3GPP 5G IoT-PCS (Platform Common Services)

5G System Architecture enhancements for PINs (Personal IoT Networks) in 3GPP 5G Advanced Release
The enhancement of 5G System (5GS) to support Personal IoT Network (PIN) is foreseen to address the Service Requirements for the Personal IoT Networks (PINs) for supporting Management of PIN, Access of PIN via PIN Element with Gateway Capability (PEGC), & Communication of PIN (e.g. PIN Element communicates with other PIN Elements directly or via PEGC or via PEGC & 5GS), enhancements for supporting identifying PIN and the PIN Elements, How to identify PIN & the PIN Elements in the PIN at 5GC level to serve for Authentication/Authorization, Management as well as Policy & Routing Control enforcement. If sidelink is used for the direct communication between PEMC & PEGC, it will be reused the procedures defined for 5G ProSe Direct Communication without introducing new features to sidelink. There shall be no change to underlying non-3GPP Access (e.g. WIFI, Bluetooth) standards. The PEGC & PEMC belongs to same PLMN or (S)NPN.
PINCTRL (*PIN Ctrl Function*) - a new Network Function (**NF**)- & *New Interfaces* P1 & NPINCTF to manage & organize PIN Network as shown in the Figure below. **PEMC/PEGC** communicates with the **PINCTRL of 5G CN** (Core Network) using P1 Reference Points for **Authorization, 3rd Party/Operator Policies** etc. PINCTRL is specified to be part of **SBI bus of the 5G Core Architecture &** communicates with the other **NF(s)** using NPINCTRL Interface. PEMC forms the PIN Network & PEMC/PEGC communicates to the 5G Core on behalf of PIN elements. A **UE** can support both PEGCF & PEMCF & furthermore support the PEF Function in order to **exchange Data Information &**/or provide PIN Services to other PINE in the PIN. The PINE per assumption can use the Non-3GPP Access (e.g. WIFI, Bluetooth) for direct communication to other PINE, PEGC & PEMC & so the following type of Device that contain the PEF are considered: 1) A **Non-3GPP Device,** i.e. a Device that does not support 3GPP Access or **N3GPP Access to 5GC**, but **supports PEF.** e.g. a Device that uses Bluetooth or Wi-Fi communication. 2) A **UE** that supports **N3GPP Access to 5GC** (i.e. **N3IWF**). The UE is restricted to only use the **N3GPP Interface** for PIN direct communication.

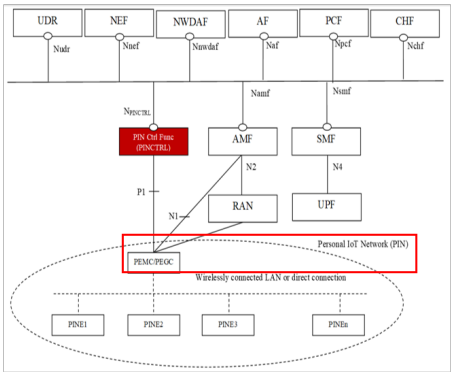

Figure: 5G Core Architecture enhancements to support PIN (Personal IoT Network)

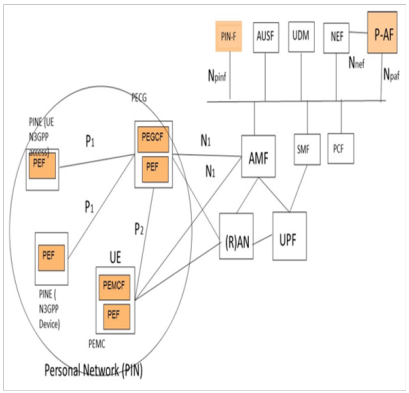

Figure: 5G Core PIN Solution Reference Architecture B

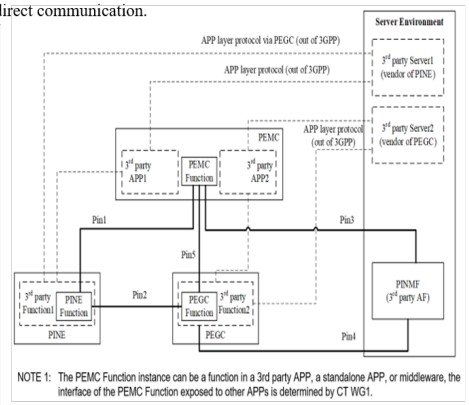

Figure: PIN (Personal IoT Network) Functions deployment example

5G Application Capability for IoT Platforms

The Figure depicts the resulting deployment. Note that this deployment aligns with the distributed network exposure access model introduced by the solution in clause 5.2, while using the proposed IoT-PCS-specific instances of SEAL reference points.

