R18 SA6 Activities

Application Enablement and Critical Communication Applications

3GPP SA6 Leadership

Suresh Chitturi

Overview of 3GPP SA6

SA6 Leadership

Suresh Chitturi
SA6 Chairman
TTA
s.chitturi@samsung.com

Alan Soloway
SA6 Vice-Chairman
ATIS
asoloway@qti.qualcomm.com

Jukka Vialen
SA6 Vice-Chairman
ETSI
jukka.vialen@airbus.com

SA6 Activities

Rel-17
- MCPTT 5.0
- MCData 4.0
- Railways 3.0
- MCIOPS
- MCOver5GS
- Edge Applications (EDGEAPP)
- 5G Message Service (5GMARCH)
- Factories of the Future (FFAPP Study)
- Unmanned Aerial Systems (UASAPP)
- V2XAPP 2.0
- SEAL 2.0

Rel-16
- MCPTT 4.0
- MCData 3.0
- MC Interworking 2.0
- Railways 2.0
- MC MBMS API
- MC Location (Study)
- MC Logging
- SEAL
- CAPIF 2.0
- V2XAPP

Rel-15
- MCPTT 3.0
- MCVideo 2.0
- MCData 2.0
- MC Interworking
- Railways
- CAPIF

Rel-14
- MCPTT 2.0
- MCVideo
- MCData

Rel-13
- MCPTT

ToR expansion

Established Dec 2014

Standards Timeline

Mar 2016 — Jun 2017 — Jun 2018 — June 2020 — Mar 2022

Critical Communications
- MCVideo
- MCData
- MCPTT
- IOPS — No backhaul

Service Frameworks
- CAPIF — API
- SEAL
- Edge

Vertical Enablers
- V2X
- UAS
- FF
- Railways
- 5G MSG

3GPP SA6 Participation*

Agencies

astrid
BDBOS digital . sicher . bundesweit
FirstNet
ERILLISVERKOT
Home Office
SBB CFF FFS
MINISTÈRE DE L'INTÉRIEUR
UIC
POLITIE

Operators

at&t
kt
SK telecom
China Mobile 中国移动
TELECOM ITALIA
China unicom 中国联通
SYSOCO Wireless technology
TELSTRA
Deutsche Telekom
NTT docomo
CHINA TELECOM 中国电信
verizon
vodafone
kapsch >>>
orange™
Jio
Telefonica

Vendors

AIRBUS
interdigital.
Apple
SOFTIL INNOVATIVE COMMUNICATIONS
kontron S&T Group
BlackBerry
CONVIDA WIRELESS
NOKIA
SONY
ZTE 中兴
Southern Linc
vivo
ONE2MANY
TD Tech
L3HARRIS
SAMSUNG
Tencent 腾讯
sepura
Qualcomm
Alibaba Group
tait communications
LG
ENENSYS EXPWAY
Microsoft
PHILIPS
ERICSSON
HUAWEI
intel
Motorola
CATT
BULL
NEC
Toyota
TEJAS NETWORKS
Facebook
GENERAL DYNAMICS United Kingdom Limited

Researchers

KRRI
ETRI
Fraunhofer
Department of Telecommunications
한성대학교 HANSUNG UNIVERSITY
iit delhi
IIT Hyderabad
nomor novel mobile radio research

*Non-exhaustive

Overview: Rel-18 Activities

Study/Work-Item	WI Code	SID/WID Approved	Theme	Remarks
Study on Mission Critical Services support over 5G System	**FS_MCOver5GS**	SA#80 (06/2018)	**Critical Communications**	Multi-release study with phased approach
Study of Gateway UE function for Mission Critical Communication	**FS_MCGWUE**	SA#88 (06/2020)	**Critical Communications**	Study concluded in Q3/2021
Study of Interconnection and Migration Aspects for Railways	**FS_IRail**	SA#88 (06/2020)	**Critical Communications**	Study to conclude in Q4/2021
Study on enhanced Application Architecture for enabling Edge Applications	**FS_eEDGEAPP**	SA#92 (06/2021)	**Service Framework**	Enhancements to Rel-17
Study on Network Slice Capability Exposure for Application Layer Enablement	**FS_NSCALE**	SA#91 (03/2021)	**Service Framework**	New focus area
Study on application enablement aspects for subscriber-aware northbound API access	**FS_SNAAPP**	SA#92 (06/2021)	**Service Framework**	Enhancements to CAPIF

Overview: Rel-18 Activities

Study/Work-Item	WI Code	SID/WID Approved	Theme	Remarks
Study on Application Capability Exposure for IoT Platforms	**FS_ACE_IOT**	SA#92 (06/2021)	**Vertical Enabler**	New focus area
Study on 5G-enabled fused location service capability exposure	**FS_5GFLS**	SA#92 (06/2021)	**Service Framework**	New focus area
Mission Critical Services over 5MBS	**MCOver5MBS**	*SA6 Agreed*	**Critical Communications**	S6-211789. Follow-up to FS_MCOver5GS
Gateway UE function for Mission Critical Communication	**MCGWUE**	*SA6 Agreed*	**Critical Communications**	S6-212173. Follow-up to FS_MCGWUE
Application layer support for Factories of the Future (FF)	**FFAPP**	*SA6 Agreed*	**Critical Communications**	S6-211859. Follow-up to FS_FFAPP
Study on SEAL data delivery enabler for vertical applications	**FS_SEALDD**	*SA6 Agreed*	**Service Framework**	S6-212174. Enhancements to SEAL

Overview: Rel-18 Activities

Study/Work-Item	WI Code	SID/WID Approved	Theme	Remarks
Study on enhanced architecture for UAS Applications	**FS_eUASAPP**	*SA6 Agreed*	**Vertical Enabler**	S6-212172 Enhancements to Rel-17
Study on enhancements to application layer support for V2X services; Phase 2	**FS_eV2XAPP2**	*SA6 Agreed*	**Vertical Enabler**	S6-212175 Enhancements to Rel-17
Study on Application Data Analytics Enablement Service	**FS_ADAES**	*SA6 Proposed*	**Service Framework**	S6-212088 New focus area
Study on application layer enablers for Smart Grid	**FS_GRIDAPP**	*SA6 Proposed*	**Vertical Enabler**	S6-212064 New focus area
Study on Service Function Chaining Support in Edge data networks	**FS_SFCEDN**	*SA6 Proposed*	**Service Framework**	S6-212116 New focus area
Enhanced Service Enabler Architecture Layer for Verticals; Phase 2	**eSEAL2**	*SA6 Proposed*	**Service Framework**	S6-211997 Enhancements to Rel-17

Overview: Rel-18 Activities

Study/Work-Item	WI Code	SID/WID Approved	Theme	Remarks
Study on Application Enablement for Data Integrity Verification Service in IoT	**FS_DIV**	*SA6 Endorsed*	**Vertical Enabler**	S6-211481 New focus area

Summary

- Rel-18 addresses enhancements and new focus areas across 3 themes
  - Critical Communications (MC over 5GS, Gateway UE, Railways Interworking)
  - Service Frameworks (SEAL+, CAPIF+, Edge Computing+, NW Slicing, Data delivery, Location, Analytics, SFC,)
  - Vertical Enablers (V2X+, UAS+, IoT, Factories, Energy, Data Integrity)

