**3GPP TSG-SA WG6 Meeting #50-e S6-222xxx**

**e-meeting, 22nd – 31st August 2022 (revision of S6-222257)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.434** | **CR** | **0125** | **rev** | **1** | **Current version:** | **18.1.0** |  |
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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 |  | Core Network | **X** |

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| ***Title:*** | Applications on UE directly consuming SEAL services via SEAL-S | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, Hisilicon | | | | | | | | | |
| ***Source to TSG:*** | S6 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eSEAL2, SNAAPP | | | | |  | ***Date:*** | | | 2022-08-16 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The following stage 1 requirement in TS 22.261 specifies that:  The 5G system shall be able to provide a UE with secure access to APIs (e.g. triggered by an application that is not visible to the 5G system), by authenticating and authorizing the UE.  The SEAL architecture should be able to offer service APIs to the application on the UE as well apart from the application servers deployed on the network.  The service APIs are offered over SEAL-S reference point. Thus, the VAL client should be able to access the SEAL service APIs directly over SEAL-S. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The general architecture of SEAL, the individual SEAL services architecture and the corresponding description of functional entities, reference points are modified to support this interaction. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The service APIs offered by SEAL services over SEAL-S cannot be enabled to be directly consumed by the VAL client. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2, 6.4.2.2, 6.4.2.5, 6.5.2.7, 8.2.1, 8.2.2, 8.2.3, 9.2.2, 9.2.4.3, 9.2.5.5, 10.2.2, 10.2.4.3, 10.2.5.5, 11.2.2, 11.2.4.3, 11.2.5.5, 12.2.2, 12.2.4.3, 10.2.5.5, 13.2.2, 13.2.4.3, 13.2.5.5, 14.2.2.1, 14.2.4.3, 14.2.5.5, 15.2, 16.2.2, 16.2.3.2, 16.2.4.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

## 6.2 On-network functional model description

Figure 6.2-1 illustrates the generic on-network functional model for SEAL.



Figure 6.2-1: Generic on-network functional model

In the vertical application layer, the VAL client communicates with the VAL server over VAL-UU reference point. VAL-UU supports both unicast and multicast delivery modes.

NOTE 1: The VAL-UU reference point is out of scope of the present document.

The SEAL functional entities on the UE and the server are grouped into SEAL client(s) and SEAL server(s) respectively. The SEAL consists of a common set of services (e.g. group management, location management) and reference points. The SEAL offers its services to the vertical application layer (VAL).

NOTE 2: The functionalities and reference points of the vertical application layer are out of scope of the present document.

NOTE 3: The vertical application layer may further consist of vertical application enabler layer functionalities (specified by 3GPP) and application specific functionalities, which is out of scope of the present document.

The SEAL client(s) communicates with the SEAL server(s) over the SEAL-UU reference points. SEAL-UU supports both unicast and multicast delivery modes. The SEAL client(s) provides the service enabler layer support functions to the VAL client(s) over SEAL-C reference points. The VAL client(s) and VAL server(s) communicate with the SEAL server(s) over the SEAL-S reference points. The SEAL server(s) may communicate with the underlying 3GPP network systems using the respective 3GPP interfaces specified by the 3GPP network system.

Editor's note: Whether there are any additional security aspects for VAL client invoking APIs on SEAL server using SEAL-S is for SA3 consideration and is FFS.

Editor's Note: SEAL-UU support for multicast delivery is FFS.

The specific SEAL client(s) and the SEAL server(s) along with their specific SEAL-UU reference points and the specific network interfaces of 3GPP network system used are described in the respective on-network functional model for each SEAL service.

Figure 6.2-2 illustrates the functional model for interconnection between SEAL servers.



Figure 6.2-2: Interconnection between SEAL servers

To support distributed SEAL server deployments, the SEAL server interacts with another SEAL server for the same SEAL service over SEAL-E reference point.

Figure 6.2-3 illustrates the functional model for inter-service communication between SEAL servers.



Figure 6.2-3: Inter-service communication between SEAL servers

The SEAL server interacts with another SEAL server for inter-service communication over SEAL-X reference point.

Figure 6.2-4 illustrates the functional model for communication between SEAL server and VAL user database.



