE 5GMM Core Network Capability is transferred only at AMF to AMF changes.

In order to ensure that the UE MM Core Network Capability information stored in the AMF is up to date (e.g. to handle the situation when the USIM is moved into a different device while out of coverage, and the old device did not send the Detach message; and the cases of inter-RAT Registration Area Update), the UE shall send the UE MM Core Network Capability information to the AMF during the Initial Registration and Mobility Registration Update procedure within the NAS message.

The AMF shall store always the latest UE MM Core Network Capability received from the UE. Any UE MM Core Network Capability that an AMF receives from an old AMF/MME is replaced when the UE provides the UE MM Core Network Capability with Registration signalling.

If the UE's UE MM Core Network Capability information changes (in either CM-CONNECTED or in CM-IDLE state), the UE shall perform a Mobility Registration Update procedure when it next returns to NG-RAN coverage. See clause 4.2.2 of TS 23.502 [3].

The UE shall indicate in the UE 5GMM Core Network Capability if the UE supports:

- Attach in EPC with Request type "Handover" in PDN CONNECTIVITY Request message (clause 5.3.2.1 of TS 23.401 [26]).

- EPC NAS.

- SMS over NAS.

- LCS.

- 5G SRVCC from NG-RAN to UTRAN, as specified in TS 23.216 [88].

- Radio Capabilities Signalling optimisation (RACS).

- Network Slice-Specific Authentication and Authorization.

- Parameters in Supported Network Behaviour for 5G CIoT as described in clause 5.31.2.

- Receiving WUS Assistance Information (E-UTRA) see clause 5.4.9..

- Paging Subgrouping Support Indication (NR) see clause 5.4.12.

- CAG, see clause 5.30.3.3.

- Subscription-based restrictions to simultaneous registration of network slices (see clause 5.15.12).

- Support of NSAG (see clause 5.15.14).

- Minimization of Service Interruption (MINT), as described in clause 5.40.

- Equivalent SNPNs (see clause 5.30.2.11).

- Unavailability Period, as described in clause 5.4.1.4.

- Support of S-NSSAI location availability policies, as described in clause 5.15.y.2.

If a UE operating two or more USIMs, supports and intends to use one or more Multi-USIM features (see clause 5.38) in a PLMN for a USIM, it shall indicate in the UE 5GMM Core Network Capability for this USIM in this PLMN that it supports these one or more Multi-USIM features with the following indications:

- Connection Release Supported.

- Paging Cause Indication for Voice Service Supported.

- Reject Paging Request Supported.

- Paging Restriction Supported.

Otherwise, the UE with the capabilities of Multi-USIM features but does not intend to use them shall not indicate support of these one or more Multi-USIM features.

A UE not operating two or more USIMs shall indicate the Multi-USIM features are not supported.

NOTE: It is not necessary for a UE operating two or more USIMs to use Multi-USIM features with all USIMs.

*NEXT CHANGE*

### 5.15.1 General

A Network Slice instance is defined within a PLMN or within an SNPN and shall include:

- the Core Network Control Plane and User Plane Network Functions, as described in clause 4.2,

and, in the serving PLMN, at least one of the following:

- the NG-RAN described in TS 38.300 [27];

- the N3IWF or TNGF functions to the non-3GPP Access Network described in clause 4.2.8.2 or the TWIF functions to the trusted WLAN in the case of support of N5CW devices described in clause 4.2.8.5;

- the W-AGF function to the Wireline Access Network described in clause 4.2.8.4.

The 5G System deployed in a PLMN shall always support the procedures, information and configurations specified to support Network Slice instance selection in the present document, TS 23.502 [3] and TS 23.503 [45].

Network slicing support for roaming is described in clause 5.15.6.

Network slices may differ for supported features and network functions optimisations, in which case such Network Slices may have e.g. different S-NSSAIs with different Slice/Service Types (see clause 5.15.2.1). The operator can deploy multiple Network Slices delivering exactly the same features but for different groups of UEs, e.g. as they deliver a different committed service and/or because they are dedicated to a customer, in which case such Network Slices may have e.g. different S-NSSAIs with the same Slice/Service Type but different Slice Differentiators (see clause 5.15.2.1).