- Higher workload expected than previous releases (17 items until date), including approved/agreed/proposed/endorsed proposals
  - Workload is manageable but companies are recommended that we are cautious and not exceed significantly beyond the current items on the table

- Coordination with other SA WGs (e.g. SA2, SA5) on the rise

Annex

FS_MCOver5GS

🔗 Motivation/Purpose

- Strong demand from users to support Mission Critical Services over 5GS;

🔗 Key Objectives

- Stage 2 and 3 work on
  - Multicast and broadcast communications for mission Critical Services
  - Off-network communication
    - Device-to-device
    - UE to network Relay (single hop and multi-hop)
    - Repeater (single hop and multi-hop)

🔗 Coordination with other WGs, if any

- SA2, RAN, CT1

Focus area 1: On-network - unicast communication for Mission Critical Services;

Focus area 2: On-network – multicast and broadcast communications for Mission Critical Services;

Focus area 3: Off-network communication

FS_MCGWUE
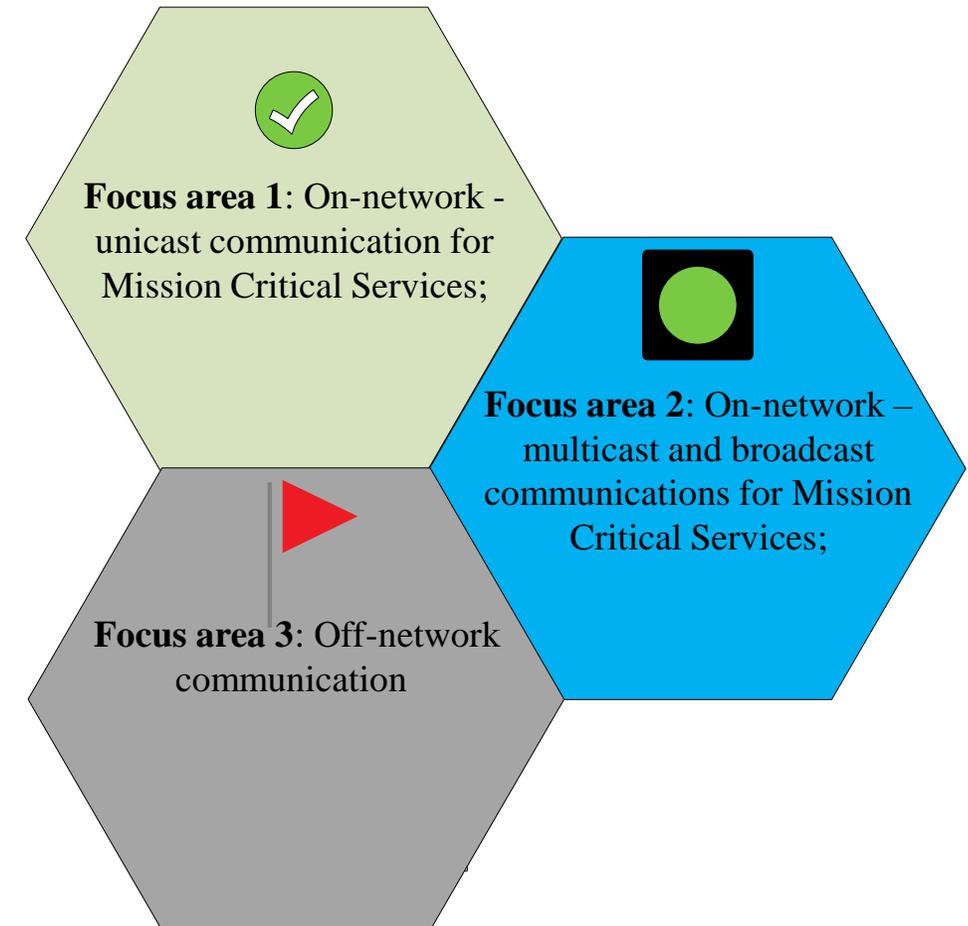
🕊 Motivation/Purpose

- Strong demand from users to connect existing equipment to the Mission Critical Communication framework;
- Allow the use of (legacy) non-3GPP capable devices for first responder teams;
- MBMS support, user traffic handling, location management, multiple gateway support.

ATC	Automatic Train Control
CCTV	Closed Circuit Television
ATO	Automatic Train Operation
DSD	Driver Safety Device
JRU	Juridical Recording Unit

🕊 Key Objectives

- Functional Architecture for an MC gateway UE;
- Authorization for connection of non-3GPP devices.

🕊 Coordination with other WGs, if any

- No

FS_IRail

Motivation/Purpose

- Satisfy interconnection and migration needs for railways between Mission Critical Communication systems.

Key Objectives

- Functional Alias handling, group communication, private communication;
- Quick migration and optimized connectivity between MC systems;
- Location management, call forwarding/transfer and IP connectivity.

Service provider agreement

Primary MC service provider

Partner MC service provider

Coordination with other WGs, if any

- No
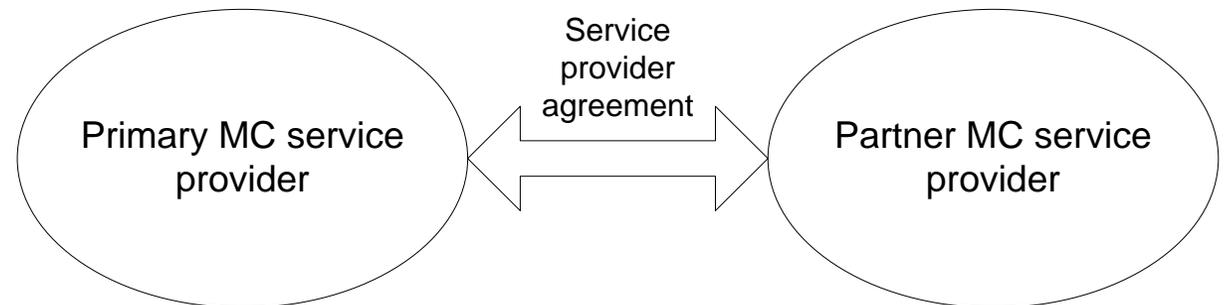
FS_eEDGEAPP

Motivation/Purpose

- In Rel-17, EDGEAPP work defines the architecture to enable edge applications over 3GPP networks. It includes features to assist an Application Client connect and maintain service continuity with an Application Server deployed on Edge.
- In Rel-18, the Edge Enabler Layer architecture requires enhancements to support emerging industry requirements (e.g. GSMA OPG) and complete those functionalities that were not fully specified in Rel-17.

Key Objectives

- **Roaming** support and **Federation** of services across ECSPs;
- **Service continuity support across MNOs and ECSPs**;
- Specification of **EDGE-5 interface** & a **framework for service differentiation**;
- **Co-existence** of network (SA2) & application layer architecture (SA6) solutions;
- **Coordination/alignment** with ETSI MEC & GSMA OP architectures;

Coordination with other WGs, if any

- SA2 for system aspects;
- SA3 for security aspects;
- SA4 for media aspects; and
- SA5 for management aspects.