Figure 6.2-4: Communication between SEAL server and VAL user database

The SEAL server interacts with the VAL user database for storing and retrieving user profile over VAL-UDB reference point.

Figure 6.2-5 shows the functional model for the signalling control plane.



Figure 6.2-5: Functional model for signalling control plane

NOTE: The Light-weight Protocol (LWP) functional entities and reference points are a generic representation of protocol entities and reference points for use in constrained environments. Realizations of LWP by means of a particular transport protocol are defined in the annex of this specification. Realizations of LWP by means of transport protocols is not limited to those defined in the annex of this specification.

\* \* \* Next Change \* \* \* \*

#### 6.4.2.2 VAL client

The VAL client provides the client side functionalities corresponding to the vertical applications (e.g. V2X client). The VAL client supports interactions with the SEAL client(s) and SEAL server(s).

NOTE: The details of the VAL client is specific to the vertical and out of scope of the present document.

\* \* \* Next Change \* \* \* \*

#### 6.4.2.5 SEAL server

The SEAL server provides the server side functionalities corresponding to the specific SEAL service. The SEAL server supports interactions with the VAL server(s) and/or VAL client(s). The SEAL server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The SEAL server also supports interactions with the corresponding SEAL server in distributed SEAL deployments.

NOTE: It is up to each SEAL server to support the appropriate signalling plane entities.

\* \* \* Next Change \* \* \* \*

#### 6.5.2.7 SEAL-S

The interactions between the VAL client/VAL server and the SEAL server are generically referred to as SEAL‑S reference point. The specific SEAL service reference point corresponding to SEAL-S is specified in the specific SEAL service functional model.

\* \* \* Next Change \* \* \* \*

### 8.2.1 SEAL server(s) deployment in PLMN operator domain

Figure 8.2.1-1 illustrates deployment of the SEAL server(s) in a single PLMN operator domain and the VAL client(s)/VAL server(s) in the VAL service provider domain.



Figure 8.2.1-1: SEAL server(s) deployed in a single PLMN operator domain

Figure 8.2.1-2 illustrates the deployment of SEAL server(s) in multiple PLMN operator domain and provides SEAL services to the VAL client(s)/VAL server(s) deployed in the VAL service provider domain. SEAL servers deployed in multiple PLMN operator domain are not interconnected.



Figure 8.2.1-2: SEAL server(s) deployed in multiple PLMN operator domain without interconnection between SEAL servers

Figure 8.2.1-3 illustrates the deployment of SEAL servers in multiple PLMN operator domain and provides SEAL services to the VAL client(s)/VAL server(s) deployed in the VAL service provider domain. SEAL servers deployed in multiple PLMN operator domain are interconnected.



Figure 8.2.1-3: SEAL server(s) deployed in multiple PLMN operator domain with interconnection between SEAL servers

Figure 8.2.1-4 illustrates the deployment of SEAL servers in a single PLMN operator domain and provides SEAL services to the VAL client(s)/VAL server(s) deployed in the VAL service provider domain. SEAL servers deployed in a single PLMN operator domain are interconnected.



Figure 8.2.1-4: SEAL server(s) deployed in a single PLMN operator domain with interconnection between SEAL servers

### 8.2.2 SEAL server(s) deployment in VAL service provider domain

Figure 8.2.2-1 illustrates deployment of the SEAL server(s) and the VAL client(s)/VAL server(s) in VAL service provider domain.



Figure 8.2.2-1: Deployment of SEAL server(s) with connections to 3GPP network system in a single PLMN operator domain

Figure 8.2.2‑2 illustrates deployment of the SEAL server(s) which connects to the 3GPP network system in multiple PLMN operator domain.



Figure 8.2.2‑2: Deployment of SEAL server(s) with connections to 3GPP network system in multiple PLMN operator domains

Figure 8.2.2‑3 illustrates the deployment of multiple SEAL servers in the VAL service provider domain where SEAL server 1 and SEAL server 2 connect with 3GPP network system of PLMN operator domain 1 and PLMN operator domain 2 respectively. The SEAL servers interconnect via SEAL-E and support the VAL service provider domain applications for the VAL UEs connected via both the PLMN operator domains.