The network may serve a single UE with one or more Network Slice instances simultaneously via a 5G-AN regardless of the access type(s) over which the UE is registered (i.e. 3GPP Access and/or N3GPP Access). The AMF instance serving the UE logically belongs to each of the Network Slice instances serving the UE, i.e. this AMF instance is common to the Network Slice instances serving a UE.

NOTE 1: Number of simultaneous connection of Network Slice instances per UE is limited by the number of S-NSSAIs in the Requested/Allowed NSSAI as described in clause 5.15.2.1.

NOTE 2: In this Release of the specification it is assumed that in any (home or visited) PLMN it is always possible to select an AMF that can serve any combination of S-NSSAIs that will be provided as an Allowed NSSAI.

The selection of the set of Network Slice instances for a UE is triggered by the first contacted AMF in a Registration procedure normally by interacting with the NSSF, and can lead to a change of AMF. This is further described in clause 5.15.5.

A PDU Session belongs to one and only one specific Network Slice instance per PLMN. Different Network Slice instances do not share a PDU Session, though different Network Slice instances may have slice-specific PDU Sessions using the same DNN.

During the Handover procedure the source AMF selects a target AMF by interacting with the NRF as specified in clause 6.3.5.

Network Slice-Specific Authentication and Authorization (NSSAA) enables Network Slice specific authentication as described in clause 5.15.10.

Network Slice Admission Control (NSAC) controls the number of registered UEs per network slice and the number of PDU Sessions per network slice as described in clause 5.15.11.

Support of subscription-based restrictions to simultaneous registration of network slices uses Network Slice Simultaneous Registration Group (NSSRG) information to enable control of which Network Slices that can be registered simultaneously by a UE as described in clause 5.15.12.

Support of data rate limitation per Network Slice for a UE enables enforcement of Maximum Bit Rate per Network Slice for a UE as described in clause 5.15.13.

The selection of N3IWF supporting a set of slice(s) is described in clause 6.3.6.

Support for Network Slices with Area of Service not matching deployed Tracking Areas is described in clause 5.15.y.

*NEXT CHANGE*

##### 5.15.4.1.1 UE Network Slice configuration

The Network Slice configuration information contains one or more Configured NSSAI(s). A Configured NSSAI may either be configured by a Serving PLMN and apply to the Serving PLMN, or may be a Default Configured NSSAI configured by the HPLMN and that applies to any PLMNs for which no specific Configured NSSAI has been provided to the UE. There is at most one Configured NSSAI per PLMN.

NOTE 1: The value(s) used in the Default Configured NSSAI are expected to be commonly decided by all roaming partners, e.g. by the use of values standardized by 3GPP or other bodies.

The Default Configured NSSAI, if it is configured in the UE, is used by the UE in a Serving PLMN only if the UE has no Configured NSSAI for the Serving PLMN.

The Configured NSSAI of a PLMN may include S-NSSAIs that have standard values or PLMN-specific values.

The Configured NSSAI for the Serving PLMN includes the S-NSSAI values which can be used in the Serving PLMN and may be associated with mapping of each S-NSSAI of the Configured NSSAI to one or more corresponding HPLMN S-NSSAI values. In the non-roaming case, the network shall not provide any mapped S-NSSAI to the UE with the Configured NSSAI.

A UE subscription may contain Network Slice Simultaneous Registration Group (NSSRG) information. If so, the UE configuration is performed as described in clause 5.15.12.2.

The UE may be pre-configured with the Default Configured NSSAI. The UE may be provisioned/updated with the Default Configured NSSAI, determined by the UDM in the HPLMN, using the UE Parameters Update via UDM Control Plane procedure defined in clause 4.20 of TS 23.502 [3]. Each S-NSSAI in the Default Configured NSSAI may have a corresponding S-NSSAI as part of the Subscribed S-NSSAI(s). Consequently, if the Subscribed S-NSSAI(s) which are also present in the Default Configured NSSAI are updated the UDM should update the Default Configured NSSAI in the UE.