ECSP : Edge Computing Service Provider
MEC : Multi-access Edge Computing
OPG : Operator Platform Group

© 3GPP 2020

FS_NSCALE
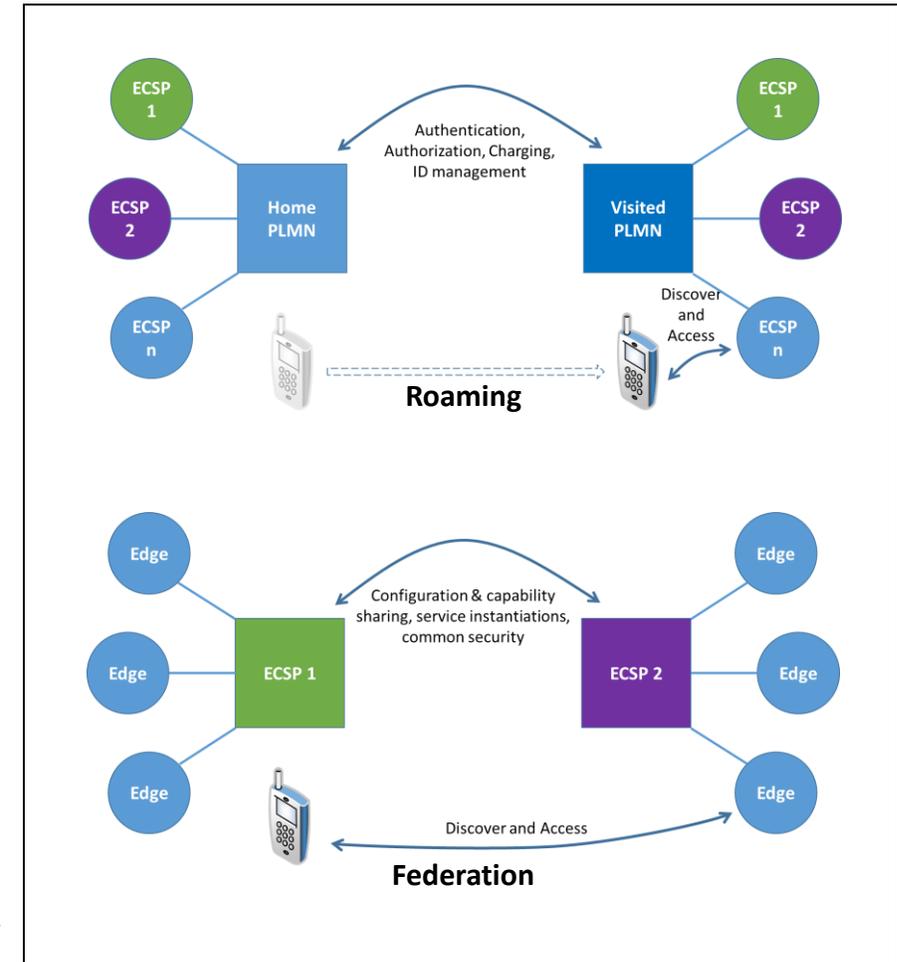
☞ Motivation/Purpose

- SA1 defines the relevant requirements of the open network slicing capability API for trusted third parties in TS 22.261 section 6.10.
- To support end-to-end network services, application layer and network layer may need to coordinate

☞ Key Objectives

- Identifies the SA1 requirements and potential vertical **requirements** of network slice capability exposure;
- Analyze and investigate the **services and functions** of enabler layer that may need to invoke control and management plane capabilities pertaining to network slicing
- Proposes **application architecture** aspects solutions and enhancements to SEAL.

☞ Coordination with other WGs, if any

☞ SA2-network slice control capabiliies, e.g. admission control, slice analytic;

☞ SA5-network slice management services, e.g. Network Slice Provisioning, PM\FM;
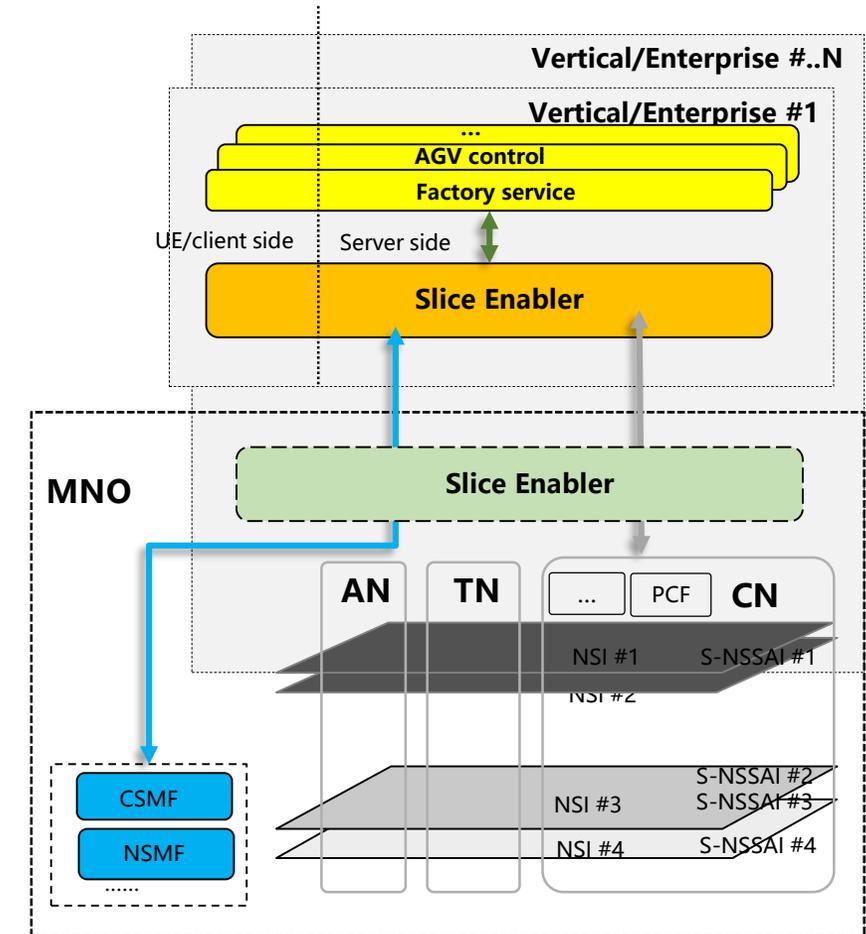
deployment use cases for slice enabler layer

© 3GPP 2020

FS_SNAAPP

🪽 Motivation/Purpose

- Check API access with the granularity of the individual 5GS subscriber, particularly when the API invocation may impact the subscriber
- SA1 requirements for SNA: TS 22.261, Clause 6.10.2

🪽 Key Objectives

- CAPIF enhancement to enable UE API access
- User consent aspect within CAPIF procedures

🪽 Coordination with other WGs, if any

- SA3 – Security aspects
- SA2 – Potential system aspects
- CT3 – API specification