Figure 8.2.2‑3: Distributed deployment of SEAL servers in VAL service provider domain

### 8.2.3 SEAL server(s) deployment outside of VAL service provider domain and PLMN operator domain

Figure 8.2.3-1 illustrates deployment of the SEAL server(s) outside of both the VAL service provider domain and PLMN operator domain i.e. in SEAL provider domain.



Figure 8.2.3-1: Deployment of SEAL server(s) outside of VAL service domain and PLMN operator domain

\* \* \* Next Change \* \* \* \*

### 9.2.2 On-network functional model description

Figure 9.2.2-1 illustrates the generic on-network functional model for location management.



Figure 9.2.2-1: On-network functional model for location management

The location management client communicates with the location management server over the LM-UU reference point. The location management client provides the support for location management functions to the VAL client(s) over LM‑C reference point. The VAL client(s) and/or VAL server(s) communicate with the location management server over the LM-S reference point.

The location management server communicates with the SCEF via T8 reference point to obtain location information from the underlying 3GPP network system. The location management server obtains location information from the NEF via N33 reference point by mechanism defined in clause 5.2.6.2 of 3GPP TS 23.502 [11].

NOTE: Location information from LCS of 4G system is not exposed by SCEF.

Editor's note: Use of Le interface for acquiring location information provided by PLMN is FFS.

\* \* \* Next Change \* \* \* \*

#### 9.2.4.3 Location management server

The location management server is a functional entity that receives and stores user location information and provides user location information to the vertical application client/vertical application server. The location management server may also acquire location information provided by PLMN operator via T8 reference point*.* The location management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The location management server also supports interactions with the corresponding location management server in distributed SEAL deployments.

NOTE: The accuracy of location information acquired from 4G system via T8 reference point is not higher than at cell level (ECGI) for E-UTRAN.

\* \* \* Next Change \* \* \* \*

#### 9.2.5.5 LM-S

The interactions related to location management functions between the VAL client(s)/VAL server(s) and the location management server are supported by LM-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].

LM-S reference point is used by the VAL server to request and receive location information from location management server. The LM-S reference point shall use SIP-1 and SIP-2 reference points for subscription/notification related signalling. And for transport and routing of location management related signalling LM-S reference point uses the HTTP-1 and HTTP-2 signalling control plane reference points.

\* \* \* Next Change \* \* \* \*

### 10.2.2 On-network functional model description

Figure 10.2.2-1 illustrates the generic on-network functional model for group management.



Figure 10.2.2-1: On-network functional model for group management

The group management client communicates with the group management server over the GM-UU reference point. The group management client provides the support for group management functions to the VAL client(s) over GM‑C reference point. The VAL client(s)/VAL server(s) communicate with the group management server over the GM-S reference point.

The group management server interacts with the NEF of the underlying 3GPP network system via N33 reference point to perform group management procedures for 5G Virtual Network (5GVN) groups.

\* \* \* Next Change \* \* \* \*

#### 10.2.4.3 Group management server

The group management server functional entity provides for management of groups supported within the vertical application layer (i.e. VAL client(s)/VAL server(s)). The group management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The group management server also supports interactions with the corresponding group management server in distributed SEAL deployments.

The group management server functional entity is supported by the SIP AS and HTTP server functional entities of the signalling control plane.

All the group management clients supporting users belonging to a single group are required to use the same group management server for that group. A group management client supporting a user involved in multiple groups can have relationships with multiple group management servers.

\* \* \* Next Change \* \* \* \*

#### 10.2.5.5 GM-S

The interactions related to group management functions between the VAL client(s)/VAL server(s) and the group management server are supported by GM-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].

GM-S reference point supports the VAL client/VAL server to obtain group information corresponding to the VAL service. The GM-S reference point uses HTTP-1/HTTP-2 reference points for transport and routing of group management related signalling. The GM-S reference point uses SIP-2 reference point for subscription/notification related signalling.

\* \* \* Next Change \* \* \* \*

### 11.2.2 On-network functional model description

Figure 11.2.2-1 illustrates the generic on-network functional model for configuration management.



Figure 11.2.2-1: On-network functional model for configuration management

The configuration management client communicates with the configuration management server over the CM-UU reference point. The configuration management client provides the support for configuration management functions to the VAL client(s) over CM‑C reference point. The VAL client(s)/VAL server(s) communicate with the configuration management server over the CM-S reference point. The configuration management server communicates with the VAL user database over the CM-VAL-UDB reference point.

