**3GPP TSG-WG SA2 Meeting #143E e-meeting  *S2-210xxxx***

**February 24 – March 9, 2021, Elbonia (revision of S2-210xxxx)**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.501** | **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:*** | Architectural Changes to Increasing efficiency of data collection | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNA\_Ph2 | | | | |  | ***Date:*** | | | 2021-02-10 |
|  |  | | | |  | |  | | |  |
| ***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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)*  *Rel-17 (Release 17)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduce the DCCF, ADRF and MAF in 23.501 as agreed in the TR 23.700-91 Conclusion in Clause 8.11.4 “Signalling reduction via architectural changes” | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Section – 3.2 Update Abbreviations 2. Section - 4.2.2 add DCCF, ARDF and MAF to list of NFs 3. Section 4.2.6 – Introduce DCCF, ADRF and MAF Service-Based Interfaces 4. Section 6.2 – summarize DCCF, ADRF and MAF functionallity 5. Section 6.3 – describe DCCF, ADRF and MAF discovery and selection 6. Section 7.2 – describe DCCF, ADRF and MAF new services | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | TS 23.501 is not updated to reflect architecture agreed in TR conclusion and Signaling Reduction enabled architectural changes are not possible. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.2, 4.2.2, 4.2.3, 4.2.6, (NEW) 6.2.x, (NEW) 6.2.x+1, (NEW) 6.3.x, (NEW) 6.3.x+1, (NEW) 6.3.x+2, (NEW) 7.2.x, (NEW) 7.2.x+1, (NEW) 7.2.x+2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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

## 3.2 Abbreviations

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

5GC 5G Core Network

5G-VN 5G Local Area Network

5GS 5G System

5G-AN 5G Access Network

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

5G-EIR 5G-Equipment Identity Register

5G-GUTI 5G Globally Unique Temporary Identifier

5G-BRG 5G Broadband Residential Gateway

5G-CRG 5G Cable Residential Gateway

5G GM 5G Grand Master

5G-RG 5G Residential Gateway

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

5G VN 5G Virtual Network

5QI 5G QoS Identifier

ADRF Analytics Data Repository Function

AF Application Function

AMF Access and Mobility Management Function

AS Access Stratum

ATSSS Access Traffic Steering, Switching, Splitting

ATSSS-LL ATSSS Low-Layer

AUSF Authentication Server Function

BMCA Best Master Clock Algorithm

BSF Binding Support Function

CAG Closed Access Group

CAPIF Common API Framework for 3GPP northbound APIs

CHF Charging Function

CN PDB Core Network Packet Delay Budget

CP Control Plane

DAPS Dual Active Protocol Stacks

DCCF Data Collection Coordination Function

DL Downlink

DN Data Network

DNAI DN Access Identifier

DNN Data Network Name

DRX Discontinuous Reception

DS-TT Device-side TSN translator

ePDG evolved Packet Data Gateway

EBI EPS Bearer Identity

EUI Extended Unique Identifier

FAR Forwarding Action Rule

FN-BRG Fixed Network Broadband RG

FN-CRG Fixed Network Cable RG

FN-RG Fixed Network RG

FQDN Fully Qualified Domain Name

GFBR Guaranteed Flow Bit Rate

GMLC Gateway Mobile Location Centre

GPSI Generic Public Subscription Identifier

GUAMI Globally Unique AMF Identifier

HR Home Routed (roaming)

IAB Integrated access and backhaul

IMEI/TAC IMEI Type Allocation Code

IPUPS Inter PLMN UP Security

I-SMF Intermediate SMF

I-UPF Intermediate UPF

LADN Local Area Data Network

LBO Local Break Out (roaming)