FS_ACE_IoT
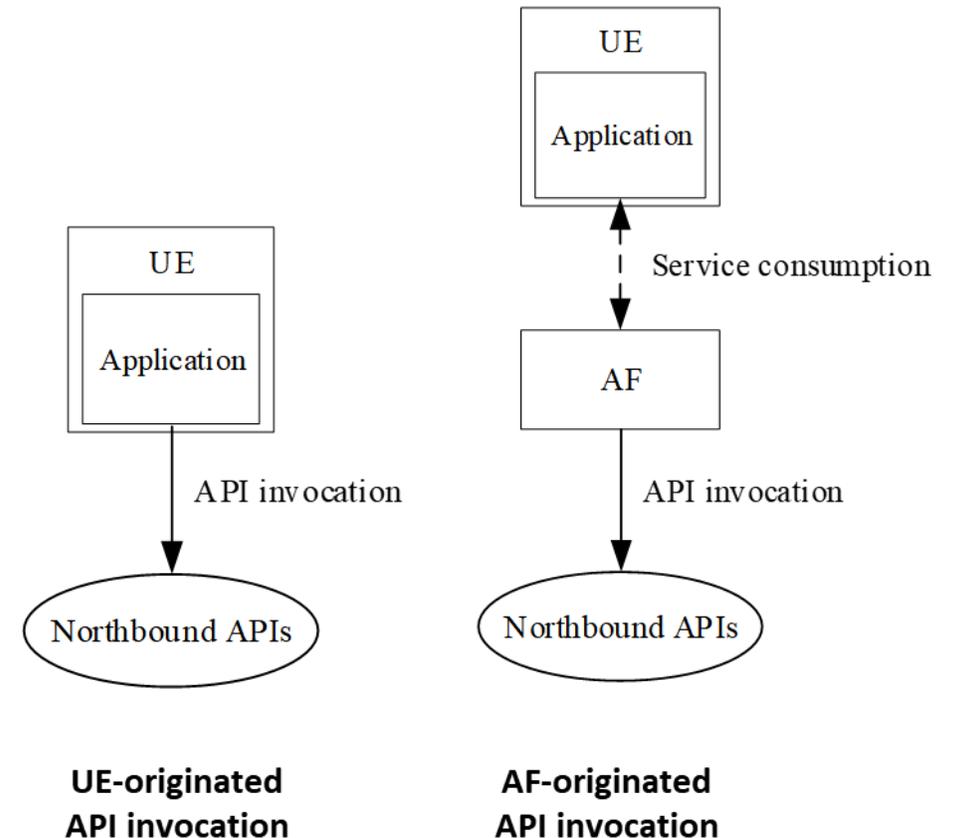
Motivation/Purpose

- Support of horizontal IoT Platforms in Service Layer
- Support of 5GS northbound exposure functionality to Application Servers via IoT Platforms.

Key Objectives

- New SEAL and/or VAL functionality provided to general purpose servers or 3rd party IoT Apps via IoT Platforms
- Limited to studying how to better utilize existing SCEF/NEF APIs
- Normative work included in eSEAL

Coordination with other WGs, if any

- SA2 - if needed, CT3 – eSEAL stage 3

FS_5GFLS
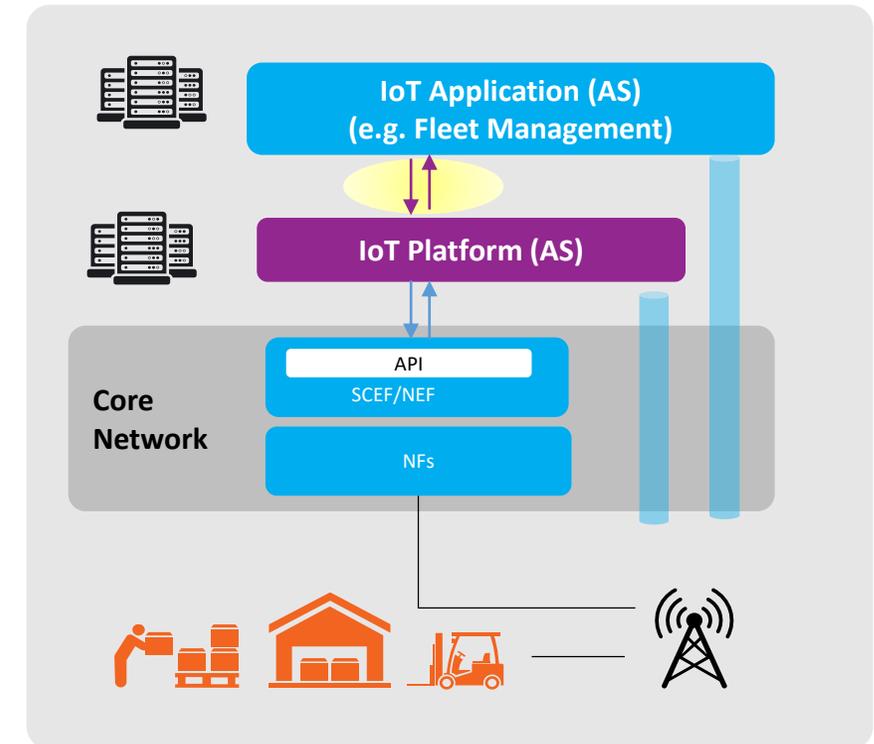
Motivation

- Growing needs of verticals for high-accuracy positioning (stage 1 requirements in IIOT, UAV, V2X, MCX...)
- Hybrid positioning and location fusion schemes desired for location services to meet increasing demands of indoor scenarios

Key Objectives

- Enabling combination/fusion of 3GPP and non-3GPP location technologies for location performance enhancement
- Architectural enhancement leveraging 5G location services
- Value-added location service exposure to verticals

Coordination with other WGs

- SA2 – LCS and core network aspects
- SA3 – Security and privacy aspects
- SA5 – Charging aspects

Fused Location Service Exposure

LCS, Edge, Network Slice, User Plane Location, Bluetooth/Wifi/UWB... positioning

MCOver5MBS

🏴 Motivation/Purpose

- Strong demand from users to support 5G MBS capabilities;
- SA2 MBS normative work will finish in Q3 2021
- Enable 5G MBS capabilities for MC services;

🏴 Key Objectives

- Update functional model to enable 5MBS;
- Session Management aspects (e.g. QoS);
- Mobility aspects addressing the system change between EPS ↔ 5GS;

🏴 Coordination with other WGs, if any

- SA2, SA3, RAN

Focus area 1: On-network - unicast communication for Mission Critical Services;

Focus area 2: On-network – multicast and broadcast communications for Mission Critical Services;

Focus area 3: Off-network communication and On-network communication of Mission Critical Services;

