**3GPP TSG-<TSG/WG> Meeting # <MTG\_SEQ**>**<MTG\_TITLE> *<TDoc#>***

**<Location>, <Country>, <Start\_Date> - <End\_Date>**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.501** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | 5G system architecture updates to support Dynamically Changing Policies in the 5GC | | | | | | | | | |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI17\_DCAMP | | | | |  | ***Date:*** | | | <Res\_date> |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The agreed TEI17\_DCAMP WID foresees the enablement of dynamically changing AM policies by the PCF (potentially upon respective requests from an AF and/or triggered by detected start/stop of applications).  In order to support this, it is required to introduce new NEF and PCF services for requesting AM policy changes, as well as enhanced PCF discovery mechanisms. | | | | | | | | |
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| ***Summary of change:*** | | This CR:  - Updates the Mobility Restrictions description to cover the case that Service Area Restrictions might be modified because of dynamically changed AM policies.  - Updates the Network Capability Exposure description to cover the case of externally influenced/changed AM Policies.  - Updates the PCF discovery section to include the case of a PCF serving the SMF being discovered by a PCF serving the AMF.  - Adds new Nnef and Npcf services (Nnef\_AMInfluence, Nnef\_AMPolicyAuthorization, Npcf\_AMPolicyAuthorization) to offer the capability to influence AM policies.  - Clarifies that the PCF managing the AM policies of a UE can be different from the PCF(s) managing the PDU Sessions of that UE. | | | | | | | | |
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| ***Consequences if not approved:*** | | Dynamically changing AM policies are not supported by the 5GC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.3.4.1.1, 5.20, 6.3.7, 7.2.4, 7.2.8, 6.2.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 23.502, TS 23.503 | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* \* First change \* \* \* \*

##### 5.3.4.1.1 General

Mobility Restrictions restrict mobility handling or service access of a UE. The Mobility Restriction functionality is provided by the UE (only for mobility restriction categories provided to the UE), the radio access network and the core network.

Unless otherwise stated, Mobility Restrictions only apply to 3GPP access and wireline access, they do not apply to other non-3GPP accesses.

The UE and the network shall override Mobility restriction whenever accessing the network for regulatory prioritized services like Emergency services and MPS.

Service Area restrictions and handling of Forbidden Areas for CM-IDLE state and, for CM-CONNECTED state when in RRC Inactive state are executed by the UE based on information received from the core network. Mobility Restrictions for CM-CONNECTED state when in RRC-Connected state are executed by the radio access network and the core network.

In CM-CONNECTED state, the core network provides Mobility Restrictions to the radio access network within Mobility Restriction List.

Mobility Restrictions consists of RAT restriction, Forbidden Area, Service Area Restrictions, Core Network type restriction and Closed Access Group information as follows:

- RAT restriction:

Defines the 3GPP Radio Access Technology(ies), a UE is not allowed to access in a PLMN. In a restricted RAT a UE based on subscription is not permitted access to the network for this PLMN. For CM-CONNECTED state, when radio access network determines target RAT and target PLMN during Handover procedure, it should take per PLMN RAT restriction into consideration. The RAT restriction is enforced in the network, and not provided to the UE.

- Forbidden Area:

In a Forbidden Area, the UE, based on subscription, is not permitted to initiate any communication with the network for this PLMN. The UE behaviour in terms of cell selection, RAT selection and PLMN selection depends on the network response that informs the UE of Forbidden Area. A Forbidden Area applies either to 3GPP access or to non-3GPP access.

Further description on Forbidden Area when using wireline access is available in TS 23.316 [84].

NOTE 1: If the N3GPP TAI (see clause 5.3.2.3) is forbidden in a PLMN, non-3GPP Access is forbidden altogether in this PLMN.

NOTE 2: The UE reactions to specific network responses are described in TS 24.501 [47].

- Service Area Restriction:

Defines areas in which the UE may or may not initiate communication with the network as follows:

- Allowed Area:

In an Allowed Area, the UE is permitted to initiate communication with the network as allowed by the subscription.

- Non-Allowed Area:

In a Non-Allowed Area a UE is service area restricted based on subscription or policies as defined in TS 23.503 [45]. The UE and the network are not allowed to initiate Service Request, or any connection requests for user plane data, control plane data, exception data reporting, or SM signalling (except for PS Data Off status change reporting) to obtain user services that are not related to mobility.