LMF Location Management Function

LoA Level of Automation

LPP LTE Positioning Protocol

LRF Location Retrieval Function

MAF Messaging Adaptor Function

MCX Mission Critical Service

MDBV Maximum Data Burst Volume

MFBR Maximum Flow Bit Rate

MICO Mobile Initiated Connection Only

MPS Multimedia Priority Service

MPTCP Multi-Path TCP Protocol

N3IWF Non-3GPP InterWorking Function

N5CW Non-5G-Capable over WLAN

NAI Network Access Identifier

NEF Network Exposure Function

NF Network Function

NGAP Next Generation Application Protocol

NID Network identifier

NPN Non-Public Network

NR New Radio

NRF Network Repository Function

NSI ID Network Slice Instance Identifier

NSSAA Network Slice-Specific Authentication and Authorization

NSSAAF Network Slice-Specific Authentication and Authorization Function

NSSAI Network Slice Selection Assistance Information

NSSF Network Slice Selection Function

NSSP Network Slice Selection Policy

NW-TT Network-side TSN translator

NWDAF Network Data Analytics Function

PCF Policy Control Function

PDB Packet Delay Budget

PDR Packet Detection Rule

PDU Protocol Data Unit

PEI Permanent Equipment Identifier

PER Packet Error Rate

PFD Packet Flow Description

PNI-NPN Public Network Integrated Non-Public Network

PPD Paging Policy Differentiation

PPF Paging Proceed Flag

PPI Paging Policy Indicator

PSA PDU Session Anchor

PTP Precision Time Protocol

QFI QoS Flow Identifier

QoE Quality of Experience

RACS Radio Capabilities Signalling optimisation

(R)AN (Radio) Access Network

RG Residential Gateway

RIM Remote Interference Management

RQA Reflective QoS Attribute

RQI Reflective QoS Indication

RSN Redundancy Sequence Number

SA NR Standalone New Radio

SBA Service Based Architecture

SBI Service Based Interface

SCP Service Communication Proxy

SD Slice Differentiator

SEAF Security Anchor Functionality

SEPP Security Edge Protection Proxy

SMF Session Management Function

SMSF Short Message Service Function

SN Sequence Number

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SSC Session and Service Continuity

SSCMSP Session and Service Continuity Mode Selection Policy

SST Slice/Service Type

SUCI Subscription Concealed Identifier

SUPI Subscription Permanent Identifier

SV Software Version

TNAN Trusted Non-3GPP Access Network

TNAP Trusted Non-3GPP Access Point

TNGF Trusted Non-3GPP Gateway Function

TNL Transport Network Layer

TNLA Transport Network Layer Association

TSC Time Sensitive Communication

TSCAI TSC Assistance Information

TSN Time Sensitive Networking

TSN GM TSN Grand Master

TSP Traffic Steering Policy

TT TSN Translator

TWIF Trusted WLAN Interworking Function

UCMF UE radio Capability Management Function

UDM Unified Data Management

UDR Unified Data Repository

UDSF Unstructured Data Storage Function

UL Uplink

UL CL Uplink Classifier

UPF User Plane Function

URLLC Ultra Reliable Low Latency Communication

URRP-AMF UE Reachability Request Parameter for AMF

URSP UE Route Selection Policy

VID VLAN Identifier

VLAN Virtual Local Area Network

W-5GAN Wireline 5G Access Network

W-5GBAN Wireline BBF Access Network

W-5GCAN Wireline 5G Cable Access Network

W-AGF Wireline Access Gateway Function

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

## 4.2 Architecture reference model

### 4.2.1 General

This specification describes the architecture for the 5G System. The 5G architecture is defined as service-based and the interaction between network functions is represented in two ways.

- A service-based representation, where network functions (e.g. AMF) within the Control Plane enables other authorized network functions to access their services. This representation also includes point-to-point reference points where necessary.

- A reference point representation, shows the interaction exist between the NF services in the network functions described by point-to-point reference point (e.g. N11) between any two network functions (e.g. AMF and SMF).

Service-based interfaces are listed in clause 4.2.6. Reference points are listed in clause 4.2.7.

Network functions within the 5GC Control Plane shall only use service-based interfaces for their interactions.

NOTE 1: The interactions between NF services within one NF are not specified in this Release of the specification.

NOTE 2: UPF does not provide any services in this Release of the specification, but can consume services provided by 5GC Control Plane NFs.

NFs and NF services can communicate directly, referred to as Direct Communication, or indirectly via the SCP, referred to as Indirect Communication. For more information on communication options, see Annex E and clauses under 6.3.1 and 7.1.2.

### 4.2.2 Network Functions and entities

The 5G System architecture consists of the following network functions (NF).

- Authentication Server Function (AUSF).

- Access and Mobility Management Function (AMF).

- Data Network (DN), e.g. operator services, Internet access or 3rd party services.

- Unstructured Data Storage Function (UDSF).

- Network Exposure Function (NEF).

- Network Repository Function (NRF).

- Network Slice Specific Authentication and Authorization Function (NSSAAF).

- Network Slice Selection Function (NSSF).

- Policy Control Function (PCF).

- Session Management Function (SMF).

- Unified Data Management (UDM).

- Unified Data Repository (UDR).

- User Plane Function (UPF).

- UE radio Capability Management Function (UCMF).

- Application Function (AF).

- User Equipment (UE).

- (Radio) Access Network ((R)AN).

- 5G-Equipment Identity Register (5G-EIR).

- Network Data Analytics Function (NWDAF).

- CHarging Function (CHF).

- Data Collection Coordination Function (DCCF)

- Analytics Data Repository Function (ADRF)

- Messaging Adaptor Function (MAF)

NOTE 1: The functional description on architecture and principles of the CHF is specified in TS 32.240 [41].

NOTE 2: The functionalities provided by the DCCF or ADRF can also be hosted by an NWDAF.