In the HPLMN, the S-NSSAIs in the Configured NSSAI provided as described in clause 5.15.4.2, at the time when they are provided to the UE, shall match the Subscribed S-NSSAIs for the UE. When the Subscribed S-NSSAI(s) are updated (i.e. some existing S-NSSAIs are removed and/or some new S-NSSAIs are added) and one or more are applicable to the Serving PLMN the UE is registered in, as described in clause 5.15.3, or when the associated mapping is updated the AMF shall update the UE with the Configured NSSAI for the Serving PLMN and/or Allowed NSSAI and/or the associated mapping to HPLMN S-NSSAIs (see clause 5.15.4.2). When there is the need to update the Allowed NSSAI, the AMF shall provide the UE with the new Allowed NSSAI and the associated mapping to HPLMN S-NSSAIs, unless the AMF cannot determine the new Allowed NSSAI (e.g. all S-NSSAIs in the old Allowed NSSAI have been removed from the Subscribed S-NSSAIs), in which case the AMF shall not send any Allowed NSSAI to the UE but indicate to the UE to perform a Registration procedure. If the UE is in a CM-IDLE state, the AMF may trigger Network Triggered Service Request or wait until the UE is in a CM-CONNECTED state as described in clause 4.2.4.2, TS 23.502 [3].

When providing a Requested NSSAI to the network upon registration, the UE in a given PLMN only includes and uses S-NSSAIs applying to this PLMN. The mapping of S-NSSAIs of the Requested NSSAI to HPLMN S-NSSAIs may also be provided (see clause 5.15.4.1.2 for when this is needed). The S-NSSAIs in the Requested NSSAI are part of the Configured and/or Allowed NSSAIs applicable for this PLMN, when they are available. If the UE has received NSSRG information together with the Configured NSSAI, it only includes in the Requested NSSAI S-NSSAIs that all share a common NSSRG. If the UE has stored Pending NSSAI and the UE is still interested in the Pending NSSAI then all the S-NSSAIs in the Requested NSSAI and the Pending S-NSSAI shall share a common NSSRG. If no Configured NSSAI and Allowed NSSAI for the PLMN are available, the S-NSSAIs in the Requested NSSAI correspond to the Default Configured NSSAI, if configured in the UE. Upon successful completion of a UE's Registration procedure over an Access Type, the UE obtains from the AMF an Allowed NSSAI for this Access Type, which includes one or more S-NSSAIs and, if needed (see clause 5.15.4.1.2 for when this is needed), their mapping to the HPLMN S-NSSAIs. These S-NSSAIs are valid for the current Registration Area and Access Type provided by the AMF the UE has registered with and can be used simultaneously by the UE (up to the maximum number of simultaneous Network Slice instances or PDU Sessions).

The UE might also obtain one or more rejected S-NSSAIs with cause and validity of rejection from the AMF. An S-NSSAI may be rejected:

- for the entire PLMN;

- for the current Registration Area; or

- for the request not complying with the S-NSSAI location availability policies (see clause 5.15.y).

While it remains RM-REGISTERED in the PLMN and regardless of the Access Type, the UE shall not re-attempt to register to an S-NSSAI rejected for the entire PLMN until this rejected S-NSSAI is deleted as specified below.

While it remains RM-REGISTERED in the PLMN, the UE shall not re-attempt to register to an S-NSSAI rejected in the current Registration Area until it moves out of the current Registration Area.

NOTE 2: The details and more cases of S-NSSAI rejection are described in TS 24.501 [47].

S-NSSAIs that the UE provides in the Requested NSSAI which are neither in the Allowed NSSAI nor provided as a rejected S-NSSAI, shall, by the UE, not be regarded as rejected, i.e. the UE may request to register these S-NSSAIs again next time the UE sends a Requested NSSAI.

