**3GPP TSG-WG SA2 Meeting #166S2-2411436**

**Orlando, USA, 18 – 22 November 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.502** | **CR** | **5127** | **rev** | **-** | **Current version:** | **19.1.0** |  |
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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:*** | Support of LP-WUS Assistance | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI19, NR\_LPWUS-Core | | | | |  | ***Date:*** | | | 2024-11-04 |
|  |  | | | |  | |  | | |  |
| ***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 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)* | |
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| ***Reason for change:*** | | According to the LS (S2-2411297) from RAN WG2: LS on LP-WUS subgrouping, it need to define the cooreponding WUS Assistance feature with Paging Subgrouping Assistance to reflect the RAN aggreement. | | | | | | | | |
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| ***Summary of change:*** | | Support of LP-WUS Assistance. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | LP-WUS is not supported. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.2.2.2.2, 4.2.3.3, 4.2.4.1, 5.2.2.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **x** |  | Other core specifications | | | | TS/TR 23.501 CR 5824 | | |
| ***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\* \* \* \*

##### 4.2.2.2.2 General Registration



Figure 4.2.2.2.2-1: Registration procedure

1. UE to (R)AN: AN message (AN parameters, Registration Request (Registration type, SUCI or 5G-GUTI or PEI, [last visited TAI (if available)], Security parameters, [Requested NSSAI], [Mapping Of Requested NSSAI], [Default Configured NSSAI Indication], [UE Radio Capability Update], [UE MM Core Network Capability], [PDU Session status], [List Of PDU Sessions To Be Activated], [Follow-on request], [MICO Indication], [Requested Active Time], [Requested DRX parameters for E-UTRA and NR], [Requested DRX parameters for NB-IoT], [extended idle mode DRX parameters], [LADN DNN(s) or Indicator Of Requesting LADN Information], [NAS message container], [Support for restriction of use of Enhanced Coverage], [Preferred Network Behaviour], [UE paging probability information], [Paging Subgrouping Support Indication], [UE Policy Container (the list of PSIs, indication of UE support for ANDSP, the operating system identifier, Indication of URSP Provisioning Support in EPS, UE capability of reporting URSP rule enforcement to network, UE capability of supporting VPLMN-specific URSP rules)] and [UE Radio Capability ID], [Release Request indication], [Paging Restriction Information], PEI, [PLMN with Disaster Condition], [Requested Periodic Update time], [Unavailability Period Duration], [Start of Unavailability Period], [Unavailability Type])).

NOTE 1: The UE Policy Container and its usage is defined in TS 23.503 [20].

In the case of NG-RAN, the AN parameters include e.g. 5G-S-TMSI or GUAMI, the Selected PLMN ID (or PLMN ID and NID, see clause 5.30 of TS 23.501 [2]) and NSSAI information, the AN parameters also include Establishment cause. The Establishment cause provides the reason for requesting the establishment of an RRC connection. Whether and how the UE includes the NSSAI information as part of the AN parameters is dependent on the value of the Access Stratum Connection Establishment NSSAI Inclusion Mode parameter, as specified in clause 5.15.9 of TS 23.501 [2].

The AN parameters shall also include an IAB-Indication if the UE is an IAB-node accessing 5GS.

The AN parameters shall also include a MBSR Indication if the UE is part of an MBSR node accessing 5GS attempting MBSR operation in the PLMN as specified in clause 5.35A.1 of TS 23.501 [2].

The Registration type indicates if the UE wants to perform an Initial Registration (i.e. the UE is in RM-DEREGISTERED state), a Mobility Registration Update (i.e. the UE is in RM-REGISTERED state and initiates a Registration procedure due to mobility or due to the UE needs to update its capabilities or protocol parameters, or to request a change of the set of network slices it is allowed to use), a Periodic Registration Update (i.e. the UE is in RM-REGISTERED state and initiates a Registration procedure due to the Periodic Registration Update timer expiry, see clause 4.2.2.2.1), an Emergency Registration (i.e. the UE is in limited service state), a Disaster Roaming Initial Registration, or a Disaster Roaming Mobility Registration Update.

When the UE is using E-UTRA, the UE indicates its support of CIoT 5GS Optimisations, which is relevant for the AMF selection, in the RRC connection establishment signalling associated with the Registration Request.

When the UE is performing an Initial Registration or a Disaster Roaming Registration the UE shall indicate its UE identity in the Registration Request message as follows, listed in decreasing order of preference in the case of registration with a PLMN:

i) a 5G-GUTI mapped from an EPS GUTI, if the UE has a valid EPS GUTI.

ii) a native 5G-GUTI assigned by the PLMN to which the UE is attempting to register, if available;

iii) a native 5G-GUTI assigned by an equivalent PLMN to the PLMN to which the UE is attempting to register, if available;

iv) a native 5G-GUTI assigned by any other PLMN, if available; or

NOTE 2: This can also be a 5G-GUTIs assigned via another access type.

v) Otherwise, the UE shall include its SUCI in the Registration Request as defined in TS 33.501 [15].

If the UE is registering with an SNPN, when the UE is performing an Initial Registration the UE shall indicate its UE identity in the Registration Request message as follows, listed in decreasing order of preference:

i) a native 5G-GUTI assigned by the same SNPN to which the UE is attempting to register, if available;

ii) a native 5G-GUTI assigned by an equivalent SNPN to the SNPN to which the UE is attempting to register along with the NID of the SNPN that assigned the 5G-GUTI, if available;

iii) a native 5G-GUTI assigned by any other SNPN along with the NID of the SNPN that assigned the 5G-GUTI, if available; or

iv) Otherwise, the UE shall include its SUCI in the Registration Request as defined in TS 33.501 [15].

When the UE performing an Initial Registration has both a valid EPS GUTI and a native 5G-GUTI, the UE shall also indicate the native 5G-GUTI as Additional GUTI. If more than one native 5G-GUTIs are available, the UE shall select the 5G-GUTI in decreasing order of preference among items (ii)-(iv) in the list above.

The NAS message container shall be included if the UE is sending a Registration Request message as an Initial NAS message and the UE has a valid 5G NAS security context and the UE needs to send non-cleartext IEs, see clause 4.4.6 of TS 24.501 [25]. If the UE does not need to send non-cleartext IEs, the UE shall send a Registration Request message without including the NAS message container.

If the UE does not have a valid 5G NAS security context, the UE shall send the Registration Request message without including the NAS message container. The UE shall include the entire Registration Request message (i.e. containing cleartext IEs and non-cleartext IEs) in the NAS message container that is sent as part of the Security Mode Complete message in step 9b.

When the UE is performing an Initial Registration (i.e. the UE is in RM-DEREGISTERED state) with a native 5G-GUTI then the UE shall indicate the related GUAMI information in the AN parameters. When the UE is performing an Initial Registration with its SUCI, the UE shall not indicate any GUAMI information in the AN parameters.

When the UE is performing an Initial Registration or a Mobility Registration and if CIoT 5GS Optimisations are supported the UE shall indicate its Preferred Network Behaviour (see clause 5.31.2 of TS 23.501 [2]). If S1 mode is supported the UE's EPC Preferred Network Behaviour is included in the S1 UE network capabilities in the Registration Request message, see clause 8.2.6.1 of TS 24.501 [25].

For an Emergency Registration, the SUCI shall be included if the UE does not have a valid 5G-GUTI available; the PEI shall be included when the UE has no SUPI and no valid 5G-GUTI. In other cases, the 5G-GUTI is included and it indicates the last serving AMF.

The UE may provide the UE's usage setting based on its configuration as defined in clause 5.16.3.7 of TS 23.501 [2]. The UE provides Requested NSSAI (as described in clause 5.15.5.2.1 of TS 23.501 [2] and if the UE supports the subscription-based restrictions to simultaneous registration of network slices, also taking into account the NSSRG Information constraints as described in clause 5.15.12 of TS 23.501 [2] and in the case of Initial Registration or Mobility Registration Update, the UE includes the Mapping Of Requested NSSAI (if available), which is the mapping of each S-NSSAI of the Requested NSSAI to the HPLMN S-NSSAIs, to ensure that the network is able to verify whether the S-NSSAI(s) in the Requested NSSAI are permitted based on the Subscribed S-NSSAIs. If the Network Slice Replacement is used and the UE is configured with Mapping Of Alternative NSSAI, the Requested NSSAI may include Alternative S-NSSAI(s). If the AMF determines that S-NSSAI(s) that the UE requests are not Alternative S-NSSAI(s) in the UE context and not Subscribed S-NSSAIs, the AMF determines to update the UE configuration as described in clause 5.15.19 of TS 23.501 [2]. In the case of inter PLMN mobility, if the serving PLMN S-NSSAI(s) corresponding to the established PDU Session(s) are not present in the UE, the associated HPLMN S-NSSAI(s) associated with the established PDU Session(s) shall be provided in the Mapping Of Requested NSSAI as described in clause 5.15.5.2.1 TS 23.501 [2]. If the UEs supports reconnection to the network due to RAN timing synchronization status change as described in TS 23.501 [2], the UE indicates the support of this capability to the network. If the UE supports UE configuration of network-controlled Slice Usage Policy and the UE stores Slice Usage Policy, the UE shall include an on demand S-NSSAI in the Requested NSSAI only when applications in the UE require data transmission by a PDU session associated with the on demand S-NSSAI as described in clause 5.15.15 of TS 23.501 [2].

The UE includes the Default Configured NSSAI Indication if the UE is using a Default Configured NSSAI, as defined in TS 23.501 [2].

The UE may include UE paging probability information if it supports LP-WUS Subgrouping, the assignment of WUS Assistance Information or AMF PEIPS Assistance Information from the AMF (see TS 23.501 [2]).

The UE may include Paging Subgrouping Support Indication as defined in TS 23.501 [2].

The UE may include LP-WUS Subgrouping Support Indication as defined in TS 23.501 [2].

In the case of Mobility Registration Update, the UE includes in the List Of PDU Sessions To Be Activated the PDU Sessions for which there are pending uplink data. When the UE includes the List Of PDU Sessions To Be Activated, the UE shall indicate PDU Sessions only associated with the access the Registration Request is related to. As defined in TS 24.501 [25] the UE shall include always-on PDU Sessions which are accepted by the network in the List Of PDU Sessions To Be Activated even if there are no pending uplink data for those PDU Sessions.

NOTE 3: A PDU Session corresponding to a LADN is not included in the List Of PDU Sessions To Be Activated when the UE is outside the area of availability of the LADN.

The UE MM Core Network Capability is provided by the UE and handled by AMF as defined in clause 5.4.4a of TS 23.501 [2]. The UE includes in the UE MM Core Network Capability an indication if it supports Request Type flag "handover" for PDN connectivity request during the attach procedure as defined in clause 5.17.2.3.1 of TS 23.501 [2]. If the UE supports 'Strictly Periodic Registration Timer Indication', the UE indicates its capability of 'Strictly Periodic Registration Timer Indication' in the MICO Indication. If the UE supports CAG, the UE indicates its capability of "CAG supported" in the UE MM Core Network Capability. If the UE operating two or more USIMs, supports and intends to use one or more Multi-USIM feature(s), the UE indicates one or more Multi-USIM specific features described in clause 5.38 of TS 23.501 [2] in the UE MM Core Network Capability. If the UE supports equivalent SNPNs, the UE indicates its capability of "equivalent SNPNs" in the UE MM Core Network Capability. If the UE supports Unavailability Period, the UE indicates its capability of "Unavailability Period Support" in the UE MM Core Network Capability. If the UE supports LADN per DNN and S-NSSAI, the UE indicates its support of LADN per DNN and S-NSSAI in the UE MM Core Network Capability. If the UE supports the Network Slice Replacement feature, the UE indicates support for Network Slice Replacement feature as described in clause 5.15.19 of TS 23.501 [2]. If the UE supports UE configuration of network-controlled Slice Usage Policy, the UE indicates its capability of "UE Configuration of network-controlled Slice Usage Policy" in the UE MM Core Network Capability as described in clause 5.15.15 of TS 23.501 [2].

The UE may provide either the LADN DNN(s) or an Indication Of Requesting LADN Information as described in clause 5.6.5 of TS 23.501 [2].

If available, the last visited TAI shall be included in order to help the AMF produce Registration Area for the UE.

NOTE 4: With NR satellite access, the last visited TAI is determined as specified in clause 5.4.11.6 of TS 23.501 [2].

The Security parameters are used for Authentication and integrity protection, see TS 33.501 [15]. Requested NSSAI indicates the Network Slice Selection Assistance Information (as defined in clause 5.15 of TS 23.501 [2]). The PDU Session status indicates the previously established PDU Sessions in the UE. When the UE is connected to the two AMFs belonging to different PLMN via 3GPP access and non-3GPP access then the PDU Session status indicates the established PDU Session of the current PLMN in the UE.

The Follow-on request is included when the UE has pending uplink signalling and the UE doesn't include List Of PDU Sessions To Be Activated, or the Registration type indicates the UE wants to perform an Emergency Registration. In Initial Registration and Mobility Registration Update, UE provides the UE Requested DRX parameters, as defined in clause 5.4.5 of TS 23.501 [2]. The UE may provide the extended idle mode DRX parameters as defined in clause 5.31.7.2 of TS 23.501 [2] to request extended idle mode DRX.

The UE provides UE Radio Capability Update indication as described in TS 23.501 [2].

The UE includes the MICO Indication and optionally a Requested Active Time value and Requested Periodic Update time value if the UE wants to use MICO Mode with Active Time.

For a UE using NR satellite access that provides discontinuous coverage or an event is triggered in the UE that would make the UE unavailable for a certain period of time, the UE may include an Unavailability Type, an Unavailability Period Duration and/or Start of Unavailability Period as described in clause 5.4.13.1 of TS 23.501 [2].

The UE may indicate its Service Gap Control Capability in the UE MM Core Network Capability, see clause 5.31.16 of TS 23.501 [2].

For a UE with a running Service Gap timer in the UE, the UE shall not set Follow-on Request indication or Uplink data status in the Registration Request message (see clause 5.31.16 of TS 23.501 [2]), except for network access for regulatory prioritized services like Emergency services or exception reporting.

If UE supports RACS and has been assigned UE Radio Capability ID(s), the UE shall indicate a UE Radio Capability ID as defined in clause 5.4.4.1a of TS 23.501 [2] as non-cleartext IE.

The PEI may be retrieved in initial registration from the UE as described in clause 4.2.2.2.1.

If a UE supports the subscription-based restrictions to simultaneous registration of network slices feature, it includes the NSSRG handling support indication in the UE 5GMM Core Network Capability according to clause 5.15.12 of TS 23.501 [2]. The AMF stores whether the UE supports this feature in the UE context.

If a UE supports the temporary available network slices feature, it includes the indication of support for temporary available network slices in the UE 5GMM Network Capability according to clause 5.15.16 of TS 23.501 [2].

When a Multi-USIM UE wants to enter CM-IDLE state immediately e.g. after having performed mobility or periodic registration, it includes the Release Request indication and optionally provides Paging Restriction Information.

When the UE is performing a Disaster Roaming Registration, the UE may indicate the PLMN with Disaster Condition for the cases as defined in TS 24.501 [25].

2. If a 5G-S-TMSI or GUAMI is not included or the 5G-S-TMSI or GUAMI does not indicate a valid AMF the (R)AN, based on (R)AT and Requested NSSAI, if available, selects an AMF

The (R)AN selects an AMF as described in clause 6.3.5 of TS 23.501 [2]. If UE is in CM-CONNECTED state, the (R)AN can forward the Registration Request message to the AMF based on the N2 connection of the UE.

If the (R)AN cannot select an appropriate AMF, it forwards the Registration Request to an AMF which has been configured, in (R)AN, to perform AMF selection.

3. (R)AN to new AMF: N2 message (N2 parameters, Registration Request (as described in step 1) and [LTE-M Indication].

When NG-RAN is used, the N2 parameters include the Selected PLMN ID (or PLMN ID and NID, see clause 5.30 of TS 23.501 [2]), Location Information and Cell Identity related to the cell in which the UE is camping, UE Context Request which indicates that a UE context including security information needs to be setup at the NG-RAN.

When NG-RAN is used, the N2 parameters shall also include the Establishment cause and IAB-Indication or MBSR Indication if the indication is received in AN parameters in step 1.

Mapping Of Requested NSSAI is provided only if available.

If the Registration type indicated by the UE is Periodic Registration Update, then steps 4 to 19 may be omitted.

When the Establishment cause is associated with priority services (e.g. MPS, MCS), the AMF includes a Message Priority header to indicate priority information. Other NFs relay the priority information by including the Message Priority header in service-based interfaces, as specified in TS 29.500 [17].