The 5G System architecture also comprises the following network entities:

- Service Communication Proxy (SCP).

- Security Edge Protection Proxy (SEPP).

The functional descriptions of these Network Functions and entities are specified in clause 6.

- Non-3GPP InterWorking Function (N3IWF).

- Trusted Non-3GPP Gateway Function (TNGF).

- Wireline Access Gateway Function (W-AGF).

- Trusted WLAN Interworking Function (TWIF).

### 4.2.3 Non-roaming reference architecture

Figure 4.2.3-1 depicts the non-roaming reference architecture. Service-based interfaces are used within the Control Plane.



Figure 4.2.3-1: 5G System architecture

NOTE: If an SCP is deployed it can be used for indirect communication between NFs and NF services as described in Annex E. SCP does not expose services itself.

Figure 4.2.3-2 depicts the 5G System architecture in the non-roaming case, using the reference point representation showing how various network functions interact with each other.



NOTE 1: N9, N14 are not shown in all other figures however they may also be applicable for other scenarios.

NOTE 2: For the sake of clarity of the point-to-point diagrams, the UDSF, NEF and NRF have not been depicted. However, all depicted Network Functions can interact with the UDSF, UDR, NEF and NRF as necessary.

NOTE 3: The UDM uses subscription data and authentication data and the PCF uses policy data that may be stored in UDR (refer to clause 4.2.5).

NOTE 4: For clarity, the UDR and its connections with other NFs, e.g. PCF, are not depicted in the point-to-point and service-based architecture diagrams. For more information on data storage architectures refer to clause 4.2.5.

NOTE 5: For clarity, the NWDAF, DCCF and ADRF and their connections with other NFs, e.g. PCF, are not depicted in the point-to-point and service-based architecture diagrams. For more information on network data analytics architecture refer to TS 23.288 [86].

Figure 4.2.3-2: Non-Roaming 5G System Architecture in reference point representation

Figure 4.2.3-3 depicts the non-roaming architecture for UEs concurrently accessing two (e.g. local and central) data networks using multiple PDU Sessions, using the reference point representation. This figure shows the architecture for multiple PDU Sessions where two SMFs are selected for the two different PDU Sessions. However, each SMF may also have the capability to control both a local and a central UPF within a PDU Session.



Figure 4.2.3-3: Applying non-roaming 5G System architecture for multiple PDU Session in reference point representation

Figure 4.2.3-4 depicts the non-roaming architecture in the case of concurrent access to two (e.g. local and central) data networks is provided within a single PDU Session, using the reference point representation.



Figure 4.2.3-4: Applying non-roaming 5G System architecture for concurrent access to two (e.g. local and central) data networks (single PDU Session option) in reference point representation

Figure 4.2.3-5 depicts the non-roaming architecture for Network Exposure Function, using reference point representation.



Figure 4.2.3-5: Non-roaming architecture for Network Exposure Function in reference point representation

NOTE 1: In figure 4.2.3-5, Trust domain for NEF is same as Trust domain for SCEF as defined in TS 23.682 [36].

NOTE 2: In figure 4.2.3-5, 3GPP Interface represents southbound interfaces between NEF and 5GC Network Functions e.g. N29 interface between NEF and SMF, N30 interface between NEF and PCF, etc. All southbound interfaces from NEF are not shown for the sake of simplicity.

\* \* \* \* Third Change \* \* \* \*

### 4.2.6 Service-based interfaces

The 5G System Architecture contains the following service-based interfaces:

**Namf:** Service-based interface exhibited by AMF.

**Nsmf:** Service-based interface exhibited by SMF.

**Nnef:** Service-based interface exhibited by NEF.

**Npcf:** Service-based interface exhibited by PCF.

**Nudm:** Service-based interface exhibited by UDM.

**Naf:** Service-based interface exhibited by AF.

**Nnrf:** Service-based interface exhibited by NRF.

**Nnssaaf:** Service-based interface exhibited by NSSAAF.

**Nnssf**: Service-based interface exhibited by NSSF.

**Nausf:** Service-based interface exhibited by AUSF.

**Nudr:** Service-based interface exhibited by UDR.

**Nudsf:** Service-based interface exhibited by UDSF.

**N5g-eir:** Service-based interface exhibited by 5G-EIR.

**Nnwdaf:** Service-based interface exhibited by NWDAF.

**Nchf:** Service-based interface exhibited by CHF.

**Nucmf:** Service-based interface exhibited by UCMF.

**Ndccf:** Service based interface exhibited by DCCF.

**Nmaf:** Service based interface exhibited by MAF.

**Nadrf:** Service based interface exhibited by ADRF.

NOTE: The Service-based interface exhibited by CHF is defined in TS 32.290 [67].

\* \* \* \* Fourth Change (all new text) \* \* \* \*

### 6.2.x DCCF

The Data Collection Coordination Function (DCCF) supports the following functionality:

- Determining Data Sources that can provide data for a received data request.