The depicts a generic IoT Platform with IoT Platform Common Services (IoT-PCS) Servers enabling a Set of Applications deployed using corresponding servers (IoT-App), which may belong to different verticals.

On the Device side, corresponding IoT-PCS and IoT-App Clients enable the Client-side functionality.

For Inter-Service Communications, an IoT-App SEAL Server communicates with the IoT-PCS server over the SEAL-X3 Reference Point.

In this deployment, both SEAL Servers provide Network Exposure Access, resulting in a Distributed Network Exposure Access Deployment.

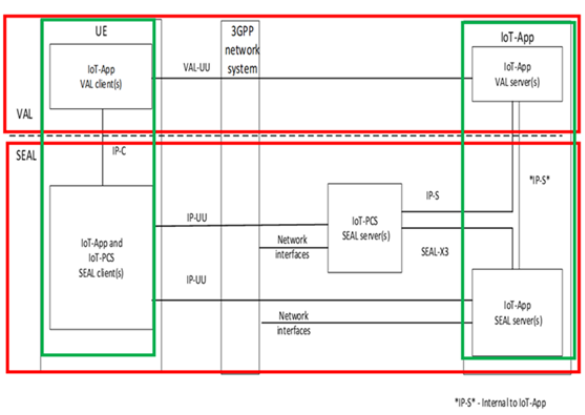

Figure: 5G Functional Model for IoT-PCS (Distributed Network Exposure Access)

5G-enabled Fused Location Service Capability Exposure

The 5G Application Architecture aspects and solutions address potential new and enhanced Location Capabilities for Vertical Application Enabler (VAE), including the following aspects:

- Enabling Location performance (Accuracy, Availability and Latency) enhancements through Combined Use & Fusion of 3GPP & Non-3GPP Location Technologies at the Application Layer;
- Enabling continuity of Location Services in different environments at the Application Layer;
- Identification & Configuration of Location related Requirements (incl. Location QoS) for Vertical Application Aervices with the use of SA2-defined Mechanisms;
- Architecture enhancement leveraging 5G Positioning and Location Services (LCS);
- Location Data handling Capabilities (e.g. Logging, Management);
- Enhanced efficiency on Location Service processing (e.g. by leveraging Edge Computing Capabilities);
- Enabling Value-added Location Service Capabilities Exposure to Vertical Applications;
- Enhancements on SEAL Location Management addressing the aspects above.

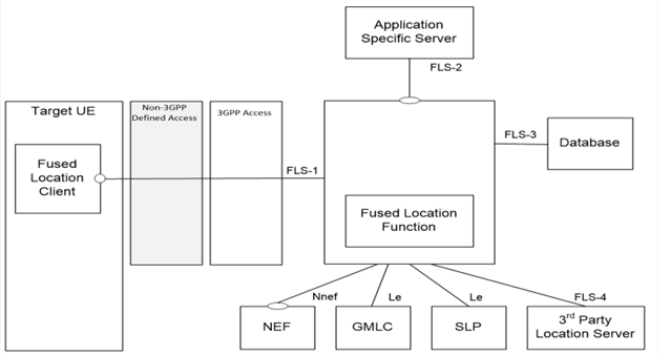

Figure: 5G Functional Architecture of Fused Location Service

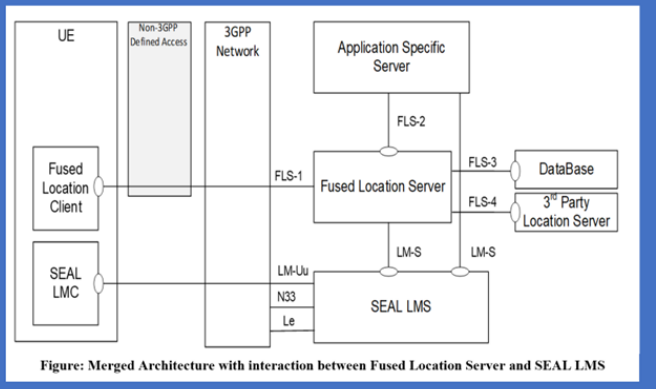

Figure: Merged Architecture with interaction between Fused Location Server and SEAL LMS