The UE shall not use the entering of a Non-Allowed Area as a criterion for Cell Reselection, a trigger for PLMN Selection or Domain selection for UE originating sessions or calls. The RRC procedures while the UE is in CM-CONNECTED with RRC Inactive state are unchanged compared to when the UE is in an Allowed Area. The RM procedures are unchanged compared to when the UE is in an Allowed Area. The UE in a Non-Allowed Area shall respond to core network paging or NAS Notification message from non-3GPP access with Service Request and RAN paging. The UE in a Non-Allowed Area may initiate MA PDU Session establishment or activation over a non-3GPP access other than wireline access, but the User Plane resources on the 3GPP access for the MA-PDU shall not be established or activated. The handling of Non-Allowed Area when using wireline access is described in TS 23.316 [84].

NOTE 3: When the services are restricted in 5GS due to Service Area Restriction, then it is assumed that the services will be also restricted in all RATs/Systems at the same location(s) using appropriate mechanisms available in the other RATs/Systems.

NOTE 4: Delivery of SOR transparent container, UE policy container, UE parameters update transparent container as defined in TS 24.501 [47], is part of the mobility related service and is allowed in an area with service restriction.

NOTE 5: For a UE in CM-CONNECTED state then neither control plane data transmission nor, if user plane resources are already established, user plane data transmission are restricted by a non-allowed area.

- Core Network type restriction:

Defines whether UE is allowed to connect to 5GC only, EPC only, both 5GC and EPC for this PLMN. The Core Network type restriction when received applies in the PLMN either to both 3GPP and non-3GPP Access Types or to non-3GPP Access Type only.

NOTE 6: The Core Network type restriction can be used e.g. in network deployments where the E-UTRAN connects to both EPC and 5GC as described in clause 5.17. When the Core Network type restriction applies to non-3GPP Access Type, the UE is restricted from using any connectivity to an N3IWF.

- Closed Access Group information:

As defined in clause 5.30.3.

For a given UE, the core network determines the Mobility Restrictions based on UE subscription information, UE location and/or local policy (e.g. if the HPLMN has not deployed 5GC, HPLMN ID of the UE and the operator's policy are used in the VPLMN for determining the Core Network type restriction). The Mobility Restriction may change due to e.g. UE's subscription, location change and local policy. Optionally the Service Area Restrictions or the Non-Allowed Area may in addition be fine-tuned by the PCF e.g. based on UE location, PEI and network policies, or a change in policies received from an AF (as defined in TS 23.503 [45]). Service Area Restrictions may be updated during a Registration procedure or UE Configuration Update procedure.

NOTE 7: The subscription management ensure that for MPS service subscriber the Mobility Restrictions is not included.

If the network sends Service Area Restrictions to the UE, the network sends only either an Allowed Area, or a Non-Allowed Area, but not both at the same time, to the UE. If the UE has received an Allowed Area from the network, any TA not part of the Allowed Area is considered by the UE as non-allowed. If the UE has received a Non-Allowed Area from the network, any TA not part of the Non-Allowed Area is considered by the UE as allowed. If the UE has not received any Service Area Restrictions, any TA in the PLMN is considered as allowed.

If the UE has overlapping areas between Forbidden Areas, Service Area Restrictions, or any combination of them, the UE shall proceed in the following precedence order:

- The evaluation of Forbidden Areas shall take precedence over the evaluation of Service Area Restrictions.

The UDM shall provide to the AMF the information defined in TS 23.008 [119] about the subscriber's NR or E-UTRA access restriction set by the operator determined e.g. by subscription scenario and roaming scenario:

- For NR:

- NR not allowed as primary access.

- NR not allowed as secondary access.

- NR in unlicensed bands not allowed as primary access.

- NR in unlicensed bands not allowed as secondary access.

- For E-UTRA:

- E-UTRA not allowed as primary access.

- E-UTRA not allowed as secondary access.

- E-UTRA in unlicensed bands not allowed as secondary access.

- NB-IoT not allowed as primary access.

- LTE-M not allowed as primary access.

In order to enforce all primary access restrictions, the related access has to be deployed in different Tracking Area Codes and the subscriber shall not be allowed to access the network in TAs using the particular access.

With all secondary access restrictions, the subscriber shall not be allowed to use this access as secondary access.