The UE stores (S-)NSSAIs as follows:

- When provisioned with a Configured NSSAI for a PLMN and/or a mapping of Configured NSSAI to HPLMN S-NSSAIs and possibly NSSRG information for each S-NSSAI in the Configured NSSAI (if applicable and supported by the UE), or when requested to remove the configuration due to network slicing subscription change, the UE shall:

- replace any stored (old) Configured NSSAI for this PLMN with the new Configured NSSAI for this PLMN (if applicable); and

- delete any stored associated mapping of this old Configured NSSAI for this PLMN to HPLMN S-NSSAIs and, if present and applicable, store the mapping of Configured NSSAI to HPLMN S-NSSAIs; and

- delete any stored associated NSSRG information for each S-NSSAI of the Configured NSSAI and, if present, store the associated NSSRG information for each S-NSSAI of the Configured NSSAI; and

- delete any stored rejected S-NSSAI for this PLMN;

- keep the received Configured NSSAI for a PLMN (if applicable) and associated mapping to HPLMN S-NSSAIs (if applicable) and associated NSSRG information for each S-NSSAI of the Configured NSSAI (if applicable and supported by the UE) stored in the UE, even when registering in another PLMN, until a new Configured NSSAI for this PLMN and/or associated mapping are provisioned in the UE, or until the network slicing subscription changes, as described in clause 5.15.4.2. The number of Configured NSSAIs and associated mapping to be kept stored in the UE for PLMNs other than the HPLMN is up to UE implementation. A UE shall at least be capable of storing a Configured NSSAI for the serving PLMN including any necessary mapping of the Configured NSSAI for the Serving PLMN to HPLMN S-NSSAIs and the Default Configured NSSAI.

- The Allowed NSSAI received in a Registration Accept message or a UE Configuration Update Command applies to a PLMN when at least a TAI of this PLMN is included in the RA/TAI list included in this Registration Accept message or UE Configuration Update Command. If the UE Configuration Update Command contains an Allowed NSSAI but not a TAI List, then the last received RA/TAI list applies for the decision on which PLMN(s) the Allowed NSSAI is applicable. If received, the Allowed NSSAI for a PLMN and Access Type and any associated mapping of this Allowed NSSAI to HPLMN S-NSSAIs shall be stored in the UE. The UE should store this Allowed NSSAI and any associated mapping of this Allowed NSSAI to HPLMN S-NSSAIs also when the UE is turned off, or until the network slicing subscription changes, as described in clause 5.15.4.2:

NOTE 3: Whether the UE stores the Allowed NSSAI and any associated mapping of the Allowed NSSAI to HPLMN S-NSSAIs also when the UE is turned off is left to UE implementation.

- When a new Allowed NSSAI for a PLMN and any associated mapping of the Allowed NSSAI to HPLMN S-NSSAIs are received over an Access Type, the UE shall:

- replace any stored (old) Allowed NSSAI and any associated mapping for these PLMN and Access Type with this new Allowed NSSAI; and

- delete any stored associated mapping of this old Allowed NSSAI for this PLMN to HPLMN S-NSSAIs and, if present, store the associated mapping of this new Allowed NSSAI to HPLMN S-NSSAIs;

- If received, an S-NSSAI rejected for the entire PLMN shall be stored in the UE while RM-REGISTERED in this PLMN regardless of the Access Type or until it is deleted.

- If received, an S-NSSAI rejected for the current Registration Area shall be stored in the UE while RM-REGISTERED until the UE moves out of the current Registration Area or until the S-NSSAI is deleted.

NOTE 4: The storage aspects of rejected S-NSSAIs are described in TS 24.501 [47].

- If received, the Pending NSSAI shall be stored in the UE as described in TS 24.501 [47].

UE configuration to guide UE selection of a N3IWF that supports the S-NSSAIs needed by the UE is defined in clause 6.3.6.

*NEXT CHANGE*

### 5.15.8 Configuration of Network Slice availability in a PLMN

A Network Slice may be available in the whole PLMN or in one or more Tracking Areas of the PLMN. Network Slices may also be supported with Area of Service not matching deployed Tracking Areas as defined in clause 5.15.y.

The availability of a Network Slice refers to the support of the S-NSSAI in the involved NFs. In addition, policies in the NSSF may further restrict from using certain Network Slices in a particular TA, e.g. depending on the HPLMN of the UE. The UE can receive, for a Network Slice where the AoS of the Network Slice does not match the whole set of cells in one or more TAs, S-NSSAI location availability policies as described in clause 5.15.y.

The availability of a Network Slice in a TA is established end-to-end using a combination of OAM and signalling among network functions. It is derived by using the S-NSSAIs supported per TA in 5G-AN, the S-NSSAIs supported in the AMF and operator policies per TA in the NSSF.