The RAT Type the UE is using is determined (see clause 4.2.2.2.1) and based on it the AMF determines whether the UE is performing Inter-RAT mobility to or from NB-IoT. If the AMF receives the LTE M indication, then it considers that the RAT Type is LTE-M and stores the LTE-M Indication in UE Context.

If a UE includes a Preferred Network Behaviour, this defines the Network Behaviour the UE supports and is expecting to be available in the network as defined in clause 5.31.2 of TS 23.501 [2].

If the UE has included the Preferred Network Behaviour and what the UE indicated it supports in Preferred Network Behaviour is incompatible with the network support, the AMF shall reject the Registration Request with an appropriate cause value (e.g. one that avoids retries on this PLMN).

If there is a Service Gap timer running in the UE Context in AMF for the UE and Follow-on Request indication or Uplink data status is included in the Registration Request message, the AMF shall ignore the Follow-on Request indication and Uplink data status and not perform any of the actions related to the status.

If the UE has included a UE Radio Capability ID in step 1 and the AMF supports RACS, the AMF stores the Radio Capability ID in UE context.

For NR satellite access, the AMF may verify the UE location and determine whether the PLMN is allowed to operate at the UE location, as described in clause 5.4.11.4 of TS 23.501 [2]. If the UE receives a Registration Reject message with cause value indicating that the PLMN is not allowed to operate at the present UE location, the UE shall attempt to select a PLMN as specified in TS 23.122 [22].

For a Disaster Roaming Registration, based on the ULI (including Cell ID) received from the NG-RAN, the PLMN with Disaster Condition derived from the UE's 5G-GUTI, derived from the UE's SUCI or indicated by the UE and the local configuration, the AMF determines if Disaster Roaming service can be provided. If the current location is not subject to Disaster Roaming service or the Disaster Roaming service is not provided to the PLMN with Disaster Condition derived from the UE's 5G-GUTI, derived from the UE's SUCI or indicated by UE, then the AMF should reject the Registration Request indicating a suitable Cause value.

4. [Conditional] new AMF to old AMF: Namf\_Communication\_UEContextTransfer (complete Registration Request) or new AMF to UDSF: Nudsf\_Unstructured Data Management\_Query().

The new AMF determines the old AMF using the UE's 5G-GUTI. If the new AMF received an NID in the Registration request, it determines that the 5G-GUTI was assigned by an SNPN and determines the old AMF using the 5G-GUTI and NID of the SNPN.

(With UDSF Deployment): If the UE's 5G-GUTI was included in the Registration Request and the serving AMF has changed since last Registration procedure, new AMF and old AMF are in the same AMF Set and UDSF is deployed, the new AMF retrieves the stored UE's SUPI and UE context directly from the UDSF using Nudsf\_UnstructuredDataManagement\_Query service operation or they can share stored UE context via implementation specific means if UDSF is not deployed. This includes also event subscription information by each NF consumer for the given UE. In this case, the new AMF uses integrity protected complete Registration request NAS message to perform and verify integrity protection.

(Without UDSF Deployment): If the UE's 5G-GUTI was included in the Registration Request and the serving AMF has changed since last Registration procedure, the new AMF may invoke the Namf\_Communication\_UEContextTransfer service operation on the old AMF including the complete Registration Request NAS message, which may be integrity protected, as well as the Access Type, to request the UE's SUPI and UE Context. See clause 5.2.2.2.2 for details of this service operation. In this case, the old AMF uses either 5G-GUTI and the integrity protected complete Registration request NAS message, or the SUPI and an indication that the UE is validated from the new AMF, to verify integrity protection if the context transfer service operation invocation corresponds to the UE requested. The old AMF also transfers the event subscriptions information by each NF consumer, for the UE, to the new AMF. If the old AMF has not yet reported a non-zero MO Exception Data Counter to the (H-)SMF, the Context Response also includes the MO Exception Data Counter.

If the old AMF has PDU Sessions for another access type (different from the Access Type indicated in this step) and if the old AMF determines that there is no possibility for relocating the N2 interface to the new AMF, the old AMF returns UE's SUPI and indicates that the Registration Request has been validated for integrity protection, but does not include the rest of the UE context.

For inter PLMN mobility, UE Context information includes HPLMN S-NSSAIs corresponding to the Allowed NSSAI for each Access Type and Partially Allowed NSSAI, without Allowed NSSAI and Partially Allowed NSSAI of old PLMN.

NOTE 5: The new AMF Sets the indication that the UE is validated according to step 9a, if the new AMF has performed successful UE authentication after previous integrity check failure in the old AMF.

NOTE 6: The NF consumers do not need to subscribe for the events once again with the new AMF after the UE is successfully registered with the new AMF.

If the new AMF has already received UE contexts from the old AMF during handover procedure, then step 4,5 and 10 shall be skipped.

For an Emergency Registration, if the UE identifies itself with a 5G-GUTI that is not known to the AMF, steps 4 and 5 are skipped and the AMF immediately requests the SUPI from the UE. If the UE identifies itself with PEI, the SUPI request shall be skipped. Allowing Emergency Registration without a user identity is dependent on local regulations.

5. [Conditional] old AMF to new AMF: Response to Namf\_Communication\_UEContextTransfer (SUPI, UE Context in AMF (as per Table 5.2.2.2.2-1)) or UDSF to new AMF: Nudsf\_Unstructured Data Management\_Query(). The old AMF may start an implementation specific (guard) timer for the UE context.

If the UDSF was queried in step 4, the UDSF responds to the new AMF for the Nudsf\_Unstructured Data Management\_Query invocation with the related contexts including established PDU Sessions, the old AMF includes SMF information DNN, S-NSSAI(s) and PDU Session ID, active NGAP UE-TNLA bindings to N3IWF/TNGF/W-AGF, the old AMF includes information about the NGAP UE-TNLA bindings. If the Old AMF was queried in step 4, Old AMF responds to the new AMF for the Namf\_Communication\_UEContextTransfer invocation by including the UE's SUPI and UE Context.

If old AMF holds information about established PDU Session(s) and it is not an Initial Registration, the old AMF includes SMF information, DNN(s), S-NSSAI(s) and PDU Session ID(s).

If old AMF holds UE context established via N3IWF, W-AGF or TNGF, the old AMF includes the CM state via N3IWF, W-AGF or TNGF. If the UE is in CM-CONNECTED state via N3IWF, W-AGF or TNGF, the old AMF includes information about the NGAP UE-TNLA bindings.

If old AMF fails the integrity check of the Registration Request NAS message, the old AMF shall indicate the integrity check failure. If the new AMF is configured to allow emergency services for unauthenticated UE, the new AMF behaves as follows:

- If the UE has only an emergency PDU Session, the AMF either skips the authentication and security procedure or accepts that the authentication may fail and continues the Mobility Registration Update procedure; or

- If the UE has both emergency and non emergency PDU Sessions and authentication fails, the AMF continues the Mobility Registration Update procedure and deactivates all the non-emergency PDU Sessions as specified in clause 4.3.4.2.

NOTE 7: The new AMF can determine if a PDU Session is used for emergency service by checking whether the DNN matches the emergency DNN.

If old AMF holds information about AM Policy Association and the information about UE Policy Association (i.e. the Policy Control Request Trigger for updating UE Policy as defined in TS 23.503 [20]), the old AMF includes the information about the AM Policy Association, the UE Policy Association and PCF ID. In the roaming case, V-PCF ID and H-PCF ID are included.

If old AMF was a consumer of UE related NWDAF services, the old AMF includes information about active analytics subscriptions, i.e. the Subscription Correlation ID, NWDAF identifier (i.e. Instance ID or Set ID), Analytics ID(s) and associated Analytics specific data in the Namf\_Communication\_UEContextTransfer response. Usage of the analytics information by the new AMF is specified in TS 23.288 [50].

During inter PLMN mobility, the handling of the UE Radio Capability ID in the new AMF is as defined in TS 23.501 [2].

NOTE 8: When new AMF uses UDSF for context retrieval, interactions between old AMF, new AMF and UDSF due to UE signalling on old AMF at the same time is implementation issue.

6. [Conditional] new AMF to UE: Identity Request ().

If the SUCI is not provided by the UE nor retrieved from the old AMF the Identity Request procedure is initiated by AMF sending an Identity Request message to the UE requesting the SUCI.

7. [Conditional] UE to new AMF: Identity Response ().

The UE responds with an Identity Response message including the SUCI. The UE derives the SUCI by using the provisioned public key of the HPLMN, as specified in TS 33.501 [15].

8. The AMF may decide to initiate UE authentication by invoking an AUSF. In that case, the AMF selects an AUSF based on SUPI or SUCI, as described in clause 6.3.4 of TS 23.501 [2].

If the AMF is configured to support Emergency Registration for unauthenticated SUPIs and the UE indicated Registration type Emergency Registration, the AMF skips the authentication or the AMF accepts that the authentication may fail and continues the Registration procedure.

9a. If authentication is required, the AMF requests it from the AUSF; if Tracing Requirements about the UE are available at the AMF, the AMF provides Tracing Requirements in its request to AUSF. For a Disaster Roaming Registration, the AMF may provide the indication of Disaster Roaming service in its request to AUSF. Upon request from the AMF, the AUSF shall execute authentication of the UE. The authentication is performed as described in TS 33.501 [15]. The AUSF selects a UDM as described in clause 6.3.8 of TS 23.501 [2] and gets the authentication data from UDM.

The AUSF may provide the indication of Disaster Roaming service to UDM if the indication is received from AMF. For a Disaster Roaming Registration, the AUSF executes authentication of the UE based on the local policy and/or local configuration as specified in clause 5.40.4 of TS 23.501 [2] and in TS 33.501 [15].

Once the UE has been authenticated the AUSF provides relevant security related information to the AMF. If the AMF provided a SUCI to AUSF, the AUSF shall return the SUPI to AMF only after the authentication is successful.

After successful authentication in new AMF, which is triggered by the integrity check failure in old AMF at step 5, the new AMF invokes step 4 above again and indicates that the UE is validated (i.e. through the reason parameter as specified in clause 5.2.2.2.2).

9b If NAS security context does not exist, the NAS security initiation is performed as described in TS 33.501 [15]. If the UE had no NAS security context in step 1, the UE includes the full Registration Request message as defined in TS 24.501 [25].

The AMF decides if the Registration Request needs to be rerouted as described in clause 4.2.2.2.3, where the initial AMF refers to the AMF.

9c. The AMF initiates NGAP procedure to provide the 5G-AN with security context as specified in TS 38.413 [10] if the 5G-AN had requested for UE Context. Also, if the AMF decides that EPS fallback is supported (e.g. based on UE capability to support Request Type flag "handover" for PDN connectivity request during the attach procedure as defined in clause 5.17.2.3.1 of TS 23.501 [2], subscription data and local policy), the AMF shall send an indication "Redirection for EPS fallback for voice is possible" towards 5G-AN as specified in TS 38.413 [10]. Otherwise, the AMF indicates "Redirection for EPS fallback for voice is not possible". In addition, if Tracing Requirements about the UE are available at the AMF, the AMF provides the 5G-AN with Tracing Requirements in the NGAP procedure. If QMC Configuration information is available at the AMF, the AMF provides the 5G-AN with QMC Configuration information in the NGAP procedure.

9d. The 5G-AN stores the security context and acknowledges to the AMF. The 5G-AN uses the security context to protect the messages exchanged with the UE as described in TS 33.501 [15].

10. [Conditional] new AMF to old AMF: Namf\_Communication\_RegistrationStatusUpdate (PDU Session ID(s) to be released e.g. due to slice not supported).

If the AMF has changed the new AMF informs the old AMF that the registration of the UE in the new AMF is completed by invoking the Namf\_Communication\_RegistrationStatusUpdate service operation.

If the authentication/security procedure fails, then the Registration shall be rejected and the new AMF invokes the Namf\_Communication\_RegistrationStatusUpdate service operation with a reject indication towards the old AMF. The old AMF continues as if the UE context transfer service operation was never received.

The new AMF determines the PDU Session(s) that cannot be supported in the new Registration Area in the cases below:

- If one or more of the S-NSSAIs used in the old Registration Area cannot be served in the target Registration Area.

- When continuity of the PDU Session(s) cannot be supported between networks (e.g. SNPN-SNPN mobility, inter-PLMN mobility where no HR agreement exists).

If any of the cases is met, the new AMF invokes the Namf\_Communication\_RegistrationStatusUpdate service operation including the rejected PDU Session ID towards the old AMF. Then the new AMF modifies the PDU Session Status correspondingly. The old AMF informs the corresponding SMF(s) to locally release the UE's SM context by invoking the Nsmf\_PDUSession\_ReleaseSMContext service operation.

If new AMF received in the UE context transfer in step 5 the information about the AM Policy Association and the UE Policy Association and decides, based on local policies, not to use the PCF(s) identified by the PCF ID(s) for the AM Policy Association and the UE Policy Association, then it will inform the old AMF that the AM Policy Association and the UE Policy Association in the UE context is not used any longer and then the PCF selection is performed in step 15.

If the new AMF received in the UE context transfer in step 5 the information about UE related analytics subscription(s), the new AMF may take over the analytics subscription(s) from the old AMF. Otherwise, if the new AMF instead determines to create new analytics subscription(s), it informs the old AMF about the analytics subscriptions (identified by their Subscription Correlation ID) that are not needed any longer and the old AMF may now unsubscribe those NWDAF analytics subscriptions for the UE according to TS 23.288 [50].

11. [Conditional] new AMF to UE: Identity Request/Response (PEI).

If the PEI was not provided by the UE nor retrieved from the old AMF the Identity Request procedure is initiated by AMF sending an Identity Request message to the UE to retrieve the PEI. The PEI shall be transferred encrypted unless the UE performs Emergency Registration and cannot be authenticated.

For an Emergency Registration, the UE may have included the PEI in the Registration Request. If so, the PEI retrieval is skipped.

If the UE supports RACS as indicated in UE MM Core Network Capability, the AMF shall use the PEI of the UE to obtain the IMEI/TAC for the purpose of RACS operation.

12. Optionally the new AMF initiates ME identity check by invoking the N5g-eir\_EquipmentIdentityCheck\_Get service operation (see clause 5.2.4.2.2).

The PEI check is performed as described in clause 4.7.

For an Emergency Registration, if the PEI is blocked, operator policies determine whether the Emergency Registration procedure continues or is stopped.

13. If step 14 is to be performed, the new AMF, based on the SUPI, selects a UDM, then UDM may select a UDR instance. See clause 6.3.9 of TS 23.501 [2].

The AMF selects a UDM as described in clause 6.3.8 of TS 23.501 [2].

14a-c. If the AMF has changed since the last Registration procedure, if UE Registration type is Initial Registration or Emergency Registration, or if the UE provides a SUPI which does not refer to a valid context in the AMF, or if the UE registers to the same AMF it has already registered to a non-3GPP access (i.e. the UE is registered over a non-3GPP access and initiates this Registration procedure to add a 3GPP access), the new AMF registers with the UDM using Nudm\_UECM\_Registration for the access to be registered (and subscribes to be notified when the UDM deregisters this AMF). The UDM based on the "Registration Type" in the Nudm\_UECM\_Registration request, can act on SoR information according to TS 23.122 [22]. In this case, if the AMF does not have event exposure subscription information for this UE, the AMF indicates it to UDM. Then, if the UDM has existing applicable event exposure subscriptions for events detected in AMF for this UE or for any of the groups this UE belongs to (possibly retrieved from UDR), UDM invokes the Namf\_EventExposure\_Subscribe service for recreating the event exposure subscriptions.

The AMF provides the "Homogenous Support of IMS Voice over PS Sessions" indication (see clause 5.16.3.3 of TS 23.501 [2]) to the UDM. The "Homogenous Support of IMS Voice over PS Sessions" indication shall not be included unless the AMF has completed its evaluation of the support of "IMS Voice over PS Session" as specified in clause 5.16.3.2 of TS 23.501 [2].

During initial Registration, if the AMF and UE supports SRVCC from NG-RAN to UTRAN the AMF provides UDM with the UE SRVCC capability.

If the AMF determines that only the UE SRVCC capability has changed, the AMF sends UE SRVCC capability to the UDM.

NOTE 9: At this step, it is possible that the AMF does not have all the information needed to determine the setting of the IMS Voice over PS Session Supported indication for this UE (see clause 5.16.3.2 of TS 23.501 [2]). Hence the AMF can send the "Homogenous Support of IMS Voice over PS Sessions" later on in this procedure.