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

## 5.20 External Exposure of Network Capability

The Network Exposure Function (NEF) supports external exposure of capabilities of network functions. External exposure can be categorized as Monitoring capability, Provisioning capability, Policy/Charging capability and Analytics reporting capability. The Monitoring capability is for monitoring of specific event for UE in 5G System and making such monitoring events information available for external exposure via the NEF. The Provisioning capability is for allowing external party to provision of information which can be used for the UE in 5G System. The Policy/Charging capability is for handling access and mobility management, QoS, and charging policies for the UE based on the request from external party. The Analytics reporting capability is for allowing an external party to fetch or subscribe/unsubscribe to analytics information generated by 5G System (this is further defined in TS 23.288 [86]).

Monitoring capability is comprised of means that allow the identification of the 5G network function suitable for configuring the specific monitoring events, detect the monitoring event, and report the monitoring event to the authorised external party. Monitoring capability can be used for exposing UE's mobility management context such as UE location, reachability, roaming status, and loss of connectivity. AMF stores URRP-AMF information in the MM context to determine the NFs that are authorised to receive direct notifications from the AMF. UDM stores URRP-AMF information locally to determine authorised monitoring requests when forwarding indirect notifications.

Provisioning capability allows an external party to provision the Expected UE Behaviour or the 5G-VN group information or service specific information to 5G NF via the NEF. The provisioning comprises of the authorisation of the provisioning external third party, receiving the provisioned external information via the NEF, storing the information, and distributing that information among those NFs that use it. The externally provisioned data can be consumed by different NFs, depending on the data. In the case of provisioning the Expected UE Behaviour, the externally provisioned information which is defined as the Expected UE Behaviour parameters in TS 23.502 [3] clause 4.15.6.3 or Network Control parameter TS 23.502 [3] clause 4.15.6.3a consists of information on expected UE movement, Expected UE Behaviour parameters or expected Network Configuration parameter. The provisioned Expected UE Behaviour parameters may be used for the setting of mobility management or session management parameters of the UE. In the case of provisioning the 5G-VN group information the externally provisioned information is defined as the 5G-VN group parameters in TS 23.502 [3] clause 4.15.6.7, and it consists of some information on the 5G-VN group. The affected NFs are informed via the subscriber data update as specified in TS 23.502 [3] clause 4.15.6.2. The externally provisioned information which is defined as the Service Parameters in clause 4.15.6.7 of TS 23.502 [3] consists of service specific information used for supporting the specific service in 5G system. The provisioned Service Parameters may be delivered to the UEs. The affected NFs are informed of the data update.

Policy/Charging capability is comprised of means that allow the request to influence access and mobility management or session and charging policies, enforce QoS policy, and apply accounting functionality. It can be used for specific QoS/priority handling for the session of the UE, and for setting applicable charging party or charging rate.

Analytics reporting capability is comprised of means that allow discovery of type of analytics that can be consumed by external party, the request for consumption of analytics information generated by NWDAF.

An NEF may support CAPIF functions for external exposure as specified in clause 6.2.5.1.

An NEF may support exposure of NWDAF analytics as specified in TS 23.288 [86].

\* \* \* \* Third change \* \* \* \*

#### 6.3.7.X Identifying a PCF with an established AM Policy association for a UE or an established SM Policy association for a PDU session

Identification of a PCF that has an established AM Policy association for a UE or an established SM Policy association for a PDU session is described in TS 23.503 [45].

\* \* \* \* Fourth change \* \* \* \*

### 7.2.4 PCF Services

The following NF services are specified for PCF:

Table 7.2.4-1: NF Services provided by PCF

| Service Name | Description | Reference in TS 23.502 [3] |
| --- | --- | --- |
| Npcf\_AMPolicyControl | This PCF service provides Access Control, network selection and Mobility Management related policies, UE Route Selection Policies to the NF consumers. | 5.2.5.2 |
| Npcf\_SMPolicyControl | This PCF service provides session related policies to the NF consumers. | 5.2.5.4 |
| Npcf\_PolicyAuthorization | This PCF service authorises an AF request and creates policies as requested by the authorised AF for the PDU Session to which the AF session is bound to. This service allows the NF consumer to subscribe/unsubscribe to the notification of Access Type and RAT type, PLMN identifier, access network information, usage report etc. | 5.2.5.3 |
| Npcf\_BDTPolicyControl | This PCF service provides background data transfer policy negotiation and optionally notification for the renegotiation to the NF consumers. | 5.2.5.5 |
| Npcf\_UEPolicyControl | This PCF service provides the management of UE Policy Association to the NF consumers. | 5.2.5.6 |
| Npcf\_EventExposure | This PCF service provide the support for event exposure. | 5.2.5.7 |
| Npcf\_AMPolicyAuthorization | The PCF authorises an AF request and creates access and mobility management related policies for a UE based on the request of the authorised AF. | 5.2.5.X |