- Determining whether data is already being collected from a data source.

- Instructing a Messaging Framework to send data to consumers or notification endpoints.

- Instructing a Messaging Framework to do formatting and processing of the data sent via the Messaging Framework.

- Formatting and processing of data.

- Sending data to consumers or notification endpoints.

- Registering NWDAFs and ADRFs that are already receiving data from a Data Source.

The DCCF functionality is specified in 3GPP TS 23.288 [86].

### 6.2.x+1 MAF

The Messaging Adaptor Function (MAF) supports the following functionality:

- Interfacing with a DCCF that controls how a messaging framework will process, format and send data to consumers or notification endpoints.

- Receiving data from Data Sources via services offered by those Data Sources.

- Sending data received from Data Sources to a messaging framework (outside the scope of 3GPP).

- Receiving data from a messaging framework (outside the scope of 3GPP).

- Processing, formatting and sending data to specified consumers or notification endpoints.

The MAF functionality is specified in 3GPP TS 23.288 [86].

### 6.2.x+2 ADRF

The Analytics Data Repository Function (ADRF) supports the following functionality:

* Storage and retrieval of analytics generated by NWDAFs and collected data.

The Analytics Data Repository Function (ADRF) is specified in 3GPP TS 23.288 [86].

\* \* \* \* Fifth Change (all new text) \* \* \* \*

### 6.3.x DCCF discovery and selection

Multiple instances of DCCF may be deployed in a network.

The NF consumers shall utilize the NRF to discover DCCF instance(s) unless DCCF information is available by other means, e.g. locally configured on NF consumers. The DCCF selection function in NF consumers selects a DCCF instance based on the available DCCF instances.

The following factors may be considered by the NF consumer for DCCF selection:

- S-NSSAI;

- NF types of the Data Sources that a DCCF coordinates;

- DCCF Serving Area information, i.e. list of TAIs for which the DCCF coordinates Data Sources.

### 6.3.x+1 ADRF discovery and selection

Multiple instances of ADRF may be deployed in a network.

The NF consumers shall utilize the NRF to discover ADRF instance(s) unless ADRF information is available by other means, e.g. locally configured on NF consumers. The ADRF selection function in NF consumers selects an ADRF instance based on the available ADRF instances.

The following factors may be considered by the NF consumer for ADRF selection:

- S-NSSAI;

- NF Types of the Data Sources for which the ADRF stores data;

- ADRF Serving Area information, i.e. list of TAIs for which the ADRF stores data.

### 6.3.x+2 MAF discovery and selection

Multiple instances of MAF may be deployed in a network.

The MAF selection function is supported by the DCCF. The DCCF shall utilize the NRF to discover MAF instance(s) unless MAF information is available by other means, e.g. locally configured on the DCCF. The MAF selection function in the DCCF selects a MAF instance based on the available MAF instances.

The following factors may be considered by the DCCF for MAF selection:

- S-NSSAI;

- NF Types of the Data Sources handled by the MAF;

- MAF Serving Area information, i.e. list of TAIs for which the MAF may receive data from Data Sources.

\* \* \* \* Sixth Change (all new text) \* \* \* \*

### 7.2.x DCCF Services

The following NF services are specified for DCCF:

Table 7.2.x-1: NF Services provided by DCCF

| Service Name | Description | Reference in TS 23.288 [86] |
| --- | --- | --- |
| Ndccf\_DataManagement | This service enables a Data Consumer to request data, and have it delivered via a messaging framework or via the DCCF, while avoiding redundant requests to data sources. | TBD |
| Ndccf\_ContextManagement | This service allows a network function to register/deregister the availability of data with the DCCF. | TBD |

### 7.2.x+1 MAF Services

The following NF services are specified for MAF:

Table 7.2.x+1-1: NF Services provided by MAF

| Service Name | Description | Reference in TS 23.288 [86] |
| --- | --- | --- |
| Nmaf\_3daDataManagement | This service allows a DCCF to request a messaging framework to provide collected data to consumers or notification endpoints according to processing and formatting instructions. | TBD |
| Nmaf\_3caDataManagement | This service allows a messaging framework to provide data to consumers or notification endpoints according to instructions received via the Nmaf\_3da\_DataManagement service. | TBD |

### 7.2.x+2 ADRF Services

The following NF services are specified for ADRF:

Table 7.2.x+2-1: NF Services provided by ADRF

| Service Name | Description | Reference in TS 23.288 [86] |
| --- | --- | --- |
| Nadrf\_DataStorage | This service allows consumers to store data in an ADRF. | TBD |
| Nadrf\_DataRetrieval | This service allows consumers to query an ADRF for stored data and to retrieve data from an ADRF. | TBD |

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