After AMF has successfully completed the Nudm\_UECM\_Registration operation and if the AMF does not have subscription data for the UE, the AMF retrieves the Access and Mobility Subscription data, SMF Selection Subscription data, UE context in SMF data and LCS mobile origination using Nudm\_SDM\_Get. If the AMF already has subscription data for the UE but the SoR Update Indicator in the UE context requires the AMF to retrieve SoR information depending on the NAS Registration Type ("Initial Registration" or "Emergency Registration") (see Annex C of TS 23.122 [22]), the AMF retrieves the Steering of Roaming information using Nudm\_SDM\_Get. This requires that UDM may retrieve this information from UDR by Nudr\_DM\_Query. After a successful response is received, the AMF subscribes to be notified using Nudm\_SDM\_Subscribe when the data requested is modified, UDM may subscribe to UDR by Nudr\_DM\_Subscribe. The GPSI is provided to the AMF in the Access and Mobility Subscription data from the UDM if the GPSI is available in the UE subscription data. The UDM may provide indication that the subscription data for network slicing is updated for the UE. If the UE is subscribed to MPS in the serving PLMN, "MPS priority" (and optionally, the MPS priority for Messaging indication if it is set (enabled) in the UDM) is included in the Access and Mobility Subscription data provided to the AMF. If the UE is subscribed to MCX in the serving PLMN, "MCX priority" is included in the Access and Mobility Subscription data provided to the AMF. The UDM also provides the IAB-Operation allowed indication or MBSR Operation allowed indication to AMF as part of the Access and Mobility Subscription data. The AMF shall trigger the setup of the UE context in NG-RAN, or modification of the UE context in NG-RAN if the initial setup is at step 9c, including an indication that the IAB-node is authorized or MBSR is authorized. If a S-NSSAI in the Subscribed S-NSSAIs is subject to network slice usage control and the S-NSSAI is dedicated to a single AF, the UDM may provide a Slice Usage Policy information including whether a network slice is on demand and a slice deregistration inactivity timer value for the Subscribed S-NSSAIs as described in clause 5.15.15 of TS 23.501 [2].

The UDM may provide the NCR-Operation allowed indication to AMF as part of the Access and Mobility Subscription data. The AMF shall trigger the setup of the UE context in NG-RAN, or modification of the UE context in NG-RAN if the initial setup is at step 9c, including an indication of NCR-MT authorization information.

For a Disaster Roaming Registration, the AMF may provide the indication of Disaster Roaming service to the UDM. The UDM provides the subscription data for a Disaster Roaming service to the AMF based on the local policy and/or the local configuration as specified in clause 5.40.4 of TS 23.501 [2].

The AMF provides MINT support indication via Nudm\_UECM\_Registration towards UDM, if UE includes the MINT support indication in the 5GMM capability as specified in clause 5.40.2 of TS 23.501 [2] or if the MINT support indication in the 5GMM capability is changed.

If the AMF receives a priority indication (e.g. MPS, MCX) as part of the Access and Mobility Subscription data, but the UE did not provide an Establishment cause associated with priority services, the AMF shall include a Message Priority header to indicate priority information for all subsequent messages. (including messages related to SMS delivery as specified in clause 4.13 if the MPS for Messaging indication is included in subscription data) Other NFs relay the priority information by including the Message Priority header in service-based interfaces, as specified in TS 29.500 [17].

The new AMF provides the Access Type it serves for the UE to the UDM and the Access Type is set to "3GPP access". The UDM stores the associated Access Type together with the serving AMF and does not remove the AMF identity associated to the other Access Type if any. The UDM may store in UDR information provided at the AMF registration by Nudr\_DM\_Update.

If the UE was registered in the old AMF for an access and the old and the new AMFs are in the same PLMN, the new AMF sends a separate/independent Nudm\_UECM\_Registration to update UDM with Access Type set to access used in the old AMF, after the old AMF relocation is successfully completed.

The new AMF creates an UE context for the UE after getting the Access and Mobility Subscription data from the UDM. The Access and Mobility Subscription data includes whether the UE is allowed to include NSSAI in the 3GPP access RRC Connection Establishment in clear text. The Access and Mobility Subscription data may include Enhanced Coverage Restricted information. If received from the UDM and the UE included support for restriction of use of Enhanced Coverage in step 1, the AMF determines whether Enhanced Coverage is restricted or not for the UE as specified in clause 5.31.12 of TS 23.501 [2] and stores the updated Enhanced Coverage Restricted information in the UE context.

The Access and Mobility Subscription data may include the NB-IoT UE Priority. For subscribed S-NSSAIs subject to NSAC, the AMF stores the corresponding applicable NSAC admission mode.

The subscription data may contain Service Gap Time parameter. If received from the UDM, the AMF stores this Service Gap Time in the UE Context in AMF for the UE.

If the AMF has the LADN service area and UE indication of support for LADN per DNN and S-NSSAI, the AMF applies LADN per DNN and S-NSSAI as described in 5.20b.2 of TS 23.501 [2].

For an Emergency Registration in which the UE was not successfully authenticated, the AMF shall not register with the UDM.

The AMF enforces the Mobility Restrictions as specified in clause 5.3.4.1.1 of TS 23.501 [2]. For an Emergency Registration, the AMF shall not check for Mobility Restrictions, access restrictions, regional restrictions or subscription restrictions. For an Emergency Registration, the AMF shall ignore any unsuccessful registration response from UDM and continue with the Registration procedure.

NOTE 10: The AMF can, instead of the Nudm\_SDM\_Get service operation, use the Nudm\_SDM\_Subscribe service operation with an Immediate Report Indication that triggers the UDM to immediately return the subscribed data if the corresponding feature is supported by both the AMF and the UDM.

14d. When the UDM stores the associated Access Type (e.g. 3GPP) together with the serving AMF as indicated in step 14a, it will cause the UDM to initiate a Nudm\_UECM\_DeregistrationNotification (see clause 5.2.3.2.2) to the old AMF corresponding to the same (e.g. 3GPP) access, if one exists. If the timer started in step 5 is not running, the old AMF may remove the UE context for the same Access Type. Otherwise, the AMF may remove UE context for the same Access Type when the timer expires. If the serving NF removal reason indicated by the UDM is Initial Registration, then, as described in clause 4.2.2.3.2, the old AMF invokes the Nsmf\_PDUSession\_ReleaseSMContext (SM Context ID) service operation towards all the associated SMF(s) of the UE to notify that the UE is deregistered from old AMF for the same Access Type. The SMF(s) shall release the PDU Session on getting this notification.

If the old AMF has established an AM Policy Association and a UE Policy Association with the PCF(s) and the old AMF did not transfer the PCF ID(s) to the new AMF (e.g. new AMF is in different PLMN), the old AMF performs an AMF-initiated Policy Association Termination procedure, as defined in clause 4.16.3.2 and performs an AMF-initiated UE Policy Association Termination procedure, as defined in clause 4.16.13.1. In addition, if the old AMF transferred the PCF ID(s) in the UE context but the new AMF informed in step 10 that the AM Policy Association information and UE Policy Association information in the UE context will not be used then the old AMF performs an AMF-initiated Policy Association Termination procedure, as defined in clause 4.16.3.2 and performs an AMF-initiated UE Policy Association Termination procedure, as defined in clause 4.16.13.1.

If the old AMF has an N2 connection for that UE (e.g. because the UE was in RRC\_INACTIVE state but has now moved to E-UTRAN or moved to an area not served by the old AMF), the old AMF shall perform AN Release (see clause 4.2.6) with a cause value that indicates that the UE has already locally released the NG-RAN's RRC Connection.

If the UE context in the old AMF contains an Allowed NSSAI or Partially Allowed NSSAI including one or more S-NSSAI(s) subject to NSAC, the old AMF upon receipt of the Nudm\_UECM\_DeregistrationNotification from the UDM, sends an update request message for each S-NSSAI subject to NSAC to the corresponding NSACF(s) with update flag parameter set to decrease (see clause 4.2.11.2).

At the end of registration procedure, the AMF may initiate synchronization of event exposure subscriptions with the UDM if the AMF does not indicate unavailability of event exposure subscription in step 14a.

NOTE 11: The AMF can initiate synchronization with UDM even if events are available in the UE context (e.g. as received from old AMF) at any given time and based on local policy. This can be done during subscription change related event.

14e. [Conditional] If old AMF does not have UE context for another access type (i.e. non-3GPP access), the Old AMF unsubscribes with the UDM for subscription data using Nudm\_SDM\_unsubscribe.

15. If the AMF decides to initiate PCF communication, the AMF acts as follows.

If the new AMF decides to use the (V-)PCF identified by the (V-)PCF ID included in UE context from the old AMF in step 5, the AMF contacts the (V-)PCF identified by the (V-)PCF ID to obtain policy. If the AMF decides to perform PCF discovery and selection and the AMF selects a (V)-PCF and may select an H-PCF (for roaming scenario) as described in clause 6.3.7.1 of TS 23.501 [2] and according to the V-NRF to H-NRF interaction described in clause 4.3.2.2.3.3.

As described in clause 6.3.7.1 of TS 23.501 [2], if the AMF receives PCF Selection Assistance info from the UDM, the AMF checks if a list of DNN, S-NSSAI combinations are provided in the PCF Selection Assistance Info then the AMF checks local configuration to determine which DNN, S-NSSAI to use then selects the PCF ID included in the corresponding UE Context in the SMF data. If no PCF ID is received, the AMF select the PCF by considering other criteria, defined in clause 6.3.7.1 of TS 23.501 [2].

16. [Optional] new AMF performs an AM Policy Association Establishment/Modification. For an Emergency Registration, this step is skipped.

If the new AMF selects a new (V-)PCF in step 15, the new AMF performs AM Policy Association Establishment with the selected (V-)PCF as defined in clause 4.16.1.2.

If the (V-)PCF identified by the (V-)PCF ID included in UE context from the old AMF is used, the new AMF performs AM Policy Association Modification with the (V-)PCF as defined in clause 4.16.2.1.2.

If the AMF notifies the Mobility Restrictions (e.g. UE location) to the PCF for adjustment, or if the PCF updates the Mobility Restrictions itself due to some conditions (e.g. application in use, time and date), the PCF shall provide the updated Mobility Restrictions to the AMF. If the subscription information includes Tracing Requirements, the AMF provides the PCF with Tracing Requirements.

If the AMF supports DNN replacement, the AMF provides the PCF with the Allowed NSSAI and Partially Allowed NSSAI and if available, the Mapping Of Allowed NSSAI and Mapping Of Partially Allowed NSSAI.

If the PCF supports DNN replacement, the PCF provides the AMF with triggers for DNN replacement.

If the PCF supports the slice replacement, the PCF provides the AMF with triggers for slice replacement.

If a S-NSSAI in subject to network slice usage control, the PCF may provide a Slice Usage Policy information including, whether a network slice is on demand and a slice deregistration inactivity timer value, for the Subscribed S-NSSAIs as described in clause 5.15.15 of TS 23.501 [2].

17. [Conditional] AMF to SMF: Nsmf\_PDUSession\_UpdateSMContext () or Nsmf\_PDUSession\_ReleaseSMContext ().

For an Emergency Registered UE (see TS 23.501 [2]), this step is applied when the Registration Type is Mobility Registration Update.

The AMF invokes the Nsmf\_PDUSession\_UpdateSMContext (see clause 5.2.8.2.6) in the following scenario(s):

- If the List Of PDU Sessions To Be Activated is included in the Registration Request in step 1, the AMF sends Nsmf\_PDUSession\_UpdateSMContext Request to SMF(s) associated with the PDU Session(s) in order to activate User Plane connections of these PDU Session(s). Steps from step 5 onwards described in clause 4.2.3.2 are executed to complete the User Plane connection activation without sending the RRC Inactive Assistance Information and without sending MM NAS Service Accept from the AMF to (R)AN described in step 12 of clause 4.2.3.2. When a User Plane connection for a PDU Session is activated, the AS layer in the UE indicates it to the NAS layer.

- If the AMF has determined in step 3 that the UE is performing Inter-RAT mobility to or from NB-IoT, the AMF sends Nsmf\_PDUSession\_UpdateSMContext Request to SMF(s) associated with the UEs PDU Session(s), so the SMF(s) can update them according to the "PDU Session continuity at inter RAT mobility" subscription data. Steps from step 5 onwards described in clause 4.2.3.2 are executed without sending MM NAS Service Accept from the AMF to (R)AN described in step 12 of clause 4.2.3.2.

When the serving AMF has changed, the new serving AMF notifies the SMF for each PDU Session that it has taken over the responsibility of the signalling path towards the UE: the new serving AMF invokes the Nsmf\_PDUSession\_UpdateSMContext service operation using SMF information received from the old AMF at step 5. It also indicates whether the PDU Session is to be re-activated.

NOTE 12: If the UE moves into a different PLMN, the AMF in the serving PLMN can insert or change the V-SMF(s) in the serving PLMN for Home Routed PDU session(s). In addition, a V-SMF is removed in case the UE moves from a VPLMN into the HPLMN. In these cases, the same procedures described in clause 4.23.3 are applied for the V-SMF change as for the I-SMF change (i.e. by replacing the I-SMF with V-SMF). During inter-PLMN change, if the same SMF is used, session continuity can be supported depending on operator policies.

NOTE 13: In the case of Indirect Network Sharing, when UE of participating operator moves between the shared network area and an area of its home network, a V-SMF can be inserted or removed. In this case, the related procedure of mobility registration update with V-SMF insertion/removal described in clause 4.23.3 is applied.

Steps from step 5 onwards described in clause 4.2.3.2 are executed. In the case that the intermediate UPF insertion, removal, or change is performed for the PDU Session(s) not included in "PDU Session(s) to be re-activated", the procedure is performed without N11 and N2 interactions to update the N3 user plane between (R)AN and 5GC.

The AMF invokes the Nsmf\_PDUSession\_ReleaseSMContext service operation towards the SMF in the following scenario:

- If any PDU Session status indicates that it is released at the UE, the AMF invokes the Nsmf\_PDUSession\_ReleaseSMContext service operation towards the SMF in order to release any network resources related to the PDU Session.

- If the UE has moved into a TA not supporting the S-NSSAI associated with the PDU Session, and the AMF determines to release the PDU Session, and no N2 interaction is needed (i.e. UP connection of the PDU Session is not active), the AMF sets the PDU Session status indicating that the PDU Session is released in the network and the AMF invokes the Nsmf\_PDUSession\_ReleaseSMContext service operation towards the SMF.

If the serving AMF is changed, the new AMF shall wait until step 18 is finished with all the SMFs associated with the UE. Otherwise, steps 19 to 22 can continue in parallel to this step.

18. [Conditional] If the new AMF and the old AMF are in the same PLMN, the new AMF sends a UE Context Modification Request to N3IWF/TNGF/W-AGF as specified in TS 29.413 [64].

If the AMF has changed and the old AMF has indicated that the UE is in CM-CONNECTED state via N3IWF, W-AGF or TNGF and if the new AMF and the old AMF are in the same PLMN, the new AMF creates an NGAP UE association towards the N3IWF/TNGF/W-AGF to which the UE is connected. This automatically releases the existing NGAP UE association between the old AMF and the N3IWF/TNGF/W-AGF.

19. N3IWF/TNGF/W-AGF sends a UE Context Modification Response to the new AMF.

19a. [Conditional] After the new AMF receives the response message from the N3IWF, W-AGF or TNGF in step 19, the new AMF registers with the UDM using Nudm\_UECM\_Registration as step 14a, but with the Access Type set to "non-3GPP access". The UDM stores the associated Access Type together with the serving AMF and does not remove the AMF identity associated to the other Access Type if any. The UDM may store in UDR information provided at the AMF registration by Nudr\_DM\_Update.

19b. [Conditional] When the UDM stores the associated Access Type (i.e. non-3GPP) together with the serving AMF as indicated in step 19a, it will cause the UDM to initiate a Nudm\_UECM\_DeregistrationNotification (see clause 5.2.3.2.2) to the old AMF corresponding to the same (i.e. non-3GPP) access. The old AMF removes the UE context for non-3GPP access.

19c. The Old AMF unsubscribes with the UDM for subscription data using Nudm\_SDM\_unsubscribe.

20a. Void.