\* \* \* \* Fifth change \* \* \* \*

### 7.2.8 NEF Services

The following NF services are specified for NEF:

Table 7.2.8-1: NF Services provided by NEF

| Service Name | Description | Reference in TS 23.502 [3] |
| --- | --- | --- |
| Nnef\_EventExposure | Provides support for event exposure. | 5.2.6.2 |
| Nnef\_PFDManagement | Provides support for PFDs management. | 5.2.6.3 |
| Nnef\_ParameterProvision | Provides support to provision information which can be used for the UE in 5GS. | 5.2.6.4 |
| Nnef\_Trigger | Provides support for device triggering. | 5.2.6.5 |
| Nnef\_BDTPNegotiation | Provides support for background data transfer policy negotiation and optionally notification for the renegotiation. | 5.2.6.6 |
| Nnef\_TrafficInfluence | Provide the ability to influence traffic routing. | 5.2.6.7 |
| Nnef\_ChargeableParty | Requests to become the chargeable party for a data session for a UE. | 5.2.6.8 |
| Nnef\_AFsessionWithQoS | Requests the network to provide a specific QoS for an AS session. | 5.2.6.9 |
| Nnef\_MSISDN-less\_MO\_SMS | Used by the NEF to send MSISDN-less MO SM to the AF. | 5.2.6.10 |
| Nnef\_ServiceParameter | Provides support to provision service specific information. | 5.2.6.11 |
| Nnef\_APISupportCapability | Provides support for awareness on availability or expected level of a service API. | 5.2.6.12 |
| Nnef\_NIDDConfiguration | Used for configuring necessary information for data delivery via the NIDD API. | 5.2.6.13 |
| Nnef\_NIDD | Used for NEF anchored MO and MT unstructured data transport. | 5.2.6.14 |
| Nnef\_SMContext | Provides the capability to create, update or release the SMF-NEF Connection. | 5.2.6.15 |
| Nnef\_AnalyticsExposure | Provides support for exposure of network analytics. | 5.2.6.16 |
| Nnef\_UCMFProvisioning | Provides the ability to configure the UCMF with dictionary entries consisting of UE manufacturer-assigned UE Radio Capability IDs, the corresponding UE radio capabilities and the (list of) associated IMEI/TAC value(s) via the NEF. The UE radio capabilities the NEF provides for a UE radio Capability ID can be in TS 36.331 [51] format, TS 38.331 [28] format or both formats. Also used for deletion (e.g. as no longer used) or update (e.g. to add or remove a (list of) IMEI/TAC value(s) associated to an entry) of dictionary entries in the UCMF. | 5.2.6.17 |
| Nnef\_ECRestriction | Provides support for queuing status of enhanced coverage restriction, or enable/disable enhanced coverage restriction per individual UEs. | 5.2.6.18 |
| Nnef\_ApplyPolicy | Provides the capability to apply a previously negotiated Background Data Transfer Policy to a UE or a group of UEs. | 5.2.6.19 |
| Nnef\_Location | Provides the capability to deliver UE location to AF. | 5.2.6.21 |
| Nnef\_AMInfluence | Provides the ability to influence access and mobility management related policies for one or multiple UEs. | 5.2.6.X |
| Nnef\_AMPolicyAuthorization | Provides the ability to request the creation of access and mobility management related policies based on the provided information. | 5.2.6.Y |

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

### 6.2.4 PCF

The Policy Control Function (PCF) includes the following functionality:

- Supports unified policy framework to govern network behaviour.

- Provides policy rules to Control Plane function(s) to enforce them.

- Accesses subscription information relevant for policy decisions in a Unified Data Repository (UDR).

NOTE: The PCF accesses the UDR located in the same PLMN as the PCF.

The PCF providing access and mobility management related policies for a UE and the PCF(s) providing policies for one or more PDU Sessions of that UE may be different NF instances.

The details of the PCF functionality are defined in clause 6.2.1 of TS 23.503 [45].

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