The AMF learns the S-NSSAIs supported per TA by the 5G-AN when the 5G-AN nodes establish or update the N2 connection with the AMF (see TS 38.413 [34]) and TS 38.300 [27]). One or all AMF per AMF Set provides and updates the NSSF with the S-NSSAIs support per TA. The 5G-AN learns the S-NSSAIs per PLMN ID the AMFs it connects to support when the 5G-AN nodes establishes the N2 connection with the AMF or when the AMF updates the N2 connection with the 5G-AN (see TS 38.413 [34] and TS 38.300 [27]).

The NSSF may be configured with operator policies specifying under what conditions the S-NSSAIs can be restricted per TA and per HPLMN of the UE.

The per TA restricted S-NSSAIs may be provided to the AMFs of the AMF Sets at setup of the network and whenever changed.

The AMF may be configured for the S-NSSAIs it supports with operator policies specifying any restriction per TA and per HPLMN of the UE.

*NEXT CHANGE*

### 5.15.y Support for Network Slices with Area of Service not matching deployed Tracking Areas

#### 5.15.y.1 General

The network support for a Network Slice is defined on a per Tracking Area granularity. Customers to the operator using certain applications and services can have requirements for geographical availability that are not matching existing Tracking Areas boundaries. The operator may benefit from being able to deploy resources for the Network Slices such that the KPIs for the Network Slice can be met for at least the area defined by the customer. Therefore, certain network slices may have limited geographical availability which results in a Coverage Area (see TS 28.541 [y]) that is not matching existing Tracking Area boundaries.

The operator can in this case decide to change the topology of the Tracking Areas so they match the boundaries of the Coverage Area of the network slice, or the operator may configure resources for the Network Slices in the cells of TAs where the Network Slices are to be available within the Coverage Area, and in areas of the TAs where the network slice is defined to be not available the cells are configured with zero resources or with limited resources to aid mobility and limit signalling. The Area of Service of the network slice is defined in this specification to be the coverage area of the network slice, where the operator allocates greater than zero resources for the network slice or where the operator allocates resources for the network slice adequate to comply with the requirements for the network slice. The network slice is defined to be available within the AoS.

Editor’s note: It is FFS whether AoS are defined as cells with more than zero resources or with resources to comply with the KPI of the network slice.

In order to optimize the end-to-end behaviour, the AMF can configure supporting UEs with S-NSSAI location availability policies, and the 5GC may need to monitor the S-NSSAI usage and enforce the S-NSSAI location availability policies e.g. if the UE does not support the S-NSSAI location availability policies.

#### 5.15.y.2 S-NSSAI location availability policies

S-NSSAI location availability policies defines additional restrictions to the usage of an S-NSSAI in TAs where the coverage area of the network slice does not match the TA boundaries and therefore the AoS is not including all the cells of the TA. The AMF is configured per S-NSSAI whether to send the S-NSSAI location availability policies to supporting UEs.

The S-NSSAI location availability policies includes the following:

- Validity:

- Location information e.g. a set of cells, or combination of cells and TAs.

NOTE: The cells in Location information can be all cells with more than zero resources for the S-NSSAI (i.e. would then include cells with limited resources) or it can be all cells with resources to comply with the KPI of the network slice.

- Policy to apply when validity is not met, but the S-NSSAI is supported in the TA

1. S-NSSAI deregistered; or

2. UP not allowed.

If the UE has indicated that the UE supports S-NSSAI location availability policies in the 5GMM Core Network Capability (see clause 5.4.4a), the AMF may, based on OAM configuration, configure the UE with S-NSSAI location availability policies for one or more S-NSSAIs in the Configured NSSAI where the S-NSSAIs AoS does not match whole TAs, by including the S-NSSAI location availability policies in the Registration Accept message or the UE Configuration Command message.

NOTE: If the AMF provides S-NSSAI location availability policies for an S-NSSAI that the UE has not yet requested, the AMF can set the Policy to UP not allowed as to enable the UE to request the S-NSSAI such that appropriate RRM can be set for the UE i.e. moving the UE to cell/TA supporting the S-NSSAI.