21. New AMF to UE: Registration Accept (5G-GUTI, Registration Area, [Mobility restrictions], [PDU Session status], [Allowed NSSAI], [Mapping Of Allowed NSSAI], [Partially Allowed NSSAI], [Mapping Of Partially Allowed NSSAI], [TAI List for S-NSSAIs in Partially Allowed NSSAI], [Configured NSSAI for the Serving PLMN], [Mapping Of Configured NSSAI], [NSSRG Information], [NSAG Information], [rejected S-NSSAIs], [TAI List for any rejected S-NSSAI Partially in the RA], [Pending NSSAI], [Mapping Of Pending NSSAI], [Periodic Registration Update timer], [Active Time], [Strictly Periodic Registration Timer Indication], [LADN Information], [MICO Indication], [IMS Voice over PS session supported Indication], [Emergency Service Support indicator], [Accepted DRX parameters for E-UTRA and NR], [Accepted DRX parameters for NB-IoT], [extended idle mode DRX parameters], [Paging Time Window], [Network support of Interworking without N26], [Access Stratum Connection Establishment NSSAI Inclusion Mode], [Network Slicing Subscription Change Indication], [Operator-defined access category definitions], [List of equivalent PLMNs], [Enhanced Coverage Restricted information], [Supported Network Behaviour], [Service Gap Time], [PLMN-assigned UE Radio Capability ID], [PLMN-assigned UE Radio Capability ID deletion], [WUS Assistance Information], [AMF PEIPS Assistance Information], [AMF LP-WUS Assistance Information], [Truncated 5G-S-TMSI Configuration], [Connection Release Supported], [Paging Cause Indication for Voice Service Supported], [Paging Restriction Supported], [Reject Paging Request Supported], [Paging Restriction Information acceptance / rejection], ["List of PLMN(s) to be used in Disaster Condition"], [Disaster Roaming wait range information], [Disaster Return wait range information], [Forbidden TAI(s)], [List of equivalent SNPNs], [Registered NID], [Unavailability Period Support], [MBSR authorization information], [Return To Coverage Notification Not Required], [Unavailability Period Duration], [Start of Unavailability Period], [S-NSSAI location availability information], [Mapping Of Alternative NSSAI], [Slice Usage Policy], [Maximum Time Offset]).

If the Requested NSSAI does not include S-NSSAIs which map to S-NSSAIs of the HPLMN subject to Network Slice-Specific Authentication and Authorization and the AMF determines that no S-NSSAI can be provided in the Allowed NSSAI for the UE in the current UE's Tracking Area and if no default S-NSSAI(s) not yet involved in the current UE Registration procedure could be further considered, the AMF shall reject the UE Registration and shall include in the rejection message the list of Rejected S-NSSAIs, each of them with the appropriate rejection cause value.

The Allowed NSSAI for the Access Type for the UE is included in the N2 message carrying the Registration Accept message. The Allowed NSSAI contains only S-NSSAIs that do not require, based on subscription information, Network Slice-Specific Authentication and Authorization and based on the UE Context in the AMF, those S-NSSAIs for which Network Slice-Specific Authentication and Authorization previously succeeded, regardless of the Access Type. The Mapping Of Pending NSSAI is the mapping of each S-NSSAI of the Pending NSSAI for the Serving PLMN to the HPLMN S-NSSAIs.

If the UE has indicated its support for the Partial Network Slice support in a Registration Area (see clause 5.15.17 of TS 23.501 [2]) in the UE MM Core Network Capability in the Registration Request, the AMF may include Partially Allowed NSSAI in the Registration Accept with the related TAI List for S-NSSAIs in Partially allowed NSSAI as per TS 23.501 [2] clause 5.1517 and in the N2 message carrying the Registration Accept message without the TAI List for S-NSSAIs in Partially allowed NSSAI. The Partially Allowed NSSAI contains only S-NSSAIs that do not require, based on subscription information, Network Slice-Specific Authentication and Authorization and based on the UE Context in the AMF, those S-NSSAIs for which Network Slice-Specific Authentication and Authorization previously succeeded, regardless of the Access Type. The Mapping Of Partially Allowed NSSAI is the mapping of each S-NSSAI of the Partially Allowed NSSAI for the Serving PLMN to the HPLMN S-NSSAIs.

If the UE has indicated its support for the Partial Network Slice support in a Registration Area (see clause 5.15.17 of TS 23.501 [2]) in the UE MM Core Network Capability in the Registration Request, the AMF may include S-NSSAI(s) rejected partially in the RA in the Registration Accept with the applicable TAI List for rejected S-NSSAI partially in the RA.

If the UE has indicated its support of the Network Slice-Specific Authentication and Authorization procedure in the UE MM Core Network Capability in the Registration Request, AMF includes in the Pending NSSAI the S-NSSAIs that map to an S-NSSAI of the HPLMN which in the subscription information has indication that it is subject to Network Slice-Specific Authentication and Authorization, as described in clause 4.6.2.4 of TS 24.501 [25]. In such case, the AMF then shall trigger at step 25 the Network Slice-Specific Authentication and Authorization procedure, specified in clause 4.2.9.2, except, based on Network policies, for those S-NSSAIs for which Network Slice-Specific Authentication and Authorization have already been initiated on another Access Type for the same S-NSSAI(s). The UE shall not attempt re-registration with the S-NSSAIs included in the list of Pending NSSAIs until the Network Slice-Specific Authentication and Authorization procedure has been completed, regardless of the Access Type.

If the UE has not indicated its support of the Network Slice-Specific Authentication and Authorization procedure in the UE 5GMM Core Network Capability in the Registration Request and the Requested NSSAI includes S-NSSAIs which map to HPLMN S-NSSAIs subject to Network Slice-Specific Authentication and Authorization, the AMF includes those S-NSSAIs in the Requested NSSAI in the Rejected S-NSSAIs.

If no S-NSSAI can be provided in the Allowed NSSAI because:

- all the S-NSSAI(s) in the Requested NSSAI are to be subject to Network Slice-Specific Authentication and Authorization; or

- no Requested NSSAI was provided or none of the S-NSSAIs in the Requested NSSAI matches any of the Subscribed S-NSSAIs and all the S-NSSAI(s) marked as default in the Subscribed S-NSSAIs are to be subject to Network Slice-Specific Authentication and Authorization.

The AMF shall provide an empty Allowed NSSAI. Upon receiving an empty Allowed NSSAI and a Pending NSSAI, the UE is registered in the PLMN but shall wait for the completion of the Network Slice-Specific Authentication and Authorization procedure without attempting to use any service provided by the PLMN on any access, except e.g. emergency services (see TS 24.501 [25]), until the UE receives an Allowed NSSAI.

The AMF stores the NB-IoT Priority retrieved in Step 14 and associates it to the 5G-S-TMSI allocated to the UE.

If the Registration Request message received over 3GPP access does not include any Paging Restriction Information, the AMF shall delete any stored Paging Restriction Information for this UE and stop restricting paging accordingly.

If the Registration Request message received over 3GPP access includes the Paging Restriction Information, AMF may accept or reject the Paging Restriction Information requested by the UE based on operator policy. If the AMF rejects the Paging Restriction Information, the AMF removes any stored Paging Restriction Information from the UE context and discards the UE requested Paging Restriction Information. If the AMF accepts the Paging Restriction Information from the UE, the AMF stores the Paging Restriction Information from the UE in the UE context and informs the UE about the acceptance/rejection of the requested Paging Restriction Information in the Registration Accept message.

If the Registration Request message received over 3GPP access includes a Release Request indication, then:

- the AMF updates the UE context with any received Paging Restriction Information, then enforces it in the network triggered Service Request procedure as described in clause 4.2.3.3;

- the AMF does not establish User Plane resources and triggers the AN release procedure as described in clause 4.2.6 after the completion of Registration procedure.

The AMF sends a Registration Accept message to the UE indicating that the Registration Request has been accepted. 5G-GUTI is included if the AMF allocates a new 5G-GUTI. Upon receiving a Registration Request message of type "Initial Registration", "mobility registration update", "Disaster Roaming Initial Registration" or "Disaster Roaming Mobility Registration Update" from the UE, the AMF shall include a new 5G-GUTI in the Registration Accept message. Upon receiving a Registration Request message of type "periodic registration update" from the UE, the AMF should include a new 5G-GUTI in the Registration Accept message. If the UE is already in RM-REGISTERED state via another access in the same PLMN, the UE shall use the 5G-GUTI received in the Registration Accept for both registrations. If no 5G-GUTI is included in the Registration Accept, then the UE uses the 5G-GUTI assigned for the existing registration also for the new registration. If the AMF allocates a new Registration area, it shall send the Registration area to the UE via Registration Accept message. For a Disaster Roaming Registration, the AMF allocates the Registration Area limited to the area with Disaster Condition as specified in clause 5.40 of TS 23.501 [2]. If there is no Registration area included in the Registration Accept message, the UE shall consider the old Registration Area as valid. Mobility Restrictions is included if mobility restrictions applies for the UE and Registration Type is not Emergency Registration. The AMF indicates the established PDU Sessions to the UE in the PDU Session status. The UE removes locally any internal resources related to PDU Sessions that are not marked as established in the received PDU Session status. If the AMF invokes the Nsmf\_PDUSession\_UpdateSMContext procedure for UP activation of PDU Session(s) in step 18 and receives rejection from the SMF, then the AMF indicates to the UE the PDU Session ID and the cause why the User Plane resources were not activated. When the UE is connected to the two AMFs belonging to different PLMN via 3GPP access and non-3GPP access then the UE removes locally any internal resources related to the PDU Session of the current PLMN that are not marked as established in received PDU Session status. If the PDU Session status information was in the Registration Request, the AMF shall indicate the PDU Session status to the UE.

If the RAT Type is NB-IoT and the network is configured to use the Control Plane Relocation Indication procedure then the AMF shall include in the Registration Accept message the Truncated 5G-S-TMSI Configuration that the UE using Control Plane CIoT 5GS Optimisation uses to create the Truncated 5G-S-TMSI, see clause 5.31.4.3 of TS 23.501 [2].

The Allowed NSSAI provided in the Registration Accept is valid in the Registration Area and it applies for all the PLMNs which have their Tracking Areas included in the Registration Area. The Mapping Of Allowed NSSAI is the mapping of each S-NSSAI of the Allowed NSSAI to the HPLMN S-NSSAIs. The Mapping Of Configured NSSAI is the mapping of each S-NSSAI of the Configured NSSAI for the Serving PLMN to the HPLMN S-NSSAIs.

For non-roaming UE, if the UE has indicated its support of Slice Usage Policy in the UE 5GMM Core Network Capability, the AMF may include Slice Usage Policies for the slices in the Configured NSSAI as described in clause 5.15.15 of TS 23.501 [2]. In the Slice Usage Policy, the AMF indicates if an S-NSSAI is on demand slice and optionally slice deregistration inactivity timer value. If the AMF includes slice deregistration inactivity timer value, the UE starts any slice deregistration inactivity timer for the on demand S-NSSAIs as described in clause 5.15.15 of TS 23.501 [2]. If the AMF includes updated slice deregistration timer value(s), the UE uses the updated slice deregistration inactivity timer value(s) next time the slice deregistration inactivity timer(s) starts.

If the UE has indicated its support of the subscription-based restrictions to simultaneous registration of network slices feature in the UE 5GMM Core Network Capability, the AMF includes, if available, the NSSRG Information, defined in clause 5.15.12 of TS 23.501 [2].

If the UE has not indicated its support of the subscription-based restrictions to simultaneous registration of network slices feature and the subscription information for the UE includes NSSRG information and the AMF is providing the Configured NSSAI to the UE, the Configured NSSAI shall include the S-NSSAIs according to clause 5.15.12 of TS 23.501 [2].

If the UE has indicated its support for temporary available network slices feature in the UE 5GMM Core Network Capability, the AMF includes validity time defined in clause 5.15.16 of TS 23.501 [2].

If the UE has not indicated its support for temporary available network slices feature in the UE 5GMM Core Network Capability and the AMF is providing the Configured NSSAI to the UE, the Configured NSSAI shall not include the S-NSSAIs if the validity time indicates S-NSSAI is not available according to clause 5.15.16 of TS 23.501 [2].

If the UE has indicated its support of the NSAG feature in the 5GMM Core Network Capability, the AMF includes, if available, the NSAG Information, defined in clause 5.15.14 of TS 23.501 [2].

The AMF shall include in the Registration Accept message the LADN Information for the list of LADNs, described in clause 5.6.5 of TS 23.501 [2], that are available within the Registration area determined by the AMF for the UE. If the UE indicates its support of LADN per DNN and S-NSSAI in the UE MM Core Network Capability, the AMF may include LADN Information per DNN and S-NSSAI. The AMF may include Operator-defined access category definitions to let the UE determinine the applicable Operator-specific access category definitions as described in TS 24.501 [25].

If the UE included MICO Indication in the Registration Request, then AMF responds in the Registration Accept message whether MICO mode should be used in the MICO Indication. When MICO mode is allowed for the UE, the AMF may include an Active Time value and/or Strictly Periodic Registration Timer Indication in the Registration Accept message. The AMF determines the Periodic Registration Update timer value, Active Time value and the Strictly Periodic Registration Timer Indication based on:

- local configuration;

- Expected UE Behaviour if available;

- UE indicated preferences;

- UE capability;

- UE subscription information;

- if using a RAN that provides discontinuous coverage, UE availability (see clause 5.4.13.1 of TS 23.501 [2]); and

- network policies,

or any combination of them so as to enable UE power saving, as described in clause 5.31.7 of TS 23.501 [2]. The AMF determines to apply the Strictly Periodic Registration Timer Indication to the UE if the UE indicates its capability of the Strictly Periodic Registration Timer Indication in the registration request message, as described in step 1. If the AMF provides the Periodic Registration Update timer value with the Strictly Periodic Registration Timer Indication to the UE, the UE and the AMF start the Periodic Registration Update timer after this step, as described in clause 5.31.7.5 of TS 23.501 [2].

In the case of registration over 3GPP access, the AMF Sets the IMS Voice over PS session supported Indication as described in clause 5.16.3.2 of TS 23.501 [2]. In order to set the IMS Voice over PS session supported Indication the AMF may need to perform the UE Capability Match Request procedure in clause 4.2.8a to check the compatibility of the UE and NG-RAN radio capabilities related to IMS Voice over PS. If the AMF hasn't received Voice Support Match Indicator from the NG-RAN on time then, based on implementation, AMF may set IMS Voice over PS session supported Indication and update it at a later stage.

In the case of registration over 3GPP access and the AMF has retrieved or determined according to local configuration a Target NSSAI and a corresponding RFSP Index for the purpose of allowing the NG-RAN to redirect the UE to a cell supporting network slices not available in the current TA as described in clause 5.3.4.3.3 of TS 23.501 [2], the AMF provides the Target NSSAI and the corresponding RFSP Index to the NG-RAN.

In the case of registration over non-3GPP access, the AMF Sets the IMS Voice over PS session supported Indication as described in clause 5.16.3.2a of TS 23.501 [2].

The Emergency Service Support indicator informs the UE that emergency services are supported, i.e. the UE is allowed to request PDU Session for emergency services. If the AMF received "MPS priority" from the UDM as part of Access and Mobility Subscription data, based on operator policy, "MPS priority" is included in the Registration Accept message to the UE to inform the UE whether configuration of Access Identity 1 is valid within the selected PLMN, as specified in TS 24.501 [25]. If the AMF received "MCX priority" from the UDM as part of Access and Mobility Subscription data, based on operator policy and UE subscription to MCX Services, "MCX priority" is included in the Registration Accept message to the UE to inform the UE whether configuration of Access Identity 2 is valid within the selected PLMN, as specified in TS 24.501 [25].

The Accepted DRX parameters are defined in clause 5.4.5 of TS 23.501 [2]. The AMF includes Accepted DRX parameters for NB-IoT, if the UE included Requested DRX parameters for NB-IoT in the Registration Request message. The AMF Sets the Network support of Interworking without N26 parameter as described in clause 5.17.2.3.1 of TS 23.501 [2]. If the AMF accepts the use of extended idle mode DRX, the AMF includes the extended idle mode DRX parameters and Paging Time Window as described in 5.31.7.2 of TS 23.501 [2]. For a UE using NR satellite access that provides discontinuous coverage, the AMF may determine extended idle mode DRX parameters and Paging Time Window considering the Unavailability Period Duration (if available), Start of Unavailability Period (if available) and the UE requested extended idle mode DRX parameters as described in clause 5.4.13.1 of TS 23.501 [2].

If the UDM intends to indicate the UE that subscription has changed, the Network Slicing Subscription Change Indication is included. If the AMF includes Network Slicing Subscription Change Indication, then the UE shall locally erase all the network slicing configuration for all PLMNs and if applicable, update the configuration for the current PLMN based on any received information.