\* \* \* Next Change \* \* \* \*

#### 11.2.4.3 Configuration management server

The configuration management server is a functional entity used to configure one or more vertical applications with 3GPP system related vertical applications provisioning information and configure data on the configuration management client. The configuration management server provides configuration management services to VAL client(s)/VAL server(s). The configuration management server manages vertical application configuration supported within the vertical's service provider. The configuration management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The configuration management server also supports interactions with the corresponding configuration management server in distributed SEAL deployments.

The configuration management server functional entity is supported by the SIP AS and HTTP server functional entities of the signalling control plane.

\* \* \* Next Change \* \* \* \*

#### 11.2.5.5 CM-S

The interactions related to configuration management functions between the VAL client(s)/VAL server(s) and the configuration management server are supported by CM-S reference point. The CM-S reference point supports VAL client/VAL server to obtain the VAL service related vertical applications provisioning information. This reference point is an instance of CAPIF‑2 reference point as specified in 3GPP TS 23.222 [8].

The CM-S reference point shall use HTTP-1/ HTTP-2 reference points for transport and routing of configuration management related signalling. The CM-S reference point shall use SIP-2 reference point for subscription/notification related signalling.

\* \* \* Next Change \* \* \* \*

### 12.2.2 On-network functional model description

Figure 12.2.2-1 illustrates the generic on-network functional model for identity management.



Figure 12.2.2-1: On-network functional model for identity management

The identity management client communicates with the identity management server over the IM-UU reference point. The identity management client provides the support for identity management functions to the VAL client(s) over IM‑C reference point. The VAL client(s)/VAL server(s) communicate with the identity management server over the IM-S reference point.

Editor's Note: The role of VAL-UU in the context of identity management is FFS.

\* \* \* Next Change \* \* \* \*

#### 12.2.4.3 Identity management server

The identity management server is a functional entity that authenticates the vertical application layer user identity. The identity management server provides identity management services to VAL client(s)/VAL server(s). The authentication is performed by verifying the credentials provided by the vertical applications' user. The identity management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The identity management server also supports interactions with the corresponding identity management server in distributed SEAL deployments.

\* \* \* Next Change \* \* \* \*

#### 12.2.5.5 IM-S

The interactions related to identity management functions between the VAL client(s)/VAL server(s) and the identity management server are supported by IM-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].

\* \* \* Next Change \* \* \* \*

### 13.2.2 On-network functional model description

Figure 13.2.2-1 illustrates the generic on-network functional model for key management.



Figure 13.2.2-1: On-network functional model for key management

The key management client communicates with the key management server over the KM-UU reference point. The key management client provides the support for key management functions to the VAL client(s) over KM‑C reference point. The VAL client(s)/VAL server(s) communicate with the key management server over the KM-S reference point.

\* \* \* Next Change \* \* \* \*

#### 13.2.4.3 Key management server

The key management server is a functional entity that stores and provides security related information (e.g. encryption keys) to the key management client, group management server, vertical application client and vertical application server to achieve the security goals of confidentiality and integrity of media and signalling. The key management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The key management server also supports interactions with the corresponding key management server in distributed SEAL deployments.

NOTE: The functionality of the key management server is specified in subclause 5.3 of 3GPP TS 33.434 [29].

\* \* \* Next Change \* \* \* \*

#### 13.2.5.5 KM-S

The interactions related to key management functions between the VAL client(s)/VAL server(s) and the key management server are supported by KM-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].

KM-S reference point provides a means for the key management server to provide security related information (e.g. encryption keys) to the VAL client/VAL server. The KM-S reference point shall use the HTTP-1 and HTTP-2 signalling control plane reference points for transport and routing of security related information to the VAL server.

NOTE: KM-S is specified in subclause 5.1.1.4 of 3GPP TS 33.434 [29].

\* \* \* Next Change \* \* \* \*

#### 14.2.2.1 Generic on-network functional model for network resource management

Figure 14.2.2-1 illustrates the generic on-network functional model for network resource management.



Figure 14.2.2.1-1: On-network functional model for network resource management

The network resource management client communicates with the network resource management server over the NRM-UU reference point. The network resource management client provides the support for network resource management functions to the VAL client(s) over NRM‑C reference point. The Val client(s)/VAL server(s) communicate with the network resource management server over the NRM-S reference point.