FFAPP
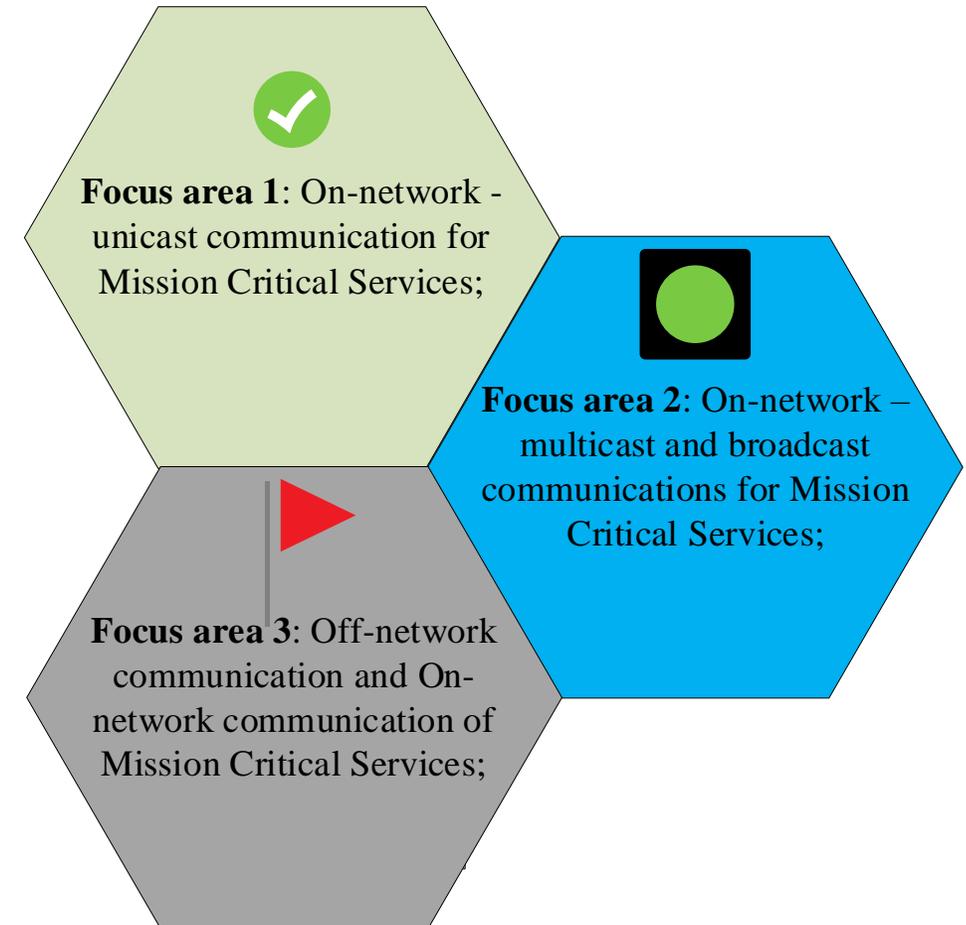
Motivation/Purpose

- TR23.745 has been conducted in SA6 to identify key issues, architecture requirements, functional model/architecture and corresponding solutions on application layer support for Factories of the Future in 5G network.

- The application layer support capabilities illustrated by the solutions can be utilized by the FF application layer resident on UE(s) (e.g. AGV, robot) or on network (e.g. factory automation system) which enhances the interaction with the 3GPP system(s) mainly considering 3GPP system services enabled towards Factories of the Future.

Key Objectives

- Defining architecture requirements and functional architecture corresponding to the application layer support capabilities for Factories of the Future.

- Procedures and information flows supporting the related solutions and usage of SEAL procedures.

- Support integration of Operation Technologies (e.g. OPC-UA) with 5G system by utilizing application support layer capabilities (e.g. CAPIF, SEAL)

Coordination with other WGs

- SA2 for core network architecture aspects, SA3 for security aspects, SA5 for slicing network management aspects.

# FS_SEALDD
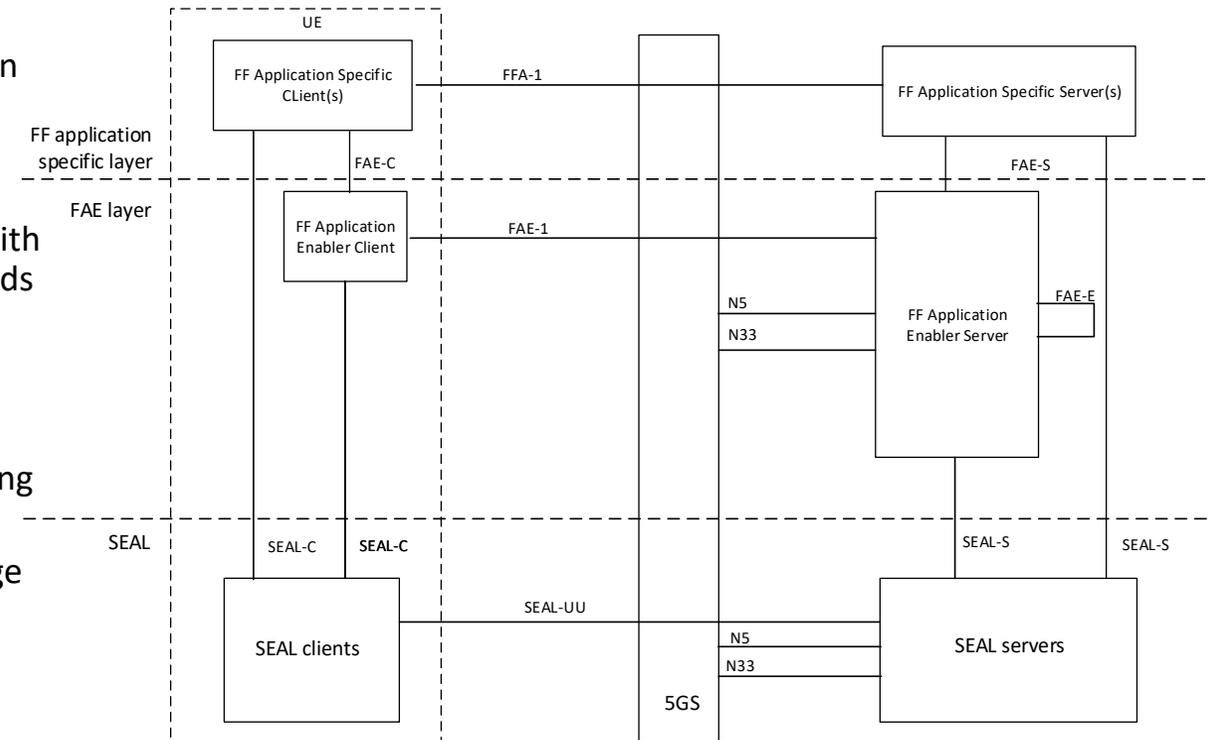
Motivation/Purpose

- Generic data delivery capabilities for multiple verticals
  - Stage 1 requirements – TS 22.261
- Use cases like E2E reliable transmission for URLLC applications, E2E QoS/QoE measurement, Lossless data transmission for UE relocation
- Integration of 3GPP MBMS data delivery and 5G Media delivery services.

Key Objectives

- New application support functions e.g. **Caching, distribution and delivery of application content/data** for multiple vertical applications.
- Optimize the use of Data delivery connections (e.g. TCP/UDP including lossless transmission considering UE mobility).
- Supporting analytics for improved data and service awareness (e.g. missing data, network performance, connectivity status, media stream analytics).
- Supporting more application data types (e.g file, machine control).
- Enhanced QoE/QoS measurement mechanism of E2E data delivery for maintaining user experience.
- E2E URLLC data delivery mechanism.

Coordination with other WGs, if any

- SA1 on service aspects, SA2 on aspects related to 3GPP system, SA3 on aspects related to security, SA4 on aspects related to media streaming, SA5 on aspects related to charging.