A UE that receives S-NSSAI location availability policies applies the policies to the S-NSSAIs.

If an S-NSSAI becomes not valid as per the Validity in the S-NSSAI location availability policies, then the UE follows the associated Policy as follows:

1. If the Policy indicates S-NSSAI deregistered, then the UE

a) does not add the S-NSSAI to any Requested NSSAI and considers the S-NSSAI as removed from the Allowed NSSAI or Partially Allowed NSSAI and locally releases any PDU Sessions with that S-NSSAI.

b) performs a Mobility Registration Update indicating that the S-NSSAI has been removed from the Allowed NSSAI or Partially Allowed NSSAI.

NOTE: If the UE is still interested in using the S-NSSAI when the S-NSSAI becomes valid as per the Validity, the UE sends a Mobility Registration Update with the S-NSSAI in the Requested NSSAI.

2. If the Policy indicates UP not allowed, then the UE

a) does not attempt to establish any PDU Session with that S-NSSAI;

b) does not attemot to activate User Plane for any PDU Session with that S-NSSAI. The PDU Session with the S-NSSAI is kept.NOTE: An S-NSSAI available in an Allowed NSSAI or Partially Allowed NSSAI is kept without change when Policy indicates UP not allowed, i.e. the UE does not need to register the S-NSSAI again when the S-NSSAI becomes valid.

#### 5.15.y.3 Network based monitoring and enforcement of network slice availability not matching deplyed TAs

The AMF is enforcing S-NSSAI location availability policies that the AMF receives from the OAM.

The AMF enforcement of the S-NSSAI location availability policies, e.g. when the UE does not support the S-NSSAI location availability policies, are performed as follows:

1. The AMF monitors the validity of the S-NSSAI, i.e. as per the location. For monitoring the location, the AMF subscribes to the AoI using the Location information of the S-NSSAI location availability policies.

2. If the UE makes a Registration request with a Requested NSSAI including an S-NSSAI that is not valid as per the S-NSSAI location availability policies, the AMF may reject the request e.g. with rejected S-NSSAI for the RA or reject partially in the RA if the UE supports the Partial Network Slice support in a Registration Area.

3. If the AMF determines that the S-NSSAI becomes not valid i.e. the UE has moved out of the AoI, the AMF, depending on the Policy, performs the following logic:

a) If the Policy indicates S-NSSAI deregistered, then the AMF updates the UE with a UE Configuration Update by removing the S-NSSAI from Configured NSSAI and removing the S-NSSAI from the Allowed NSSAI (which causes the UE to locally release the PDU Sessions), or sets the S-NSSAI as rejected for the RA, and then the AMF requests the SMF to locally release in the network the PDU Sessions with that S-NSSAI as per step 1f in clause 4.2.3.4 in TS 23.502 [3].

b) If the Policy indicates UP not allowed, then the AMF indicate to the SMF to deactivate the User Plane.

4. If the AMF determines that the S-NSSAI becomes valid e.g. the UE has moved into the AoI, the AMF updates the UE with a UCU e.g. including the S-NSSAI in the Configured NSSAI.

As to ensure that the NG-RAN can try to move the UE into the Network Slice Area of Service when the Policy is Registration is not allowed and the S-NSSAI is removed from the Allowed NSSAI, the AMF sends a Target NSSAI (and associated RFSP) with the S-NSSAIs of the Allowed NSSAI and the S-NSSAIs that are not allowed as per the location information in the S-NSSAI location availability policies.

OAM may configure RRM policies for S-NSSAIs on a per cell basis as defined in TS 28.541 [y], i.e. cells outside the Network Slice Area of Service while in a TA supporting the S-NSSAI may be allocated limited or no RRM resources for the S-NSSAI.

If some of the cells of the TAs supporting the S-NSSAI are configured with limited RRM resources, then the OAM configures the SMF to provide to the CHF information whether the UE is in Network Slice Area of Service or whether the UE is out of the Network Slice Area of Service. This is achieved by SMF subscribing to the AoI corresponding to the AoS for the S-NSSAI.

NOTE: If cells are configured with either zero resources or with resources to comply with the KPI of the network slice, then the UP will only be activated while the UE is in the AoS i.e. there is no need to provide CHF with the in or out of AoS information.