The Access Stratum Connection Establishment NSSAI Inclusion Mode, as specified in clause 5.15.9 of TS 23.501 [2], is included to instruct the UE on what NSSAI, if any, to include in the Access Stratum connection establishment. The AMF can set the value to modes of operation a,b,c defined in clause 5.15.9 of TS 23.501 [2] in the 3GPP Access only if the Inclusion of NSSAI in RRC Connection Establishment Allowed indicates that it is allowed to do so.

For a UE registered in a PLMN, the AMF may provide a List of equivalent PLMNs which is handled as specified in TS 24.501 [25]. The AMF shall not provide a list of equivalent SNPNs to the UE.

For a UE registered in an SNPN and the UE has included support of equivalent SNPNs in step 1, the AMF may provide a List of equivalent SNPNs which is handled as specified in TS 24.501 [25]. The AMF shall not provide a list of equivalent PLMNs to the UE.

If the UE included support for restriction of use of Enhanced Coverage in step 1, the AMF sends the Enhanced Coverage Restricted information to the NG-RAN in N2 message. The AMF also sends Enhanced Coverage Restricted information to the UE in the Registration Accept message.

If the UE receives Enhanced Coverage Restricted information in the Registration Accept message, the UE shall store this information and shall use the value of Enhanced Coverage Restricted information to determine if Enhanced Coverage feature should be used or not.

If the UE and the AMF have negotiated to enable MICO mode via MICO Indication and the AMF uses the Extended connected timer, then the AMF provides the Extended Connected time value to NG-RAN (see clause 5.31.7.3 of TS 23.501 [2]) in this step. The Extended Connected Time value indicates the minimum time the RAN should keep the UE in RRC\_CONNECTED state regardless of inactivity. For a UE using NR satellite access that provides discontinuous coverage, the AMF may determine the Extended Connected Timer value considering the Unavailability Period Duration (if available), Start of Unavailability Period (if available) as described in clause 5.4.13.1 of TS 23.501 [2].

The AMF indicates the CIoT 5GS Optimisations it supports and accepts in the Supported Network Behaviour information (see clause 5.31.2 of TS 23.501 [2]) if the UE included Preferred Network Behaviour in its Registration Request.

The AMF may steer the UE from 5GC by rejecting the Registration Request. The AMF should take into account the Preferred and Supported Network Behaviour (see clause 5.31.2 of TS 23.501 [2]) and availability of EPC to the UE before steering the UE from 5GC.

If the AMF accepts MICO mode as indicated in Registration Accept via MICO Indication and knows there may be mobile terminated data or signalling pending, the AMF maintains the N2 connection for at least the Extended Connected Time as described in clause 5.31.7.3 of TS 23.501 [2] and provides the Extended Connected Time value to the RAN.

The AMF includes Service Gap Time if Service Gap Time is present in the subscription information (steps 14a-c) or the Service Gap Time has been updated by the Subscriber Data Update Notification to AMF procedure (see clause 4.5.1) and the UE has indicated UE Service Gap Control Capability.

If the UE receives a Service Gap Time in the Registration Accept message, the UE shall store this parameter and apply Service Gap Control (see clause 5.31.16 of TS 23.501 [2]).

If the network supports WUS grouping (see TS 23.501 [2]), the AMF shall send the WUS Assistance Information to the UE. If the UE provided the UE paging probability information in Step 1, the AMF takes it into account to determine the WUS Assistance Information.

If the UE provided Paging Subgrouping Support Indication in step 1, a supporting AMF may provide the AMF PEIPS Assistance Information, including the Paging Subgroup ID as defined in TS 23.501 [2].

If the UE provided LP-WUS Subgrouping Support Indication in step 1, a supporting AMF may provide the AMF LP-WUS Assistance Information, including the Paging Subgroup ID as defined in TS 23.501 [2].

When the UE and the AMF supports RACS as defined in clause 5.4.4.1a of TS 23.501 [2] and the AMF needs to configure the UE with a UE Radio Capability ID and the AMF already has the UE radio capabilities other than NB-IoT radio capabilities for the UE, the AMF may provide the UE with the UE Radio Capability ID for the UE radio capabilities the UCMF returns to the AMF in a Nucmf\_assign service operation for this UE. Alternatively, when the UE and the AMF support RACS, the AMF may provide the UE with an indication to delete any PLMN-assigned UE Radio Capability ID in this PLMN (see clause 5.4.4.1a of TS 23.501 [2]).

If the UE is "CAG supported" and the AMF needs to update the CAG information of the UE, the AMF may include the CAG information as part of the Mobility Restrictions in the Registration Accept message.

If the UE has indicated the support of Unavailability Period in the UE MM Core Network Capability in the Registration Request, the AMF shall indicate to the UE whether the corresponding feature is supported by providing the "Unavailability Period Support" indication.

If both the UE and the AMF support the Unavailability Period, the AMF may provide an Unavailability Period Duration and/or Start of Unavailability Period determined due to NR satellite access discontinuous coverage during initial registration procedure as described in clause 5.4.1.4 of TS 23.501 [2]. If the UE has provided Unavailability Period Duration and/or Start of Unavailability Period in step 1, the AMF shall store the received Unavailability Period Duration and/or Start of Unavailability Period in UE context. The AMF considers that the UE is unavailable at the start of unavailability period as described in clause 5.4.1.4 of TS 23.501 [2]. The AMF may provide Periodic Registration Update timer based on Unavailability Period Duration and/or Start of Unavailability Period indicated by the UE as described in clause 5.4.1.4 of TS 23.501 [2].

If the Multi-USIM UE has indicated support for one or more Multi-USIM Specific Capabilities in the UE 5GMM Core Network Capability in step 1, the AMF shall indicate to the Multi-USIM UE whether the corresponding one or more Multi-USIM specific features described in clause 5.38 of TS 23.501 [2] are supported, based on network capability and preference by the network (i.e. based on local network policy), by providing one or more of the Connection Release Supported, Paging Cause Indication for Voice Service Supported, Paging Restriction Supported and Reject Paging Request Supported indications. The AMF shall only indicate Paging Restriction Supported together with either Connection Release Supported or Reject Paging Request Supported. The UE shall only use Multi-USIM specific features that the AMF indicated as being supported.

If the NG-RAN provides MBSR indication in step 3 and the subscription data received in step 14 does not allow the MBSR operation, the AMF may either accept the registration with providing the MBSR authorization information to MBSR (IAB-UE), or the AMF may reject the registration if the PLMN does not allow the MBSR (IAB-UE) to be registered to the PLMN as specified in clause 5.35A.4 of TS 23.501 [2].

If the UE and AMF supports Disaster Roaming service, the AMF may include the "list of PLMN(s) to be used in Disaster Condition", Disaster Roaming wait range information and Disaster Return wait range information as specified in TS 23.501 [2].

If AMF receives multiple TAIs from the NG-RAN in step 3 and determines that some, but not all of them are forbidden by subscription or by operator policy, the AMF shall include the forbidden TAI(s) in the Registration Accept message.

In the case of Emergency Registration, the AMF shall not indicate support for any Multi-USIM specific features to the UE.

If the UE has included support of equivalent SNPNs in step 1 and the serving SNPN changes, the AMF shall include the Registered NID in the Registration Accept message as specified in TS 23.501 [2].

For a UE using NR satellite access that provides discontinuous coverage, the AMF may provide Return To Coverage Notification Not Required, which requests the UE in CM-IDLE state to not perform the Mobility Registration Update procedure when it returns to coverage and/or provide the UE with a Unavailability Period Duration and/or Start of Unavailability Period (if available), as described in clause 5.4.13.1 of TS 23.501 [2]. The AMF may determine a Maximum Time Offset and provide it to UE when it is allowed to initiate NAS signalling with the network as described in clause 5.4.13.5 of TS 23.501 [2].

If the UE has indicated the support of S-NSSAI location availability information, the AMF may include S-NSSAI location availability information as described in clause 5.15.18 of TS 23.501 [2].

If the UE indicated a support for the Network Slice Replacement feature in the 5GMM Core Network Capability and the AMF determines that an S-NSSAI from an Allowed NSSAI is to be replaced with an Alternative S-NSSAI (as described in clause 5.15.19 of TS 23.501 [2]), the AMF includes the Mapping Of Alternative NSSAI within the Registration Accept message to the UE and also adds the Alternative S-NSSAI to the Allowed NSSAI and/or Configured NSSAI, if not already included. The Mapping Of Alternative NSSAI is the mapping of each Alternative S-NSSAI, included in the Allowed NSSAI and/or Configured NSSAI, to the corresponding replaced VPLMN S-NSSAI or HPLMN S-NSSAI (as described in clause 5.15.19 of TS 23.501 [2]).

If the UE has indicated a support for reconnection to the network due to RAN timing synchronization status in step 1 as described in TS 23.501 [2], and if the AMF received "clock quality detail level" either as part of an AM Policy Association procedure or from the UDM as part of Clock Quality Reporting Control Information (CQRCI) included in the Access and Mobility Subscription data, "UE reconnection indication" is included in the Registration Accept message to the UE to inform the UE when to connect to the network in case when the UE later detects that the NG-RAN timing synchronization status has changed while the UE is in RRC IDLE or RRC INACTIVE state, as specified in clause 5.27.1.12 of TS 23.501 [2].

21b. [Optional] The new AMF performs a UE Policy Association Establishment as defined in clause 4.16.11. For an Emergency Registration, this step is skipped.

The new AMF sends a Npcf\_UEPolicyControl Create Request to PCF. PCF sends a Npcf\_UEPolicyControl Create Response to the new AMF.

PCF triggers UE Configuration Update Procedure as defined in clause 4.2.4.3.

22. [Conditional] UE to new AMF: Registration Complete ().

The UE sends a Registration Complete message to the AMF when it has successfully updated itself after receiving any of the [Configured NSSAI for the Serving PLMN], [Mapping Of Configured NSSAI], [NSSRG Information], [NSAG Information] and a Network Slicing Subscription Change Indication, or CAG information in step 21.

The UE sends a Registration Complete message to the AMF to acknowledge if a new 5G-GUTI was assigned.

If new 5G-GUTI was assigned, then the UE passes the new 5G-GUTI to its 3GPP access' lower layer when a lower layer (either 3GPP access or non-3GPP access) indicates to the UE's RM layer that the Registration Complete message has been successfully transferred across the radio interface.

NOTE 14: The above is needed because the NG-RAN may use the RRC\_INACTIVE state and a part of the 5G-GUTI is used to calculate the Paging Frame (see TS 38.304 [44] and TS 36.304 [43]). It is assumed that the Registration Complete is reliably delivered to the AMF after the 5G-AN has acknowledged its receipt to the UE.

When the List Of PDU Sessions To Be Activated is not included in the Registration Request and the Registration procedure was not initiated in CM-CONNECTED state, the AMF releases the signalling connection with UE, according to clause 4.2.6.

When the Follow-on request is included in the Registration Request, the AMF should not release the signalling connection after the completion of the Registration procedure.

If the AMF is aware that some signalling is pending in the AMF or between the UE and the 5GC, the AMF should not release the signalling connection immediately after the completion of the Registration procedure.

If the UE has provided Unavailability Period Duration and not included Start of Unavailability Period in step 1, the AMF shall release the signalling connection immediately after the completion of the Registration procedure.

If the UE has indicated Start of Unavailability Period in step 1, the AMF shall release the signalling connection before the start of unavailability period.

If PLMN-assigned UE Radio Capability ID is included in step 21, the AMF stores the PLMN-assigned UE Radio Capability ID in UE context if receiving Registration Complete message.

If the AMF provided updated slice deregistration timer value(s) to the UE in step 21, the AMF uses the corresponding slice deregistration inactivity timer value(s) next time the slice deregistration inactivity timer(s) starts.

If the UE receives PLMN-assigned UE Radio Capability ID deletion indication in step 21, the UE shall delete the PLMN-assigned UE Radio Capability ID(s) for this PLMN.

23. [Conditional] AMF to UDM: If the Access and Mobility Subscription data provided by UDM to AMF in 14b includes Steering of Roaming information with an indication that the UDM requests an acknowledgement of the reception of this information from the UE, the AMF provides the UE acknowledgement to UDM using Nudm\_SDM\_Info. For more details regarding the handling of Steering of Roaming information refer to TS 23.122 [22].

23a. For Registration over 3GPP Access, if the AMF does not release the signalling connection, the AMF sends the RRC Inactive Assistance Information to the NG-RAN.

For Registration over non-3GPP Access, if the UE is also in CM-CONNECTED state on 3GPP access, the AMF sends the RRC Inactive Assistance Information to the NG-RAN. If the Multi-USIM UE has indicated support for the Paging Cause Indication for Voice Service feature and the network supports the Paging Cause Indication for Voice Service, the AMF shall include an indication in the RRC Inactive Assistance Information that the UE supports the Paging Cause Indication for Voice Service to NG-RAN to enable NG-RAN to apply the Paging Cause Indication for Voice Service feature for RAN based paging.

The AMF also uses the Nudm\_SDM\_Info service operation to provide an acknowledgment to UDM that the UE received CAG information, or the Network Slicing Subscription Change Indication (see step 21 and step 22) and acted upon it.

24. [Conditional] AMF to UDM: After step 14a and in parallel to any of the preceding steps, the AMF shall send a "Homogeneous Support of IMS Voice over PS Sessions" indication to the UDM using Nudm\_UECM\_Update:

- If the AMF has evaluated the support of IMS Voice over PS Sessions, see clause 5.16.3.2 of TS 23.501 [2]; and

- If the AMF determines that it needs to update the Homogeneous Support of IMS Voice over PS Sessions, see clause 5.16.3.3 of TS 23.501 [2].

25. [Conditional] If the UE indicates its support for Network Slice-Specific Authentication and Authorization procedure in the UE MM Core Network Capability in Registration Request and any S-NSSAI of the HPLMN is subject to Network Slice-Specific Authentication and Authorization, the related procedure is executed at this step (see clause 4.2.9.1). Once the Network Slice-Specific Authentication and Authorization procedure is completed for all S-NSSAIs, the AMF shall trigger a UE Configuration Update procedure to deliver an Allowed NSSAI (or Partially Allowed NSSAI) containing also the S-NSSAIs for which the Network Slice-Specific Authentication and Authorization was successful and include any rejected NSSAIs with an appropriate rejection cause value.

The AMF stores an indication in the UE context for any S-NSSAI of the HPLMN subject to Network Slice-Specific Authentication and Authorization for which the Network Slice-Specific Authentication and Authorization succeeds.

Once completed the Network Slice-Specific Authentication and Authorization procedure, if the AMF determines that no S-NSSAI can be provided in the Allowed NSSAI for the UE, which is already authenticated and authorized successfully by a PLMN and if no default S-NSSAI(s) could be further considered, the AMF shall execute the Network-initiated Deregistration procedure described in clause 4.2.2.3.3 and shall include in the explicit De-Registration Request message the list of Rejected S-NSSAIs, each of them with the appropriate rejection cause value.

If Unavailability Period Duration is received from the UE and there is "Loss of Connectivity" monitoring event subscription for the UE, the AMF triggers "Loss of Connectivity" monitoring event report and includes the remaining values of the Unavailability Period Duration as described in clause 4.15.

The mobility related event notifications towards the NF consumers are triggered at the end of this procedure for cases as described in clause 4.15.4.

\* \* \* Next change\* \* \* \*

#### 4.2.3.3 Network Triggered Service Request

This procedure is used when the network needs to signal (e.g. N1 signalling to UE, Mobile-terminated SMS, User Plane connection activation for PDU Session(s) to deliver mobile terminating user data) with a UE. When the procedure is triggered by SMSF, PCF, LMF, GMLC, NEF, AMF or UDM, the SMF (and UPF, if applicable) in the following figure should be replaced by the respective NF. For MT-SMS delivery request from SMSF, see also procedures defined in clause 4.13.3.6, clause 4.13.3.7 and clause 4.13.3.8. If the UE is in CM-IDLE state or CM-CONNECTED state in 3GPP access, the network initiates a Network Triggered Service Request procedure. If the UE is in CM-IDLE state and asynchronous type communication is not activated, the network sends a Paging Request to (R)AN/UE. The Paging Request triggers the UE Triggered Service Request procedure in the UE. If asynchronous type communication is activated, the network stores the received message and forward the message to the (R)AN and/or the UE (i.e. synchronizes the context with the (R)AN and/or the UE) when the UE enters CM-CONNECTED state.

If the UE is in CM-IDLE state in non-3GPP access and if the UE is simultaneously registered over 3GPP and non-3GPP accesses in a PLMN, the network shall initiate a Network Triggered Service Request procedure over 3GPP access.