UE

Application Specific Client

Application Specific Server

SEAL DD Client

SEAL DD Server

Analytics

Storage

Delivery
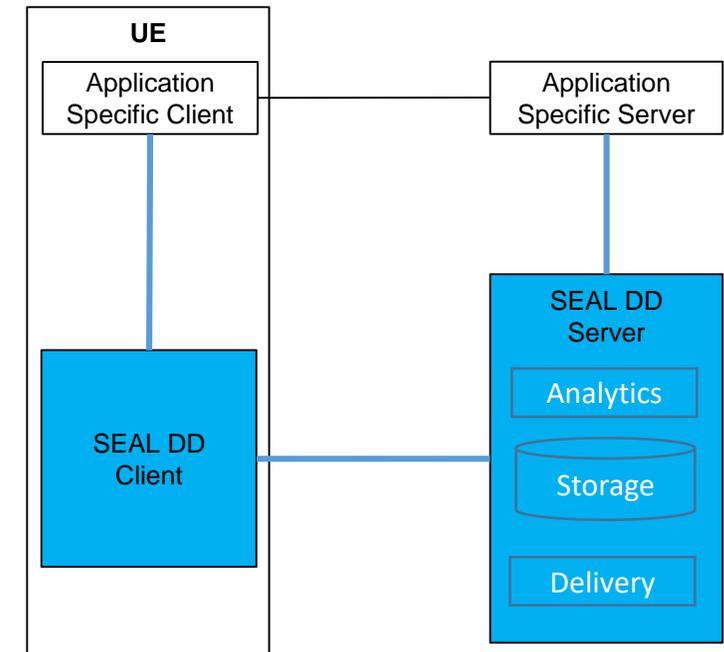
FS_eUASAPP

🦅 Motivation/Purpose
- Identify key issues and solutions for enhancement to UAS Applications

🦅 Key Objectives
- Improvements to UAS Applications due to new requirements in the UAS application layer, e.g. due to support for multiple USSs, multiple PLMNs, PC5 and 5MBS
- Improvements of SEAL due to corresponding new requirements in the UAS application layer

🦅 Coordination with other WGs, if any
- SA1 – UAV Stage 1 requirements
- SA2 – UAV connectivity aspects (e.g. PC5 / 5MBS)

Focus area 1
Improvements to UAS-appplication layer due to SA6-internal new or modified functions

Focus area 2
Improvements to UAS-application layer due to new functions led by SA1, SA2* and / or external bodies

Focus area 3
Improvements to SEAL due to improvements in Focus area 1 or Focus area 2
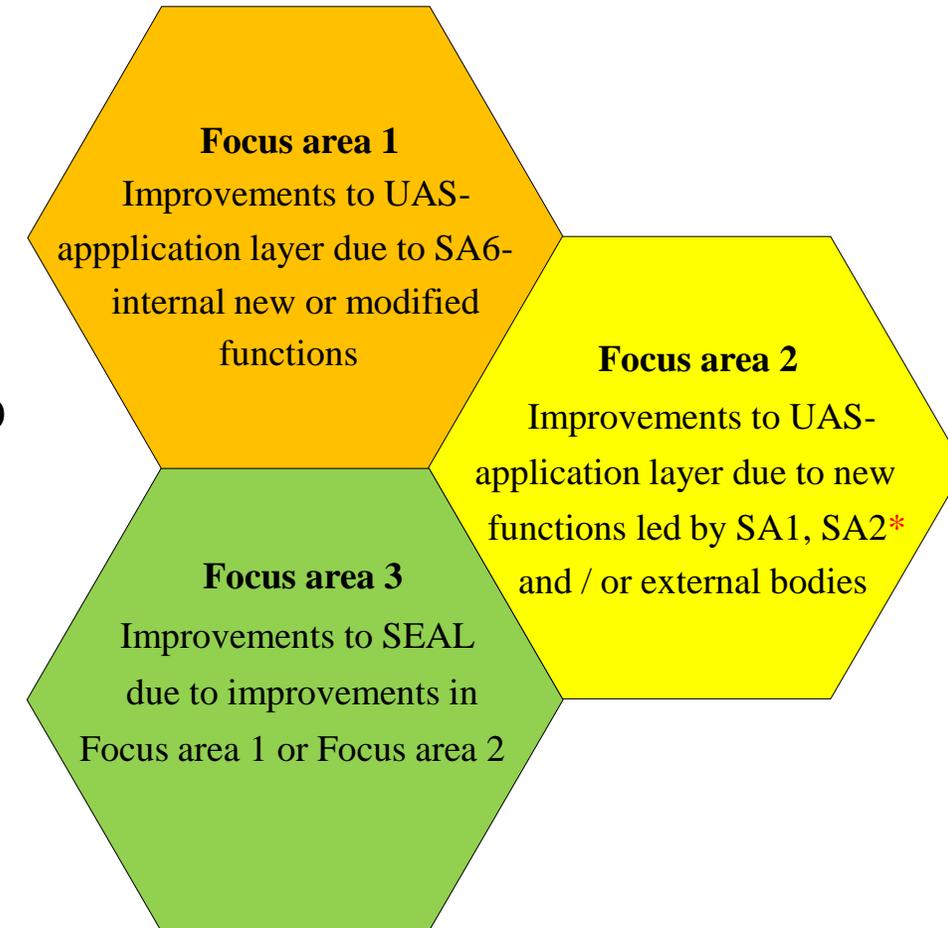
* SA6-work is pending progress in SA2

FS_eV2XAPP2

☞ Motivation/Purpose

- Use cases for V2P are supported in 5GAA and ETSI C-ITS work and for V2P use cases 5GC enhancements are provided in TS 23.287. Several aspects of V2P like clustering, hotzones may have impact on the V2X application support capabilities specified in TS 23.286.

- How advanced V2X applications (e.g. Platooning) can be supported by V2X communication enabled by edge deployments and also considering network analytics.

- Advanced services based on 5GS like UE monitoring service for Haptics/ToD use case

☞ Key Objectives

1. Analyze the stage 1 requirements for advanced V2X services like V2P, ToD specified in TS 22.185 and TS 22.186, the corresponding 3GPP system architecture enhancements specified in TS 23.287 and the related scenarios specified in industry bodies (e.g. 5GAA, ETSI ITS) which have impact on the enabler layer services;

2. Analyze the impact of edge and data analytics architecture (specified in TS 23.501, TS 23.288, TS 23.548, TS 23.558) usage on the existing V2X application enabler functionalities specified in TS 23.286 and the corresponding support for edge computing for advanced V2X services; and

3. Based on (1) and (2), develop key issues, corresponding architecture requirements and solution recommendations to enable the application layer support for the advanced V2X services over 3GPP systems (5GS, EPS).

☞ Coordination with other WGs, if any

- SA1 on service aspects, SA2 on aspects related to 3GPP system, SA3 on aspects related to security, SA5 on aspects related to charging.

VRU cluster

Edge

Hot zone

UE monitoring

ToD

FS_ADAES
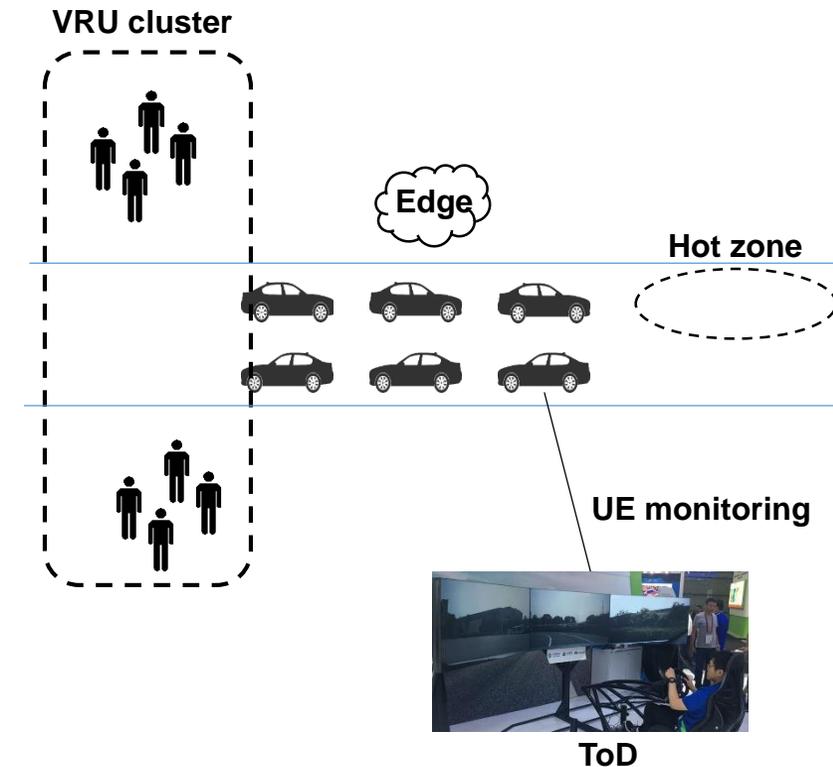
Motivation/Purpose

- Application data analytics may involve collecting data from different domains (OAM, 5GC, UE, edge/cloud platforms) and analyzing them to predict/prescribe actions that will help the ASPs/verticals to optimize the application service experience