*NEXT CHANGE*

### 6.2.1 AMF

The Access and Mobility Management function (AMF) includes the following functionality. Some or all of the AMF functionalities may be supported in a single instance of an AMF:

- Termination of RAN CP interface (N2).

- Termination of NAS (N1), NAS ciphering and integrity protection.

- Registration management.

- Connection management.

- Reachability management.

- Mobility Management.

- Lawful intercept (for AMF events and interface to LI System).

- Provide transport for SM messages between UE and SMF.

- Transparent proxy for routing SM messages.

- Access Authentication.

- Access Authorization.

- Provide transport for SMS messages between UE and SMSF.

- Security Anchor Functionality (SEAF) as specified in TS 33.501 [29].

- Location Services management for regulatory services.

- Provide transport for Location Services messages between UE and LMF as well as between RAN and LMF.

- EPS Bearer ID allocation for interworking with EPS.

- UE mobility event notification.

- S-NSSAIs per TA mapping notification.

- Support for Control Plane CIoT 5GS Optimisation.

- Support for User Plane CIoT 5GS Optimisation.

- Support for restriction of use of Enhanced Coverage.

- Provisioning of external parameters (Expected UE Behaviour parameters or Network Configuration parameters).

- Support for Network Slice-Specific Authentication and Authorization.

- Support for charging.

- Controlling the 5G access stratum-based time distribution based on UE's subscription data.

NOTE 1: Regardless of the number of Network functions, there is only one NAS interface instance per access network between the UE and the CN, terminated at one of the Network functions that implements at least NAS security and Mobility Management.

In addition to the functionalities of the AMF described above, the AMF may include the following functionality to support non-3GPP access networks:

- Support of N2 interface with N3IWF/TNGF. Over this interface, some information (e.g. 3GPP Cell Identification) and procedures (e.g. Handover related) defined over 3GPP access may not apply, and non-3GPP access specific information may be applied that do not apply to 3GPP accesses.

- Support of NAS signalling with a UE over N3IWF/TNGF. Some procedures supported by NAS signalling over 3GPP access may be not applicable to untrusted non-3GPP (e.g. Paging) access.

- Support of authentication of UEs connected over N3IWF/TNGF.

- Management of mobility, authentication, and separate security context state(s) of a UE connected via a non-3GPP access or connected via a 3GPP access and a non-3GPP access simultaneously.

- Support as described in clause 5.3.2.3 a co-ordinated RM management context valid over a 3GPP access and a Non 3GPP access.

- Support as described in clause 5.3.3.4 dedicated CM management contexts for the UE for connectivity over non-3GPP access.

- Determine whether the serving N3IWF is appropriate based on the slices supported by the N3IWFs as specified in clause 6.3.6.

NOTE 2: Not all of the functionalities are required to be supported in an instance of a Network Slice.

In addition to the functionalities of the AMF described above, the AMF may include policy related functionalities as described in clause 6.2.8 of TS 23.503 [45].

The AMF uses the N14 interface for AMF re-allocation and AMF to AMF information transfer. This interface may be either intra-PLMN or inter-PLMN (e.g. in the case of inter-PLMN mobility).

In addition to the functionality of the AMF described above, the AMF may include the following functionality to support monitoring in roaming scenarios:

- Normalization of reports according to roaming agreements between VPLMN and HPLMN (e.g. change the location granularity in a report from cell level to a level that is appropriate for the HPLMN); and

- Generation of charging/accounting information for Monitoring Event Reports that are sent to the HPLMN.

In addition to the functionality of the AMF described above, the AMF may provide support for Network Slice restriction and Network Slice instance restriction based on NWDAF analytics.

In addition to the functionalities of the AMF described above, the AMF may provide support for the Disaster Roaming as described in clause 5.40.

In addition to the functionalities of the AMF described above, the AMF may also include following functionalities to support Network Slice Admission Control:

- Support of NSAC for maximum number of UEs as defined in clauses 5.15.11.1 and 5.15.11.3.

In addition to the functionality of the AMF described above, the AMF may include the following functionality to support SNPNs:

- Support for Onboarding of UEs for SNPNs.