If the UE is in CM-IDLE state in 3GPP access and in CM-CONNECTED state in non-3GPP access and if the UE is simultaneously registered over 3GPP and non-3GPP accesses in the same PLMN, the network may initiate a Network Triggered Service Request procedure for 3GPP access via non-3GPP access.

For this procedure, the impacted SMF and UPF are all under control of the PLMN serving the UE, e.g. in Home Routed roaming case the SMF and UPF in HPLMN are not involved.

The procedure below covers the following non exhaustive list of use-cases for 3GPP access (detailed conditions of when the steps apply are stated in the procedure below):

- The SMF needs to setup N3 tunnel to deliver downlink packet to the UE for a PDU Session and the UE is in CM-IDLE state: Step 3a contains an N2 message and Step 4b (paging) is performed.

- The SMF needs to setup N3 tunnel to deliver downlink packet to the UE for a PDU Session and the UE is in CM-CONNECTED state: Step 3a contains an N2 message and Step 4a (UP reactivation) is performed.

- NF (e.g. SMF, SMSF, PCF or LMF) needs to send an N1 message to the UE, using the Namf\_Communication\_N1N2MessageTransfer service operation and the UE is in CM-IDLE state: Step 3a contains an N1 message, Step 3b contains cause "Attempting to reach UE" and Step 4b (paging) occurs.

- The LMF triggers AMF, using the Namf\_Communication\_N1N2MessageTransfer service operation, to setup a NAS connection with the UE and the UE is in CM-IDLE state: Step 3b contains cause "Attempting to reach UE" and step 4b (paging) occurs.

- The GMLC triggers AMF, using the Namf\_Location\_ProvideLocation service operation, to setup a NAS connection with the UE and the UE is in CM-IDLE state: Step 4b (paging) occurs.

- The PCF needs to send a message to the UE, using the Npcf\_AMPolicyControl\_Create Response service operation, or the Npcf\_AMPolicyControl\_UpdateNotify service operation and the UE is in CM-IDLE state: Step 3a contains a message and step 4b (paging) occurs.

- NF (e.g. SMSF or SMF) triggers AMF, using the Namf\_MT\_EnableUEReachability service operation, to setup a NAS connection with the UE and the UE is in CM-IDLE state: The trigger is specific to the procedure and Step 4b (paging) occurs.

As described in clause 4.2.4.2, the AMF may also trigger the Network Triggered Service Request before the AMF sends a UE Configuration Update.



Figure 4.2.3.3-1: Network Triggered Service Request

1. When a UPF receives downlink data for a PDU Session and there is no AN Tunnel Info stored in UPF for the PDU Session, based on the instruction from the SMF (as described in clause 5.8.3 of TS 23.501 [2]), the UPF may buffer the downlink data (steps 2a and 2b), or forward the downlink data to the SMF (step 2c).

2a. UPF to SMF: Data Notification (N4 Session ID, Information to identify the QoS Flow for the DL data packet, DSCP).

- On arrival of the first downlink data packet for any QoS Flow, the UPF shall send Data Notification message to the SMF, if the SMF has not previously notified the UPF to not send the Data Notification to the SMF (in which case the next steps are skipped).

- If the UPF receives downlink data packets for another QoS Flow in the same PDU Session, the UPF shall send another Data Notification message to the SMF.

- If the Paging Policy Differentiation feature (as specified in clause 5.4.3 of TS 23.501 [2]) is supported by the UPF and if the PDU Session type is IP, the UPF shall also include the DSCP in TOS (IPv4) / TC (IPv6) value from the IP header of the downlink data packet and the information to identify the QoS Flow for the DL data packet.

2b. SMF to UPF: Data Notification Ack.

2c. The UPF forwards the downlink data packets towards the SMF if the SMF instructed the UPF to do so (i.e. the SMF will buffer the data packets).

- If the Paging Policy Differentiation feature is supported by the SMF and if the PDU Session type is IP, the SMF determines the Paging Policy Indicator based on the DSCP in TOS (IPv4) / TC (IPv6) value from the IP header of the received downlink data packet and identifies the corresponding QoS Flow from the QFI of the received DL data packet.

3a. [Conditional] SMF to AMF: Namf\_Communication\_N1N2MessageTransfer (SUPI, PDU Session ID, N1 SM container (SM message), N2 SM information (QFI(s), QoS profile(s), CN N3 Tunnel Info, S-NSSAI), Area of validity for N2 SM information, ARP, Paging Policy Indicator, 5QI, N1N2TransferFailure Notification Target Address, Extended Buffering support), or NF to AMF: Namf\_Communication\_N1N2MessageTransfer (SUPI, N1 message).

The SMF shall not include both N1 SM Container and N2 SM Information in Namf\_Communication\_N1N2MessageTransfer unless the N1 SM Container is related to the N2 SM Information.

If this step is triggered by a notification from UPF, upon reception of a Data Notification message, for a PDU Session corresponding to a LADN, the SMF takes actions as specified in clause 5.6.5 of TS 23.501 [2]. The SMF may notify the UPF that originated the Data Notification to discard downlink data for the PDU Sessions and/or to not provide further Data Notification messages.

Otherwise, the SMF determines whether to contact the AMF. The SMF does not contact the AMF:

- if the SMF had previously been notified that the UE is unreachable; or

- if the UE is reachable only for regulatory prioritized service and the PDU Session is not for regulatory prioritized service.

The SMF determines the AMF and invokes the Namf\_Communication\_N1N2MessageTransfer to the AMF including the PDU Session ID of the PDU Session. If this step is triggered by a notification from the UPF in step 2a, the SMF determines the PDU Session ID based on the N4 Session ID received in step 2a.

The SMF determines whether Extended Buffering applies based on local policy and the capability of the SMF (for SMF-based buffering) or the capability of the UPF (for UPF-based buffering). If Extended Buffering applies, the SMF includes "Extended Buffering support" indication in Namf\_Communication\_N1N2MessageTransfer.

If the SMF, while waiting for the User Plane Connection to be activated, receives any additional Data Notification message or, in the case that the SMF buffers the data packets, additional data packets for a QoS Flow associated with a higher priority (i.e. ARP priority level) than the priority indicated to the AMF in the previous Namf\_Communication\_N1N2MessageTransfer, or the SMF derive a different Paging Policy Indicator according to the additional Data Notification or the DSCP of the data packet, the SMF invokes a new Namf\_Communication\_N1N2MessageTransfer indicating the higher priority or different Paging Policy Indicator to the AMF.

If the SMF, while waiting for the User Plane to be activated, receives a message from a new AMF other than the one to which the SMF invoked theNamf\_Communication\_N1N2MessageTransfer, the SMF re-invokes the Namf\_Communication\_N1N2MessageTransfer towards the new AMF.

When supporting Paging Policy Differentiation, the SMF determines the Paging Policy Indicator related to the downlink data that has been received from the UPF or triggered the Data Notification message, based on the DSCP as described in clause 5.4.3 of TS 23.501 [2] and indicates the Paging Policy Indicator in the Namf\_Communication\_N1N2MessageTransfer.

NOTE 1: AMF may receive request message(s) from other network functions which leads to signalling towards UE/RAN, e.g. Network-initiated Deregistration, SMF initiated PDU Session Modification. If the UE is in CM-CONNECTED state and the AMF only delivers N1 message towards UE, the flow continues in step 6 below.

The N2 SM information is optional and is not provided e.g. in the case that the SMF only wants to send an N1 message such as PDU Session Modification Command with only updating the UE with a PCO.

For PDU session with user plane in Suspend mode (i.e. applying User Plane CIoT 5GS Optimisation as specified in clause 5.31.8 of TS 23.501 [2]) for 3GPP access, the SMF uses Namf\_MT\_EnableUEReachability service operation if there is neither N1 SM container nor N2 SM information to be delivered by SMF.

3b. [conditional] The AMF responds to the SMF.

If the UE is in CM-IDLE state at the AMF and the AMF is able to page the UE the AMF sends a Namf\_Communication\_N1N2MessageTransfer response to the SMF immediately to indicate to the SMF that AMF is attempting to reach UE and the N2 SM information provided in step 3a, may be ignored by the AMF once the UE is reachable and the SMF may be asked to provide the N2 SM information again.

While waiting for the UE to respond to a previous paging request, if the AMF receives an Namf\_Communication\_N1N2MessageTransfer Request message with the same or a lower priority than the previous message triggering the paging, or if the AMF has determined not to trigger additional paging requests for this UE based on local policy, the AMF rejects the Namf\_Communication\_N1N2MessageTransfer Request message.

If the UE is in CM-CONNECTED state at the AMF then the AMF sends a Namf\_Communication\_N1N2MessageTransfer response to the SMF immediately to indicate that the N1/N2 message has been sent out.

If the UE is in CM-IDLE state and the AMF determines that the UE is not reachable for paging, the AMF shall send an Namf\_Communication\_N1N2MessageTransfer response to the NF from which AMF received the request message in step 3a to indicate that the UE is not reachable, or the AMF performs asynchronous type communication and stores the UE context based on the received message, it shall send an Namf\_Communication\_N1N2MessageTransfer response to indicate that asynchronous type communication is invoked. If asynchronous type communication is invoked, the AMF initiates communication with the UE and (R)AN when the UE is reachable e.g. when the UE enters CM-CONNECTED state.

If the AMF detects that the UE context contains Paging Restriction Information, the AMF may block the paging for this UE, based on local policy and the stored Paging Restriction Information (see clause 5.38.1 of TS 23.501 [2]). If the AMF blocks paging, the AMF sends Namf\_Communication\_N1N2MessageTransfer response with an indication that its request has been rejected due to restricted paging to the NF from which AMF received the request message in step 3a.

If the AMF has determined the UE is unreachable for the SMF (e.g. due to the UE in MICO mode, the UE using extended idle mode DRX or the UE is only registered over non-3GPP access and its state is CM-IDLE), then the AMF rejects the request from the SMF. The AMF may include in the reject message an indication that the SMF need not trigger the Namf\_Communication\_N1N2MessageTransfer Request to the AMF, if the SMF has not subscribed to the event of the UE reachability. If the SMF included the Extended Buffering Support indication, the AMF indicates the Estimated Maximum Wait time, in the reject message, for the SMF to determine the Extended Buffering time. If the UE is in MICO mode, the AMF determines the Estimated Maximum Wait time based on the next expected periodic registration by the UE or by implementation. If the UE is using extended idle mode DRX, the AMF determines the Estimated Maximum Wait time based on the start of the next Paging Time Window. The AMF stores an indication that the SMF has been informed that the UE is unreachable.

If the AMF has determined the UE is reachable and the AMF detects the UE is in a Non-Allowed Area unless the request from the SMF is for regulatory prioritized service, the AMF rejects the request from the SMF and notifies the SMF that the UE is reachable only for regulatory prioritized service. The AMF stores an indication that the SMF has been informed that the UE is reachable only for regulatory prioritized service. If the AMF cannot determine whether the UE is in a Non-Allowed Area (e.g. due to UE's Registration Area containing both Allowed area and Non-Allowed Area), the procedure continues in step 4.

If the Registration procedure with AMF change is in progress when the old AMF receives the Namf\_Communication\_N1N2MessageTransfer, the old AMF may reject the request with an indication that the Namf\_Communication\_N1N2MessageTransfer has been temporarily rejected.

Upon reception of an Namf\_Communication\_N1N2MessageTransfer response with an indication that its request has been temporarily rejected, the SMF shall start a locally configured guard timer and wait for any message to come from an AMF. Upon reception of a message from an AMF, the SMF shall re-invoke the Namf\_Communication\_N1N2MessageTransfer (with N2 SM info and/or N1 SM info) to the AMF from which it received the message. Otherwise the SMF takes the step 3c at expiry of the guard timer. If the SMF decides that the control plane buffering applies, the SMF shall request UPF to start forwarding the downlink data PDU towards the SMF.

3c. [Conditional] SMF responds to the UPF

SMF may notify the UPF about the User Plane setup failure.

If the SMF receives an indication from the AMF that the UE is unreachable or reachable only for regulatory prioritized service and the SMF determines that Extended Buffering does not apply, the SMF may, based on network policies, either:

- indicate to the UPF to stop sending Data Notifications;

- indicate to the UPF to stop buffering DL data and discard the buffered data;

- indicate to the UPF to stop sending Data Notifications and stop buffering DL data and discard the buffered data; or

- refrains from sending further Namf\_Communication\_N1N2MessageTransfer message for DL data to the AMF while the UE is unreachable.

Then the SMF subscribes to the AMF for UE reachability event notifications.

Based on operator policies, the SMF applies the pause of charging procedure as specified in clause 4.4.4.

If the SMF receives an indication from the AMF that the Namf\_Communication\_N1N2MessageTransfer message requested from an SMF has been temporarily rejected, the SMF may, based on network policies, indicate to the UPF to apply temporary buffering.

If the SMF receives an "Estimated Maximum Wait time" from the AMF and Extended Buffering applies, the SMF may either:

- If the DL data buffering in the SMF applies, store the DL Data for an Extended Buffering time. The SMF does not send any additional Namf\_Communication\_N1N2MessageTransfer message if subsequent downlink data packets are received. If the Extended Buffering timer expires, the SMF discards the buffered downlink data.

- If the DL data buffering in the UPF applies, send a Failure indication with an indication to the UPF to buffer the DL data with an Extended Buffering time and optionally a DL Buffering Suggested Packet Count. The Suggested Number of Downlink Packets network configuration parameter (if available) may be used to derive the value for DL Buffering Suggested Packet Count. The SMF may also indicate to the UPF to stop sending Data Notifications.

The Extended Buffering time is determined by the SMF and should be larger or equal to the Estimated Maximum Wait time received from the AMF.

If the UPF receives an Extended Buffering indication from the SMF, the UPF initiates Extended Buffering of the downlink data and starts an Extended Buffering timer. If the Extended Buffering timer expires, the UPF discards the buffered downlink data.

4a. [Conditional] If the UE is in CM-CONNECTED state in the access associated with the PDU Session ID received from the SMF in step 3a, the steps 4 to 22 in UE Triggered Service Request procedure (see clause 4.2.3.2) are performed for this PDU Session (i.e. establish the radio resources and in the case that the User Plane is to be activated, to establish the N3 tunnel) without sending a Paging message to the (R)AN node and the UE. In step 12 of clause 4.2.3.2, the AMF does not send the NAS Service Accept message to the UE. The rest of this procedure is omitted.

4b. [Conditional] If the UE is in CM-IDLE state in 3GPP access and the PDU Session ID received from the SMF in step 3a has been associated with 3GPP access and based on local policy the AMF decides to notify the UE through 3GPP access even when UE is in CM-CONNECTED state for non-3GPP access, the AMF may send a Paging message to NG-RAN node(s) via 3GPP access.

If the UE is simultaneously registered over 3GPP and non-3GPP accesses in the same PLMN, the UE is in CM-IDLE state in both 3GPP access and non-3GPP access and the PDU Session ID in step 3a is associated with non-3GPP access, the AMF sends a Paging message with associated access "non-3GPP" to NG-RAN node(s) via 3GPP access.

If the UE is in RM-REGISTERED state and CM-IDLE and reachable in 3GPP access, the AMF sends a Paging message (NAS ID for paging, Registration Area list, Paging DRX length, Paging Priority, access associated to the PDU Session, Enhanced Coverage Restricted information, WUS Assistance Information) to (R)AN node(s) belonging to the Registration Area(s) in which the UE is registered, then the NG-RAN node pages the UE, including the access associated to the PDU Session in the paging message if received from the AMF, see TS 38.331 [12]. If extended idle mode DRX was accepted by the AMF in the last registration procedure, the AMF includes extended idle mode DRX cycle length and Paging Time Window in the Paging message. The AMF shall ensure that the correct Paging DRX length is provided based on the accepted UE Specific DRX of the current RAT.

NOTE 2: The usage of the Access associated with a PDU Session when paging an UE is defined in clause 5.6.8 of TS 23.501 [2].

NOTE 3: This step is performed also when the UE and the network support User Plane CIoT 5GS Optimisation and the previous RRC connection has been suspended. For PDU session in Suspend mode, the SMF uses the service operation as described in step 3a.

Different paging strategies may be configured in the AMF for different combinations of DNN, Paging Policy Indicator (if supported), ARP and 5QI.

For RRC\_INACTIVE state, the paging strategies may be configured in the (R)AN for different combinations of Paging Policy Indicator, ARP and 5QI.

Paging Priority is included only:

- if the AMF receives an Namf\_Communication\_N1N2MessageTransfer message with an ARP value associated with priority services (e.g. MPS, MCS), as configured by the operator.