- SA6 aims to study whether and how application enablement layer can be enhanced to provide such App Data Analytics Enabler (ADAE) capability to the vertical / ASP

Key Objectives

- Perform gap analysis and investigate what new analytics are required to be derived by the enabler layer to improve the application enablement support services and what data need to be collected by 5GS (NWDAF, MDAS), by edge/cloud platforms and UE to derive such analytics.

- Study possible new enablement value-add services related to potential new application data analytics (Predictive/Prescriptive edge-aware or vertical specific analytics) exposure to the vertical / application specific layer.

- Identify potential enhancements to existing enabler layer services (SEAL, EDGEAPP, vertical specific enablers), to support application data analytics enablement.

- Investigate possible impacts of application data analytics enablement, where application data are collected from both edge and cloud platforms.
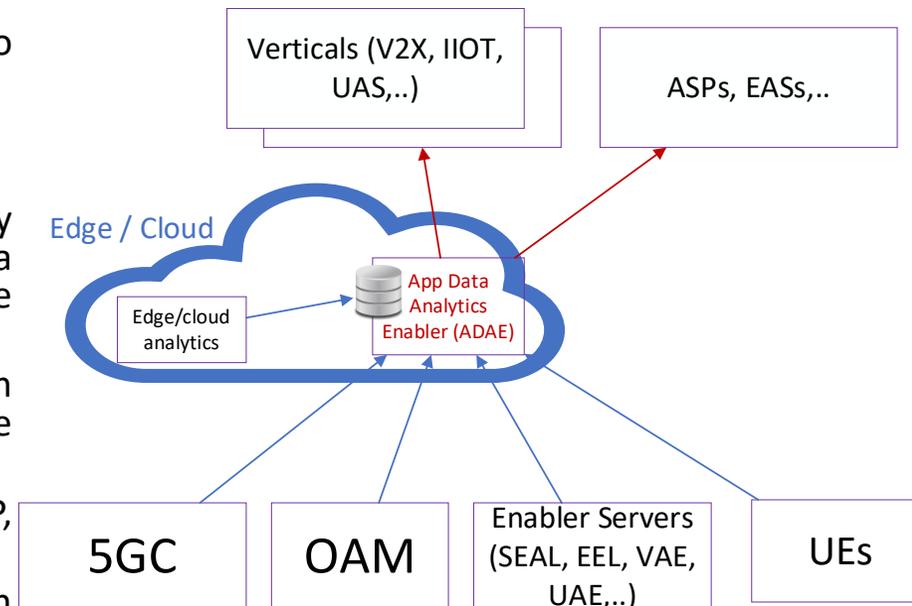
Coordination with other WGs, if any

- SA2, SA4, SA5 for possible coordination for the data collection that will be used for analytics enablement

# FS_GRIDAPP

Motivation/Purpose

- New Rel.18 SA1 requirement for SEI and existing requirements already specified in TS 22.261 and TS 22.104
- Impact of Use cases like Distributed Energy Storage, Advanced Metering, Remote DSO management of connectivity for Smart Energy, Smart Energy Differentiated QoS for Transported Encrypted Data, Distribution Intelligence – FLISR (Fault Location, Isolation, and Service Restoration), Line current differential protection in power distribution grid on SA6 specified enablers.
- Possible enabler layer aspects include supporting symmetrical latency, support for data distribution over 5G, generic data collection and analysis, support slice management, enhanced network status monitoring.

Key Objectives

1. Investigate and analyze the general applicability of Smart Grid related communication requirements in 3GPP TS 22.261, TS 22.104 considering the use cases in TR 22.867 for deriving the potential requirements for the enabler layer services.
2. Analyze the Smart Grid application layer usage of CAPIF, SEAL services and Edge enabler services.
3. Based on 1 and 2, develop key issues, corresponding architecture requirements and solutions (architecture, procedures) to enable Smart Grid application layer over 3GPP networks.

Coordination with other WGs, if any

- SA1 on service aspects, SA2 on aspects related to 3GPP system, SA3 on aspects related to security, SA4 on aspects related to media, SA5 on aspects related to charging.

# FS_SFCEDN
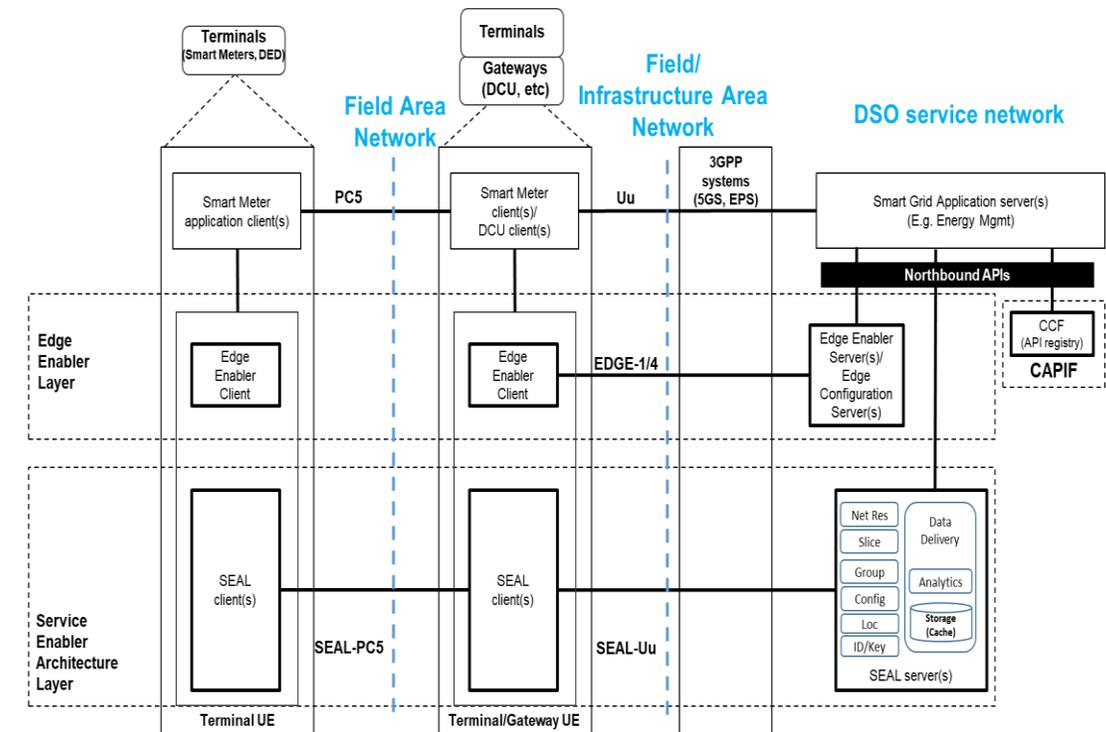
☙ Motivation/Purpose

- Service Function Chaining (SFC) at the edge/cloud data network for improved Quality of Experience (such as latency) for the user.
- State-1 requirements for SFC have already been approved (TS 22.261)

☙ Key Objectives

- Identify application architecture requirements to enable support for SFC deployments in the existing EDGEAPP architecture and required enhancements.
- Identify application architecture requirements to enable support for interacting with 5G core network and coordinating with other SFs deployed in the 5G core network.
- Key issues related to SFs deployment at the EDN such as Application-aware and application-unaware SFs, policy and management of SFs based on SFC requirements, and service continuity support in case of UE mobility/roaming scenarios.