The network resource management server communicates with the BM-SC via MB2-C and xMB-C reference points to obtain and control the multicast resources from the underlying 3GPP network system. The network resource management server communicates with the PCRF via Rx reference point or communicates with the PCF via N5 reference point to control the unicast resources from the underlying 3GPP network system. The network resource management server communicates with the SCEF via T8 reference point or communicates with the NEF via N33 reference point to perform event monitoring procedures from the underlying 3GPP network system. The network resource management server interacts with NEF via N33 to obtain QoS monitoring information from the 5GS.

\* \* \* Next Change \* \* \* \*

#### 14.2.4.3 Network resource management server

The network resource management server functional entity provides for management of 3GPP system network resources (e.g. unicast, multicast) and monitoring events to support the VAL applications (i.e. VAL client(s) and VAL server(s)). The network resource management server acts as CAPIF's API exposing function as specified in 3GPP TS 23.222 [8]. The network resource management server also supports interactions with the corresponding network resource management server in distributed SEAL deployments. The NRM server's role may be assumed by the VAL server in some deployments, in which case, the VAL server performs the procedures for network resource management of the NRM server.

\* \* \* Next Change \* \* \* \*

#### 14.2.5.5 NRM-S

The interactions related to network resource management functions between the VAL client(s)/VAL server(s) and the network resource management server are supported by the NRM-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].

\* \* \* Next Change \* \* \* \*

## 15.2 Functional model representation

Figure 15.2-1 illustrates the service-based interface representation of the functional model for SEAL services.



Figure 15.2-1: SEAL generic functional model representation using service-based interfaces

The SEAL function(s) exhibit the service-based interfaces which are used for providing and consuming SEAL services. The service APIs are specified for each SEAL function enabled over the service-based interface. The service-based interfaces of specific SEAL services are specified in this document. All the interactions with SEAL are governed based on the reference point interactions of the functional models specified in subclause 6. VAL server function represents the functionalities of the VAL server. VAL client function in the VAL UE represents the functionalities of the VAL client. The VAL client function is a consumer of SEAL services using the service-based interfaces.

NOTE: The service-based interface Sval for the VAL server function is out of scope of the present document.

The service APIs offered by the SEAL function(s) are published and discovered on the CAPIF core function as specified in 3GPP TS 23.222 [8].

Editor's note: Refinement of the SEAL services in service-based interface representation is FFS.

\* \* \* Next Change \* \* \* \*

### 16.2.2 Functional model description

Figure 16.2.2-1 illustrates the generic functional model for network slice capability enablement.



Figure 16.2.2-1: Functional model for network slice capability enablement

The network slice capability enablement client communicates with the network slice capability enablement server over the NSCE-UU reference point. The network slice capability enablement client provides the support for network slice capability enablement functions to the VAL client(s) over NSCE‑C reference point. The VAL client(s)/VAL server(s) communicates with the network slice capability enablement server over the NSCE-S reference point. It is assumed that the network slice capability enablement server is deployed at the 5G system domain. The network slice capability enablement server, acting as AF, may communicate with the 5G Core Network functions via NEF (N33) reference point (for interactions with PCF).

\* \* \* Next Change \* \* \* \*

#### 16.2.3.2 Network slice capability enablement server

The network slice capability enablement server functional entity provides the enablement of the network slicing aspects to support the VAL applications (i.e. VAL client(s) and VAL server(s)). Such enablement supports the mapping or migration of one or more vertical applications to one or more network slices (from a set of network slices, as provided by the 3GPP network system) as described in procedure in clauses 16.3.2.3 and 16.3.2.4. Such adaptation assumes that the UE is subscribed to more than one slice and is done via providing a guidance to update the URSP rules at the 5GS (denoted in clause 16.3.3 as network-based mechanism).

\* \* \* Next Change \* \* \* \*

#### 16.2.4.4 NSCE-S

The interactions related to network slice capability enablement functions between the VAL client(s)/VAL server(s) and the network slice capability enablement server are supported by the NSCE-S reference point. This reference point is an instance of CAPIF-2 reference point as specified in 3GPP TS 23.222 [8].