In addition to the functionalities of the AMF described above, the AMF may also include following functionalities to support satellite backhaul:

- Support for reporting satellite backhaul category (i.e. GEO, MEO, LEO or OTHERSAT) and its modification based on AMF local configuration to SMF as defined in clause 5.8.2.15.

In addition to the functionalities of the AMF described above, the AMF may also include functionalities to support for network slice area of service not matching deployed Tracking Areas as described in clause 5.15.y.

*NEXT CHANGE*

### 6.2.2 SMF

The Session Management function (SMF) includes the following functionality. Some or all of the SMF functionalities may be supported in a single instance of a SMF:

- Session Management e.g. Session Establishment, modify and release, including tunnel maintain between UPF and AN node.

- UE IP address allocation & management (including optional Authorization). The UE IP address may be received from a UPF or from an external data network.

- DHCPv4 (server and client) and DHCPv6 (server and client) functions.

- Functionality to respond to Address Resolution Protocol (ARP) requests and / or IPv6 Neighbour Solicitation requests based on local cache information for the Ethernet PDUs. The SMF responds to the ARP and / or the IPv6 Neighbour Solicitation Request by providing the MAC address corresponding to the IP address sent in the request.

- Selection and control of UP function, including controlling the UPF to proxy ARP or IPv6 Neighbour Discovery, or to forward all ARP/IPv6 Neighbour Solicitation traffic to the SMF, for Ethernet PDU Sessions.

- Configures traffic steering at UPF to route traffic to proper destination.

- 5G VN group management, e.g. maintain the topology of the involved PSA UPFs, establish and release the N19 tunnels between PSA UPFs, configure traffic forwarding at UPF to apply local switching, N6-based forwarding or N19-based forwarding.

- Termination of interfaces towards Policy control functions.

- Lawful intercept (for SM events and interface to LI System).

- Support for charging.

- Control and coordination of charging data collection at UPF.

- Termination of SM parts of NAS messages.

- Downlink Data Notification.

- Initiator of AN specific SM information, sent via AMF over N2 to AN.

- Determine SSC mode of a session.

- Support for Control Plane CIoT 5GS Optimisation.

- Support of header compression.

- Act as I-SMF in deployments where I-SMF can be inserted, removed and relocated.

- Provisioning of external parameters (Expected UE Behaviour parameters or Network Configuration parameters).

- Support P-CSCF discovery for IMS services.

- Act as V-SMF with following roaming functionalities:

- Handle local enforcement to apply QoS SLAs (VPLMN).

- Charging (VPLMN).

- Lawful intercept (in VPLMN for SM events and interface to LI System).

- Support for interaction with external DN for transport of signalling for PDU Session authentication/authorization by external DN.

- Instructs UPF and NG-RAN to perform redundant transmission on N3/N9 interfaces.

NOTE: Not all of the functionalities are required to be supported in an instance of a Network Slice.

In addition to the functionalities of the SMF described above, the SMF may include policy related functionalities as described in clause 6.2.2 of TS 23.503 [45].

In addition to the functionality of the SMF described above, the SMF may include the following functionality to support monitoring in roaming scenarios:

- Normalization of reports according to roaming agreements between VPLMN and HPLMN; and

- Generation of charging information for Monitoring Event Reports that are sent to the HPLMN.

The SMF may also include following functionalities to support Edge Computing enhancements (further defined in TS 23.548 [130]):

- Selection of EASDF and provision of its address to the UE as the DNS Server for the PDU session;

- Usage of EASDF services as defined in TS 23.548 [130];

- For supporting the Application Layer Architecture defined in TS 23.558 [134]: Provision and updates of ECS Address Configuration Information to the UE.

The SMF and SMF+ PGW-C may also include following functionalities to support Network Slice Admission Control:

- Support of NSAC for maximum number of PDU sessions as defined in clauses 5.15.11.2, 5.15.11.3 and 5.15.11.5.

- Support of NSAC for maximum number of UEs as defined in clauses 5.15.11.3 and 5.15.11.5.

The SMF may also include functionalities to support network based monitoring and enforcement of network slice availability not matching deplyed TAs as described in clause 5.15.y3.

*END CHANGE*