☙ Coordination with other WGs, if any

- SA3 for security aspects, SA5 for management and charging aspects and SA2 for Service Function Chaining in core network.

eSEAL2 *(expected in Q1, 2022)*
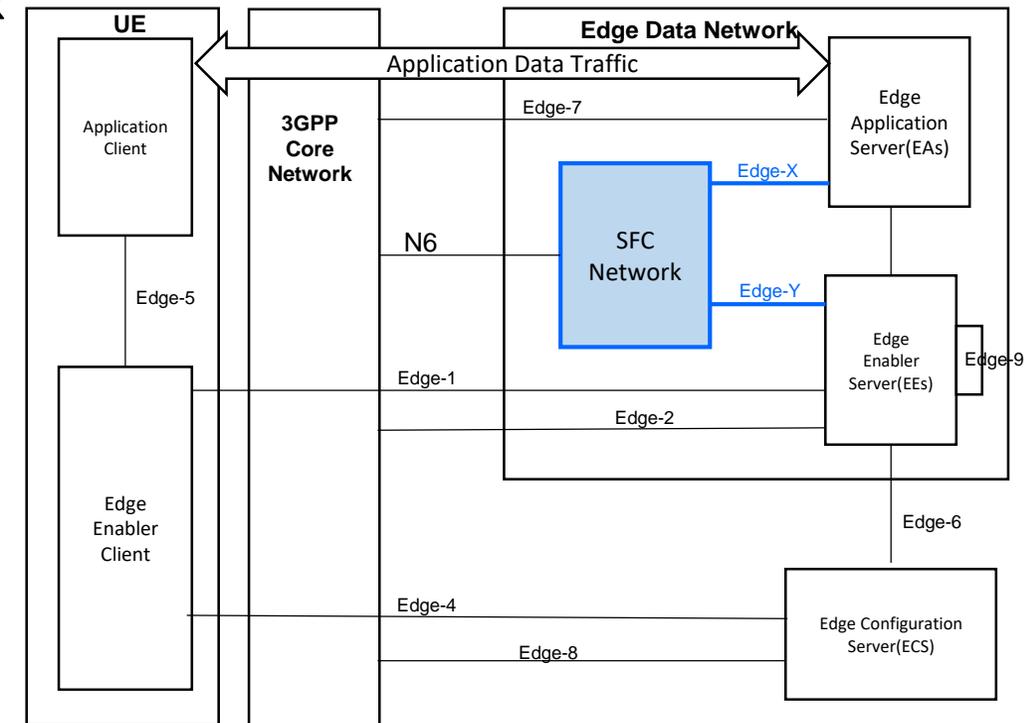
Motivation/Purpose

- SEAL - common set of application enabler capabilities relevant to multiple Verticals.
- Examples of application enabler capabilities in SEAL: Group creation/deletion for V2X Platooning, Location tracking/reporting, UE/Service configuration, Monitoring network situation, Communicating Vertical requirements to network, Message distribution for the Vertical applications.
- In Rel-17, enhancements to SEAL included enabler capabilities related to following verticals : eV2XAPP, UASAPP, 5GMARCH, FS_FFAPP.
- In Rel-18, potential SEAL enhancements to support emerging industry requirements and complete those functionalities that were not fully specified in Rel-17.

Key Objectives

- Addressing functionalities that were not fully specified in Rel-17, for example:
  - Support for multicast delivery
  - Off-network support
  - Distributed deployment of SEAL services
  - SEAL services in service-based interface representation
  - SEAL services to support multiple service providers and additional deployment models
- Potential enhancements from ongoing studies include - FS_NSCALE, FS_SNAAPP, FS_ACE_IOT, FS_5GFLS, FS_SEALDD, FS_eUASAPP, FS_eV2XAPP2, FS_ADAES

Coordination with other WGs, if any

- SA1 on service aspects, SA2 on aspects related to 3GPP system, SA3 on aspects related to security.

FS_DIV
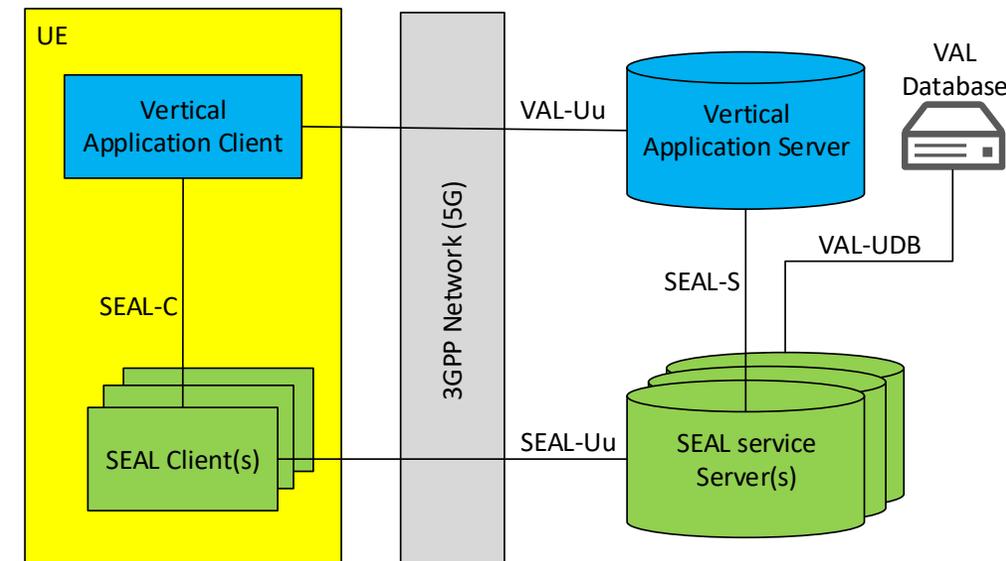
Motivation/Purpose

- Study on data integrity protection service between 3GPP network and application servers offered by a third-party service provider for IoT services.
- The service requirements have been specified in S1 TS 22.261 and S1 DI_5G(UID 910035).

Key Objectives

- Application enablement/application architecture of data integrity verification(DIV) service;
- DIV service APIs to 3rd party SPs.

Coordination with other WGs, if any

- SA3 - security related issues

DIV Service Application Architecture

Note1: **Orange Line marked is inside SA6 Scope**
Note2: Application solutions have no effcts on nework layer and UE.

© 3GPP 2020