- if the AMF receives an Nudm\_SDM\_Notification message for a change in priority subscription (e.g. MPS), with a priority value as configured by the operator.

- One Paging Priority level can be used for multiple ARP values. The mapping of ARP values to Paging Priority level (or levels) is configured by operator policy in the AMF and in NG-RAN.

The (R)AN may prioritise the paging of UEs according to the Paging Priority.

If the AMF, while waiting for a UE response to the Paging Request message sent without Paging Priority, receives an Namf\_Communication\_N1N2MessageTransfer message, which indicates an ARP value associated with priority services (e.g. MPS, MCS), as configured by the operator, the AMF shall send another paging message with the suitable Paging Priority. For subsequent received Namf\_Communication\_N1N2MessageTransfer messages with the same or higher priority, the AMF may determine whether to send the Paging message with suitable Paging Priority based on local policy.

If the AMF has assigned PEIPS Assistance Information, the AMF shall provide the information. The NG-RAN uses this information as described in TS 23.501 [2].

If the AMF has assigned LP-WUS Assistance Information, the AMF shall provide the information to the NG-RAN and UE as described in TS 23.501 [2]. Paging strategies may include:

- paging retransmission scheme (e.g. how frequently the paging is repeated or with what time interval);

- determining whether to send the Paging message to the (R)AN nodes during certain AMF high load conditions;

- whether to apply sub-area based paging (e.g. first page in the last known cell-id or TA and retransmission in all registered TAs).

NOTE 4: Setting of Paging Priority in the Paging message is independent from any paging strategy.

The AMF and the (R)AN may support further paging optimisations in order to reduce the signalling load and the network resources used to successfully page a UE by one or several of the following means:

- by the AMF implementing specific paging strategies (e.g. the N2 Paging message is sent to the (R)AN nodes that served the UE last);

- by the AMF considering Information On Recommended Cells And NG-RAN nodes provided by the (R)AN at transition to CM-IDLE state. The AMF takes the (R)AN nodes related part of this information into account to determine the (R)AN nodes to be paged and provides the information on recommended cells within the N2 Paging message to each of these (R)AN nodes;

- by the (R)AN considering the Paging Attempt Count Information provided by the AMF at paging.

If the UE Radio Capability for Paging Information is available in the AMF, the AMF adds the UE Radio Capability for Paging Information in the N2 Paging message to the (R)AN nodes.

If the Information On Recommended Cells And (R)AN nodes For Paging is available in the AMF, the AMF shall take that information into account to determine the (R)AN nodes for paging and when paging a (R)AN node, the AMF may transparently convey the information on recommended cells to the (R)AN node.

The AMF may include in the N2 Paging message(s) the paging attempt count information. The paging attempt count information shall be the same for all (R)AN nodes selected by the AMF for paging.

If the AMF has Paging Assistance Data for CE capable UE stored in the UE Context in AMF and Enhanced Coverage is not restricted for the UE then the AMF shall include Paging Assistance Data for CE capable UE in the N2 paging message for all NG-RAN nodes selected by the AMF for paging.

The AMF may include in the N2 Paging message(s) the WUS Assistance Information, if available. If the WUS Assistance Information is included by the N2 Paging message, the NG-eNB takes it into account when paging the UE (see TS 36.300 [46]).

The AMF may include in the N2 paging message the PLMN ID(s) of Serving PLMN and equivalent PLMN(s) supported by NG-RAN and corresponding CAG information per PLMN ID which including an Allowed CAG list and optionally an indication whether the UE is only allowed to access 5GS via CAG cells, if available. If the above information is included in N2 paging message, the NG-RAN node may take it into account when determining the cells where paging will be performed (see TS 38.413 [10]).

If the UE and NG-eNB support WUS, then:

- if the NGAP Paging message contains the *Assistance Data for Recommended Cells* IE (see TS 38.413 [10]), the NG-eNB shall only broadcast the UE's Wake Up Signal in the last used cell;

- else (i.e. the *Assistance Data for Recommended Cells* IE is not included in the NGAP Paging message) the eNodeB should not broadcast the UE's Wake Up Signal.

If the network supports the Paging Cause Indication for Voice Service feature and if the UE context in the AMF indicates that the UE supports the Paging Cause Indication for Voice Service feature, the AMF should provide the Voice Service Indication in the NGAP Paging message only when the AMF detects that the downlink data which triggers the Paging message is related to voice service, as specified in clause 5.38.3 of TS 23.501 [2]. If the NG RAN supporting the Paging Cause Indication for Voice Service feature receives the Voice Service Indication, it provides the Voice Service Indication in the Paging message and sends the Paging message to the UE.

4c. [Conditional] If the UE is simultaneously registered over 3GPP and non-3GPP accesses in the same PLMN and the UE is in CM-CONNECTED state in 3GPP access and the PDU Session ID in step 3a is associated with non-3GPP access, the AMF sends a NAS Notification message containing the non-3GPP Access Type to the UE over 3GPP access and sets a Notification timer. Step 5 is omitted.

If the UE is simultaneously registered over 3GPP and non-3GPP accesses in the same PLMN and the UE is in CM-CONNECTED state for non-3GPP access and in CM-IDLE for 3GPP access and if the PDU Session ID in step 3a is associated with 3GPP access and based on local policy the AMF decides to notify the UE through non-3GPP access, the AMF may send a NAS Notification message containing the 3GPP Access Type to the UE over non-3GPP access and sets a Notification timer. If the network supports the Paging Cause Indication for Voice Service feature and if the UE context in the AMF indicates that the UE supports the Paging Cause Indication for Voice Service feature and the AMF detects that the downlink data is related to voice service, as specified in clause 5.38.3 of TS 23.501 [2], the AMF shall send Paging message over 3GPP access as specified in step 4b.

NOTE 5: This step is performed also when the UE and the network support User Plane CIoT 5GS Optimisation in 3GPP access and the previous RRC connection has been suspended.

5. [Conditional] AMF to SMF: Namf\_Communication\_N1N2Transfer Failure Notification.

The AMF supervises the paging procedure with a timer. If the AMF receives no response from the UE to the Paging Request message, the AMF may apply further paging according to any applicable paging strategy described in step 4b.

The AMF notifies the SMF by sending Namf\_Communications\_N1N2MessageTransfer Failure Notification to the Notification Target Address provided by the SMF in step 3a if the UE does not respond to paging, unless the AMF is aware of an ongoing MM procedure that prevents the UE from responding, i.e. the AMF receives an N14 Context Request message indicating that the UE performs Registration procedure with another AMF.

When a Namf\_Communication\_N1N2Transfer Failure Notification is received, SMF informs the UPF (if applicable).

Procedure for pause of charging at SMF is specified in clause 4.4.4.

6. If the UE is in CM-IDLE state in 3GPP access, upon reception of paging request for a PDU Session associated to 3GPP access, the UE shall initiate the UE Triggered Service Request procedure (clause 4.2.3.2) or, if the UE is enabled to use User Plane CIoT 5GS Optimisation and there is suspended access stratum context stored in the UE, the UE initiates the Connection Resume in CM-IDLE with Suspend procedure (clause 4.8.2.3). To support the buffered data forwarding, the SMF instruct the UPF to establish a Data forwarding tunnel between the old UPF and the new UPF or to the PSA as described at steps 6a, 7a, 8a of clause 4.2.3.2.

If the UE is in CM-IDLE state in 3GPP access and is using the Multi-USIM Paging Rejection feature (see clause 5.38 of TS 23.501 [2]), upon reception of paging request and if the UE determines not to accept the paging, the UE attempts to send a Reject Paging Indication via the UE Triggered Service Request procedure (clause 4.2.3.2) unless it is unable to do so e.g. due to UE implementation constraints.

If the UE is in CM-IDLE state in both non-3GPP and 3GPP accesses, upon reception of paging request for a PDU Session associated to non-3GPP access, the UE shall initiate the UE Triggered Service Request procedure (clause 4.2.3.2) which shall contain the List Of Allowed PDU Sessions that, according to UE policies and whether the S-NSSAIs of these PDU Sessions are within the Allowed NSSAI or Partially Allowed NSSAI, if the serving cell is in a TA where the S-NSSAIs are supported or in a serving cell where the S-NSSAIs are available (according to clause 5.15.18 of TS 23.501 [2]) for 3GPP access, can be re-activated over the 3GPP access. If there is no PDU Session that can be re-activated over the 3GPP access, the UE includes an empty List Of Allowed PDU Sessions. If the AMF receives a Service Request message from the UE via non-3GPP access as described in clause 4.12.4.1 (e.g. because the UE successfully connects to a non-3GPP access), the AMF stops the paging procedure and processes the received Service Request procedure. If the AMF receives the Service Request message and the List Of Allowed PDU Sessions provided by the UE does not include the PDU Session for which the UE was paged, the AMF notifies the SMF that the UE was reachable but did not accept to re-activate the PDU Session by invoking Namf\_EventExposure\_Notify service as described in step 4 of clause 4.2.3.2.

If the UE is in CM-IDLE state in non-3GPP access and in CM-CONNECTED state in 3GPP access, upon reception of NAS Notification message over 3GPP access containing the non-3GPP Access Type, the UE shall initiate the UE Triggered Service Request procedure (clause 4.2.3.2) with the List Of Allowed PDU Sessions that, according to UE policies and whether the S-NSSAIs of these PDU Sessions are within the Allowed NSSAI or Partially Allowed NSSAI, if the serving cell is in a TA where the S-NSSAIs are supported or in a serving cell where the S-NSSAIs are available (according to clause 5.15.18 of TS 23.501 [2]) for 3GPP access, can be re-activated over the 3GPP access. If there is no PDU Session that can be re-activated over the 3GPP access, the UE include an empty List Of Allowed PDU Sessions. When the AMF receives the Service Request message and the List of Allowed PDU Sessions provided by the UE does not include the PDU Session for which the UE was notified, the AMF notifies the SMF that the UE was reachable but did not accept to re-activate the PDU Session by invoking Namf\_EventExposure\_Notify service. If the AMF receives a Service Request message from the UE via non-3GPP access as described in clause 4.12.4.1 (e.g. because the UE successfully connects to a non-3GPP access), the AMF stops the Notification timer and processes the received Service Request procedure.

- Alternatively, if the UE is in CM-IDLE state in non-3GPP access with the Mobility Management back-off timer running, upon reception of Paging Message over 3GPP access containing the non-3GPP Access Type, the UE on stopping the back-off timer (for both accesses), shall initiate the UE Triggered Service Request procedure (clause 4.12.4.1) over non-3GPP access if non-3GPP access is available. When the AMF receives a Service Request message from the UE via non-3GPP access, the AMF stops the Paging timer and processes the received Service Request.

NOTE 6: A scenario where the UE is CM-IDLE over non-3GPP access and yet non-3GPP access is available, is when the UE over the non-3GPP access is running the Mobility Management back-off timer and network has released the NAS signalling connection upon service reject.

If the UE is in CM-IDLE state in 3GPP access and in CM-CONNECTED state in non-3GPP access, upon reception of NAS Notification message over non-3GPP access identifying the 3GPP access type, the UE shall initiate the UE triggered Service Request procedure (clause 4.2.3.2) over the 3GPP access when 3GPP access is available. The Multi-USIM UE may not be able to trigger Service Request procedure (clause 4.2.3.2) over the 3GPP access to response the NAS Notification, e.g. due to UE implementation constraints. If the AMF does not receive the Service Request message before Notification timer expires, the AMF may either page the UE through 3GPP access or notify the SMF that the UE was not able to re-activate the PDU Session.

The User Plane of all PDU Sessions for URLLC shall be activated during the Service Request procedure if the UE initiates the Service Request from 3GPP access in CM-IDLE state as described in clause 4.2.3.2.

6a. After receiving the Reject Paging Indication, the AMF notifies the SMF using the Namf\_Communication\_N1N2MessageTransfer Failure Notification that the UE rejected the page and no user plane connection will be established. The UE remains reachable for future paging attempts.

If the AMF detects the UE is in a Non-Allowed Area unless the request from the SMF is for regulatory prioritized service, the AMF rejects the request from the SMF and notifies the SMF that the UE is reachable only for regulatory prioritized service. The AMF stores an indication that the SMF has been informed that the UE is reachable only for regulatory prioritized service.

7. If the AMF has paged the UE to trigger the Service Request Procedure, the AMF shall initiate the UE configuration update procedure as defined in clause 4.2.4.2 to assign a new 5G-GUTI. If the UE response in the Service Request includes a Reject Paging Indication, the AMF triggers the release of the UE as specified in clause 4.2.3.2.

8. The UPF transmits the buffered downlink data toward UE via (R)AN node which performed the Service Request procedure. If data is buffered in the SMF, the SMF delivers buffered downlink data to the UPF.

The network also sends downlink signalling to the UE if the procedure is triggered due to request from other NFs, as described in step 3a.

\* \* \* \* Next change\* \* \* \*

#### 4.2.4.1 General

UE configuration may be updated by the network at any time using UE Configuration Update procedure. UE configuration includes:

- Access and Mobility Management related parameters decided and provided by the AMF. This includes the Configured NSSAI and its mapping to the Subscribed S-NSSAIs, the Allowed NSSAI and its mapping to Subscribed S-NSSAIs, the Partially Allowed NSSAI and its mapping to Subscribed S-NSSAIs, the list of S-NSSAI(s) rejected partially in the RA, the Service Gap time, the list of Rejected NSSAIs if the UE Configuration Update procedure is triggered by the AMF after Network Slice-Specific Authentication and Authorization of S-NSSAIs, the Truncated 5G-S-TMSI Configuration and a priority subscription indication (e.g. MPS). If the UE and the AMF support RACS, this may also include a PLMN-assigned UE Radio Capability ID or alternatively a PLMN-assigned UE Radio Capability ID deletion indication. If the UE and AMF supports Disaster Roaming service, this may also include the "list of PLMN(s) to be used in Disaster Condition", Disaster Roaming wait range information, Disaster Return wait range information and notifying UE that the disaster condition is no longer applicable, as specified in TS 23.501 [2]. The AMF may also update MBSR (IAB-UE) with MBSR authorization information as specified in clause 5.35A.4 of TS 23.501 [2], S-NSSAI location availability information. The AMF may determine a Maximum Time Offset controlling when UEs are allowed to initiate NAS signalling with the network as specified in clause 5.4.13.5 of TS 23.501 [2]. The AMF may update the AMF PEIPS Assistance Information as specified in clause 5.4.12 of TS 23.501 [2] or AMF LP-WUS Assistance Information as specified in clause 5.4.12a of TS 23.501 [2].

- UE Policy provided by the PCF.

When AMF wants to change the UE configuration for access and mobility management related parameters the AMF initiates the procedure defined in clause 4.2.4.2. When the PCF wants to change or provide new UE Policies in the UE, the PCF initiates the procedure defined in clause 4.2.4.3.

If the UE Configuration Update procedure requires the UE to initiate a Registration procedure, the AMF indicates this to the UE explicitly.

The procedure in clause 4.2.4.2 may be triggered also when the AAA Server that performed Network Slice-Specific Authentication and Authorization for an S-NSSAI revokes the authorization.

\* \* \* \* Next change\* \* \* \*

##### 5.2.2.2.2 Namf\_Communication\_UEContextTransfer service operation

**Service operation name:** Namf\_Communication\_UEContextTransfer

**Description:** Provides the UE context to the consumer NF.

**Input, Required:** 5G-GUTI or SUPI, Access Type, Reason.

**Input, Optional:** Integrity protected message from the UE that triggers the context transfer.

**Output, Required:** The UE context of the identified UE or only the SUPI and an indication that the Registration Request has been validated. The UE context is detailed in table 5.2.2.2.2-1.