Ref. 3GPP 5G -enabled Fused Location LCS, Rel. 18. Sept., 2022 6

5G SEAL Data Delivery (SEALDD) Enabler for Vertical Applications

Illustration of the Application Enabling Layer (AEL) Platform Architecture, Capabilities and Services to efficiently support

- Distribution,
- Storage and
- Delivery for the Application Content/Data for Vertical Applications.

It takes into consideration the Existing Stage 1 and Stage 2 work within 3GPP related to Data Delivery and 3GPP System User Plane aspects specified in 5G Service Requirements & Architectural enhancements for 5G Multicast-Broadcast Services

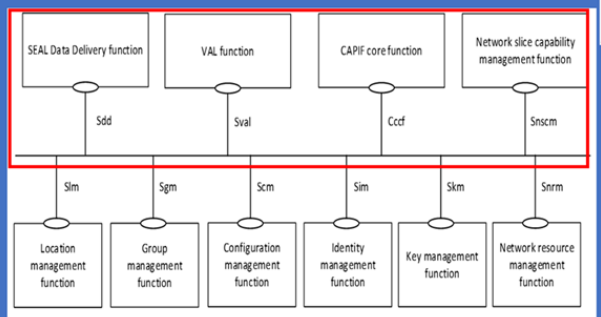

Figure: 5G SEALDD Representation in SEAL Generic Functional Model Representation using Service-based Interfaces

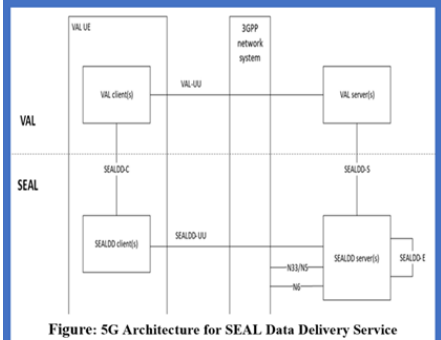

Figure: 5G Architecture for SEAL Data Delivery Service

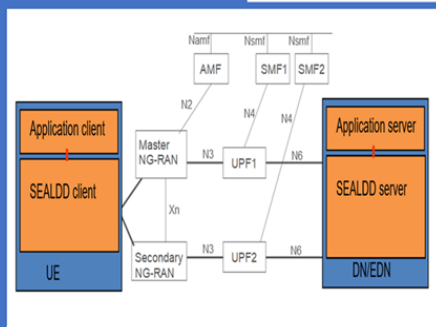

Figure: 5G SEALDD E2E Redundant Transmission Architecture

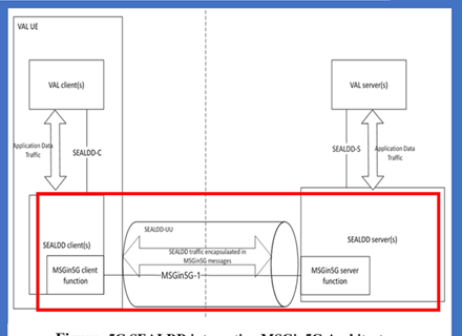

Figure: 5G SEALDD integrating MSGin5G Architecture

1. 5G MSGin5G SBI Service based Interface representation for MSGin5G Service

The MSGin5G, as shown in the figure, is the Service based Architecture for MSGin5G Service.

The M5C Function is the MSGin5G Client.

The AC is the Application Client.

The L3G Function is a Service based function exhibited by Legacy 3GPP Message Gateway.
The N3G function is a Service based Function exhibited by Non-3GPP Message Gateway.

The M5S manages the Distribution of the Messages it has received from MSGin5G UE, from Application Server, or from N3G (on behalf of Non-3GPP UE) or from L3G (on behalf of Legacy 3GPP UE).

The M5S invokes Services provided by L3G/N3G to send MSGin5G Messages towards Legacy 3GPP UE or Non-3GPP UE.

The AS/L3G/N3G invokes Services provided by M5S to send MSGin5G Messages to M5S on behalf of Legacy 3GPP UE or Non-3GPP UE.