**Output, Optional:** Mobile Equipment Identifier (if available), Allowed NSSAI, Mapping Of Allowed NSSAI.

See clause 4.2.2.2.2 for example of usage of this service operation. If the consumer NF sent an integrity protected message from the UE, the AMF uses it to verify whether this request is permitted to retrieve the UE context of the UE. If it is permitted, the AMF provides UE context to the consumer NF in the Namf\_Communication\_UEContextTransfer response. The following table illustrates the UE Context:

Table 5.2.2.2.2-1: UE Context in AMF

| Field | Description |
| --- | --- |
| SUPI | SUPI (Subscription Permanent Identifier) is the subscriber's permanent identity in 5GS. |
| Routing Indicator | UE's Routing Indicator that allows together with SUCI/SUPI Home Network Identifier to route network signalling to AUSF and UDM instances capable to serve the subscriber. |
| Home Network Public Key identifier | UE's Network Public Key identifier that may be used together with SUCI/SUPI Home Network Identifier and Routing Indicator to route network signalling to AUSF and UDM instances capable to serve the subscriber. |
| AUSF Group ID | The AUSF Group ID for the given UE. |
| UDM Group ID | The UDM Group ID for the UE. |
| PCF Group ID | The PCF Group ID for the UE. |
| SUPI-unauthenticated-indicator | This indicates whether the SUPI is unauthenticated. |
| GPSI | The GPSI(s) of the UE. The presence is dictated by its storage in the UDM. |
| 5G-GUTI | 5G Globally Unique Temporary Identifier. |
| PEI | Mobile Equipment Identity. |
| Internal Group ID-list | List of the subscribed internal group(s) that the UE belongs to. |
| UE Specific DRX Parameters | UE specific DRX parameters for E-UTRA and NR. |
| UE Specific DRX Parameters for NB-IoT | UE Specific DRX Parameters for NB-IoT. |
| UE MM Network Capability | Indicates the UE MM network capabilities. |
| 5GMM Capability | Includes other UE capabilities related to 5GCN or interworking with EPS. |
| Events Subscription | List of the event subscriptions by other CP NFs. Indicating the events being subscribed as well as any information on how to send the corresponding notifications. |
| LTE-M Indication | Indicates if the UE is a Category M UE. This is based on indication provided by the NG-RAN or by the MME at EPS to 5GS handover. |
| NR RedCap Indication | Indicates if the UE is a NR RedCap UE. This is based on indication provided by the NG-RAN as specified in TS 23.501 [2]. |
| MO Exception Data Counter | MO Exception Data Counter used for Small Data Rate Control purposes, see clause 5.31.14.3 of TS 23.501 [2]. |
| AMF-Associated Expected UE Behaviour parameters | Indicates per UE the Expected UE Behaviour Parameters and their corresponding validity times as specified in clause 4.15.6.3. |
| Disaster Roaming | Indicates the UE is registered for Disaster Roaming service. |
| PLMN with disaster condition | This is the PLMN of the UE which has faced disaster condition. |
| SNPN Onboarding indication | Indicates that the UE is registered for onboarding in an SNPN. |
| **For the AM Policy Association:** | |
| AM Policy Information | Information on AM policy provided by PCF. It includes the Policy Control Request Triggers and Access and mobility related policy information as described in clauses 6.1.2.5 and 6.5 of TS 23.503 [20] except RFSP Index in Use Validity Time. |
| PCF ID | The identifier of the PCF for AM Policy. In roaming, the identifier of V-PCF (NOTE 2). |
| AM Policy Association indicator | Indicates whether AM Policy Association is "enabled" or "disabled" |
| **For the UE Policy Association:** | |
| Trigger Information | The Policy Control Request Triggers on UE policy provided by PCF. |
| PCF ID(s) | The identifier of the PCF for UE Policy. In roaming, the identifiers of both V-PCF and H-PCF (NOTE 1) (NOTE 2). |
| UE Policy Container | The UE Policy Container received from the UE |
| UE Policy Association indicator | Indicates whether UE Policy Associations is "enabled" or "disabled" |
| **For the UE NWDAF association:** | |
| NWDAF ID(s) | Indicating the NWDAF ID(s) (instance ID(s) or Set ID(s)) used for the UE specific Analytics. |
| Subscription Correlation ID(s) | Active UE-related analytics subscription(s) for each given NWDAF ID. |
| Analytics ID(s) | Analytics ID(s) per NWDAF ID. |
| Analytics specific data | Additional information on the Analytics ID(s) the AMF is subscribed related to the UE specific Analytics, i.e. per Analytics ID it contains the following parameters: Analytics Filter Information, Target of Analytics reporting, Analytics Reporting Info. |
| **Other information** | |
| Subscribed RFSP Index | An index to specific RRM configuration in the NG-RAN that is received from the UDM. |
| RFSP Index in Use | An index to specific RRM configuration in the NG-RAN that is currently in use. |
| 5G access stratum time distribution indication | The 5G access stratum time distribution indication to be provided to RAN based on the 5G access stratum time distribution indication received from the PCF. |
| Uu time synchronization error budget | The Uu time synchronization error budget to be provided to RAN based on the Uu time synchronization error budget received from the PCF. |
| Clock quality detail level | It indicates whether and which clock quality information to provide to the UE and can take one of the following values "clock quality metrics" or "acceptable/not acceptable indication". |
| Clock quality acceptance criteria | Indicates acceptable criteria for the UE based on the attributes defined in Table 5.27.1.12-1 of TS 23.501 [2]. |
| UE reconnection indication | Indicates to the UE to reconnect to the network in the case the UE determines that the reference report ID has changed as described in clause 5.27.1.12 of TS 23.501 [2]. |
| UE-AMBR in serving network | The UE-AMBR that has been sent to RAN (e.g. based on subscribed UE-AMBR from UDM or UE-AMBR received from PCF) |
| List of UE-Slice-MBR(s) | The list of UE-Slice-MBR if applicable. There is a single uplink and a single downlink value per S-NSSAI. |
| MICO Mode Indication | Indicates the MICO Mode for the UE. |
| Extended idle mode DRX Parameters | Negotiated extended idle mode DRX parameters. |
| Active Time Value for MICO mode | UE specific Active Time value allocated by AMF for MICO mode handling. |
| Strictly Periodic Registration Timer Indication | An indication that UE shall perform the Periodic Registration Update in a strictly periodic time, see clause 5.31.7.5 of TS 23.501 [2]. |
| Voice Support Match Indicator | An indication whether the UE radio capabilities are compatible with the network configuration. The AMF uses it as an input for setting the IMS voice over PS Session Supported Indication over 3GPP access. |
| Homogenous Support of IMS Voice over PS Sessions | Indicates per UE if "IMS Voice over PS Sessions" is homogeneously supported in all TAs in the serving AMF or homogeneously not supported, or, support is non-homogeneous/unknown, see clause 5.16.3.3 of TS 23.501 [2]. |
| UE Radio Capability for Paging Information | Information used by the NG-RAN to enhance the paging towards the UE (see clause 5.4.4.1 of TS 23.501 [2]). |
| Information On Recommended Cells And RAN nodes For Paging | Information sent by the NG-RAN and used by the AMF when paging the UE to help determining the NG-RAN nodes to be paged as well as to provide the information on recommended cells to each of these NG-RAN nodes, in order to optimize the probability of successful paging while minimizing the signalling load on the radio path. |
| UE Radio Capability Information | Information sent by the NG-RAN node and stored in the AMF. The AMF sends this information to the NG-RAN node within the UE context during transition to CM-CONNECTED state, except for NB-IoT when NB-IoT specific UE Radio Access Capability are sent instead. |
| UE Radio Capability ID | Pointer that uniquely identifies a set of UE Radio Capabilities in UCMF as defined in TS 23.501 [2]. |
| NB-IoT specific UE Radio Access Capability Information | NB-IoT specific UE radio access capabilities. |
| WUS Assistance Information | Assistance information for determining the WUS group (see TS 23.501 [2]). |
| Paging Subgrouping Support Indication | UE indication of its capability to support NR paging subgrouping. |
| AMF PEIPS Assistance Information | AMF assigned NR paging subgroup information for use in NR paging subgrouping (see TS 23.501 [2]). |
| AMF LP-WUS Assistance Information | AMF assigned LP-WUS Assistance Information (see TS 23.501 [2]). |
| SMSF Identifier | The Identifier of the SMSF serving the UE in RM‑REGISTERED state. |
| SMSF Address | The Address of the SMSF serving the UE in RM-REGISTERED state. (see clause 4.13.3.1). |
| SMS Subscription | Indicates subscription to any SMS delivery service over NAS irrespective of access type. |
| SEAF data | Master security information received from AUSF. |
| Last used EPS PLMN ID | The identifier of the last used EPS PLMN. |
| Paging Assistance Data for CE capable UE | Paging Assistance Data for Enhanced Coverage level and cell ID provided by the last NG-RAN the UE was connected to. |
| Enhanced Coverage Restricted Information | Specifies per PLMN whether CE mode B is restricted for the UE, or both CE mode A and CE mode B are restricted for the UE, or both CE mode A and CE mode B are not restricted for the UE. |
| NB-IoT Enhanced Coverage Restricted Information | Specifies per PLMN whether the Enhanced Coverage is restricted or not for the UE. |
| Service Gap Time | Used to set the Service Gap timer for Service Gap Control (see clause 5.31.16 of TS 23.501 [2]). |
| Running Service Gap expiry time | The time of expiry of a currently running Service Gap Timer (see clause 5.31.16 of TS 23.501 [2]). |
| NB-IoT UE Priority | Numerical value used by the NG-RAN to prioritise between UEs accessing via NB-IoT. |
| List of Small Data Rate Control Statuses | List of Small Data Rate Control Statuses by DNN and S-NSSAI for the released PDU Sessions, see clause 5.31.14.3 of TS 23.501 [2]. |
| List of APN Rate Control Statuses | Indicates for each APN, the APN Rate Control Status (see clause 4.7.7.3 of TS 23.401 [13]) received from an MME when mobility from EPC to 5GC occurs. This information is provided to the MME during 5GC to EPC mobility. |
| UE positioning capability | Information sent by the LMF and stored in the AMF. The AMF sends this information along with the location request to the LMF. |
| UE LCS User plane connection information | Information of UE LCS-UP connection indicating the UE has a maintained LCS User Plane connection with certain LMFs. |
| **For each access type level context within the UE access and mobility context:** | |
| Access Type | Indicates the access type for this context. |
| RM State | Registration management state. |
| UUAA-MM Status | Indicates the status of UUAA-MM if the AMF is configured to perform the UAV authentication/authorization at 5GS registration as described in clause 5.2.2 of TS 23.256 [80]. Possible states are "PENDING", "SUCCESS", "FAILED".  For status "PENDING" and "FAILED" the AMF rejects any PDU session establishment request from the UE for DNN and S-NSSAI that are used for UAS services. |
| Registration Area | Current Registration Area (a set of tracking areas in TAI List). |
| TAI of last Registration | TAI of the TA in which the last Registration Request was initiated. |
| User Location Information | Information on user location. |
| Mobility Restrictions | Mobility Restrictions restrict mobility handling or service access of a UE. It consists of RAT restriction, Forbidden area, Service area restrictions and Core Network type restriction. It may also contain an Allowed CAG list and optionally an indication whether the UE is only allowed to access 5GS via CAG cells. Each entry in the Allowed CAG list may also be associated with validity conditions (NOTE 4). |
| Security Information for CP | As defined in TS 33.501 [15]. |
| Security Information for UP | As defined in TS 33.501 [15]. |
| Allowed NSSAI | Allowed NSSAI consisting of one or more S-NSSAIs for serving PLMN in the present Registration Area. |
| Mapping Of Allowed NSSAI | Mapping Of Allowed NSSAI is the mapping of each S-NSSAI of the Allowed NSSAI to the S-NSSAIs of the Subscribed S-NSSAIs. |
| Partially Allowed NSSAI | Partially Allowed NSSAI consisting of one or more S-NSSAIs for serving PLMN.  An associated TA-list for each of the S-NSSAIs in the Partially Allowed NSSAI defines in which TAs the S-NSSAI may be used. |
| Mapping Of Partially Allowed NSSAI | Mapping Of Partially Allowed NSSAI is the mapping of each S-NSSAI of the Partially Allowed NSSAI to the S-NSSAIs of the Subscribed S-NSSAIs. |
| S-NSSAIs subject to Network Slice-Specific Authentication and Authorization | Subscribed S-NSSAIs which are subject to NSSAA procedure.  Also including the status, i.e. result, of the NSSAA if already executed or whether the S-NSSAI is pending the completion of an NSSAA procedure. |
| Inclusion of NSSAI in RRC Connection Establishment Allowed by HPLMN | [Only for 3GPP access] it defines whether the UDM has indicated that the UE is allowed to include NSSAI in the RRC connection Establishment in clear text. |
| Access Stratum Connection Establishment NSSAI Inclusion Mode | Defines what NSSAI, if any, to include in the Access Stratum connection establishment as specified in clause 5.15.9 of TS 23.501 [2]. |
| List of mapping of the S-NSSAI to the Alternative S-NSSAI | Defines the mapping of the replaced S-NSSAIs to the Alternative S-NSSAIs configured to the UE, see clause 5.15.19 of TS 23.501 [2]. |
| Slice Deregistration Inactivity Timer Information | It includes following information per on demand slice:  - On demand S-NSSAI.  - Ongoing slice deregistration inactivity timer information, if the slice deregistration inactivity timer is started.  - Configured slice deregistration inactivity timer value(s).  For more detail see clause 5.15.15.2 of TS 23.501 [2]. |
| CM state for UE connected via N3IWF/TNGF | Identifies the UE CM state (CM-IDLE, CM-CONNECTED) for UE connected via N3IWF/TNGF |
| N2 address information for N3IWF/TNGF | Identifies the N3IWF/TNGF to which UE is connected. Exists only if CM state for UE connected via N3IWF/TNGF is CM-CONNECTED. |
| AMF UE NGAP ID | Identifies the UE association over the NG interface within the AMF as defined in TS 38.413 [10]. This parameter exists only if CM state for the respective Access Type is CM-CONNECTED. |
| RAN UE NGAP ID | Identifies the UE association over the NG interface within the NG-RAN node as defined in TS 38.413 [10]. This parameter exists only if CM state for the respective Access Type is CM-CONNECTED. |
| Network Slice Instance(s) | The Network Slice Instances selected by 5GC for this UE. |
| URRP-AMF information | UE Reachability Request Parameter contains a list of URRP-AMF flags and associated authorised NF IDs. Each URRP-AMF flag indicates whether direct UE reachability notification has been authorised by the HPLMN towards the associated NF ID or not. |
| SoR Update Indicator for Initial Registration | An indication whether the UDM requests the AMF to retrieve SoR information when the UE performs NAS Registration Type "Initial Registration". |
| SoR Update Indicator for Emergency Registration | An indication whether the UDM requests the AMF to retrieve SoR information when the UE performs NAS Registration Type "Emergency Registration". |
| Charging Characteristics | The Charging Characteristics as defined in Annex A of TS 32.256 [71]. |
| **For each PDU Session level context:** | |
| S-NSSAI(s) | The S-NSSAI(s) associated to the PDU Session. |
| Alternative S-NSSAI(s) | The Alternative S-NSSAI(s) for one or more of the S-NSSAI(s) may be present in case of Network Slice replacement, see clause 5.15.19 of TS 23.501 [2]. |
| DNN | The associated DNN for the PDU Session. |
| Network Slice Instance id | The network Slice Instance information for the PDU Session |
| PDU Session ID | The identifier of the PDU Session. |
| SMF Information | The associated SMF identifier and SMF address for the PDU Session.  When an I-SMF is used, this additionally include the information correspond to an I-SMF. |
| Access Type | The current access type for this PDU Session (for a MA PDU Session this may correspond to information indicating 2 Access Type). |
| EBI-ARP list | The allocated EBI and associated ARP pairs for this PDU session. |
| 5GSM Core Network Capability | The UEs 5GSM Core Network Capability as defined in clause 5.4.4b of TS 23.501 [2]. |
| SMF derived CN assisted RAN parameters tuning | These are PDU Session specific parameters received from the SMF and used by the AMF to derive the Core Network assisted RAN parameters tuning. |
| PDU Session Priority | The PDU Session Priority value of the PDU session, if it is received from SMF as specified in TS 23.501 [2]. |
| NOTE 1: The AMF transfers the PCF ID to the SMF during PDU Session Establishment. The SMF may select the PCF identified by the PCF ID as described in clause 6.3.7.1 of TS 23.501 [2]. In HR roaming case, the AMF transfers the identifier of H-PCF as described in clause 4.3.2.2.2. In LBO roaming case, the AMF transfers the identifier of V-PCF as described in clause 4.3.2.2.1.  NOTE 2: The PCF ID in AM Policy Association information and the PCF ID in UE Policy Association Information should be the same in non-roaming case. The V-PCF ID in AM Policy Association information and the V-PCF ID in UE Policy Association Information should be the same in roaming case.  NOTE 3: Not all the parameters stored at AMF are required to be transferred between AMFs during the inter-AMF mobility. The parameters which are required to be transferred between AMFs are defined in TS 29.518 [18].  NOTE 4: The validity information is not provided to the NG-RAN. The AMF shall determine the CAG Identifier(s) to be provided to the NG-RAN in Allowed CAG list, by taking into consideration the validity information associated with the CAG Identifier(s), as described in clause 5.30.3 of TS 23.501 [2]. | |

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