The M5S invokes Services provided by SEAL Group Management Function to do MSGin5G Group Management.

The M5S/L3G/N3G invokes Services provided by SEAL Configuration Management Function to do Service Configuration (including UE Service ID Provisioning).

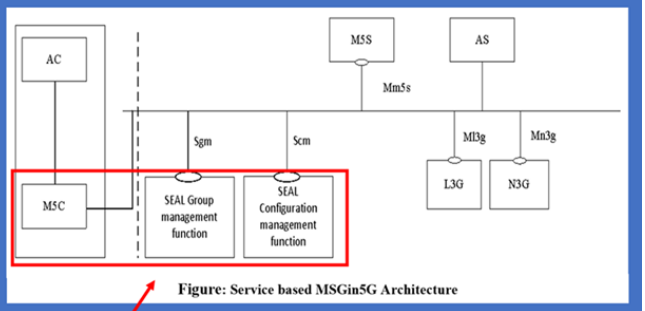

Figure: Service based MSGin5G Architecture

Table: Service based Interfaces supported by MSGin5G Service

Service based interface	Application function entity	Mapping server entity	APIs offered
Mm5s	MSGin5G Server function	MSGin5G Server	Specified in 9.1
MI3g	Legacy 3GPP Message Gateway function	Legacy 3GPP Message Gateway	Specified in 9.2.1
Mn3g	Non-3GPP Message Gateway function	Non-3GPP Message Gateway	Specified in 9.2.2

5G MSGin5G Service overview

The MSGin5G Service is designed and optimized for massive IoT Device Communication including Thing-to-Thing (T2T) Communication and Person-to-Thing (P2T) communication.

The MSGin5G Service is a Message Enabler for applications.

An Application Client in a UE utilizes MSGin5G Service to send a message to another UE, to multiple UEs or to the Application Server, or the Application Server utilizes the MSGin5G Service to send a message to a UE or to multiple UEs. All messages will be routed via the MSGin5G Server in the 5G system. The MSGin5G Service flow is shown in figure 7.1-1.
If the UE supports a legacy 3GPP message service (e.g. SMS, NIDD, or CB) and does not support the MSGin5G Service (i.e. UE has no MSGin5G Client), the message will be translated to the appropriate message delivery mechanism by the Legacy 3GPP Message Gateway. A UE that does not support any 3GPP message service can connect to the MSGin5G Service via Non-3GPP Message Gateway that facilitates the translation between the MSGin5G Service and non-3GPP message delivery mechanism. The connection between such UE and the gateway can be via 3GPP access or non 3GPP access (e.g. WLAN) and is out of scope of the present specification.
An Application Server resides outside the 3GPP domain and connects to the MSGin5G Server via a CAPIF-aware reference point.
The message communication models include:

- Point-to-Point messaging: message that is originated at a UE (UE A) and terminated at another UE (UE B, a Legacy 3GPP UE or a Non-3GPP UE).

- Application-to-Point Messaging: message that is originated at an Application Sever and terminated at a UE.
- Point-to-Application messaging: message that is originated at a UE and terminated at an Application Sever
- Group Messaging: message that is originated at a UE or an Application Server and is terminated at a group of UEs (a group member can be of type UE A, Legacy 3GPP UE or Non-3GPP UE).

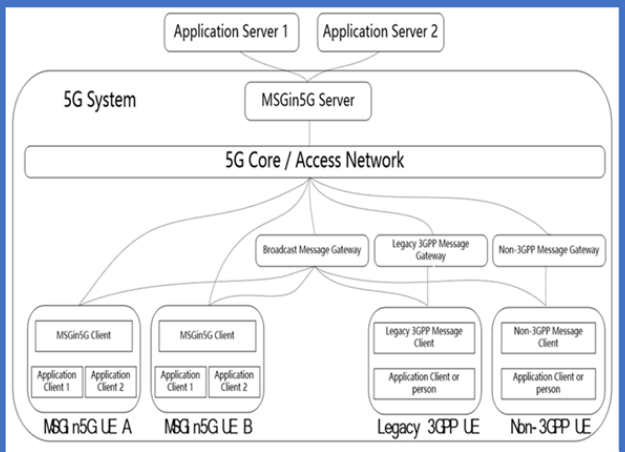

Figure: 5G MSGin5G Service overview