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Multi-access Edge Computing (MEC)

A common, extensible application enabling platform for new business opportunities

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ETSI MEC: enabling applications in distributed clouds

Where are we now?

Foundation for Edge Computing created: fully standardized solution to enable applications in distributed cloud, created by ETSI MEC + 3GPP

- API Framework
- API Principles & Guidelines
- Service exposure via standardized APIs
- Management & Orchestration of Applications

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- ection & re-location of UPF
- AF influence on traffic routing
- Mobility event notifications from SMF
- Concurrent access to local and central DN

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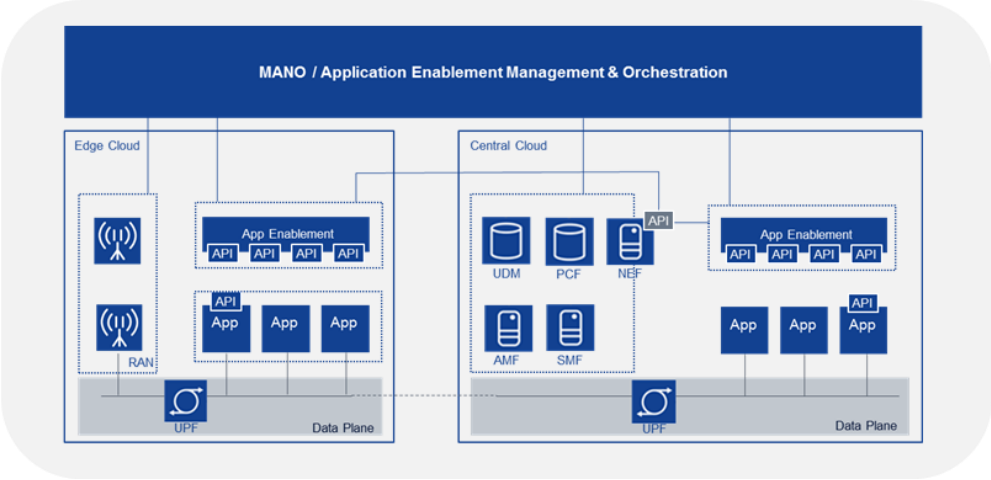
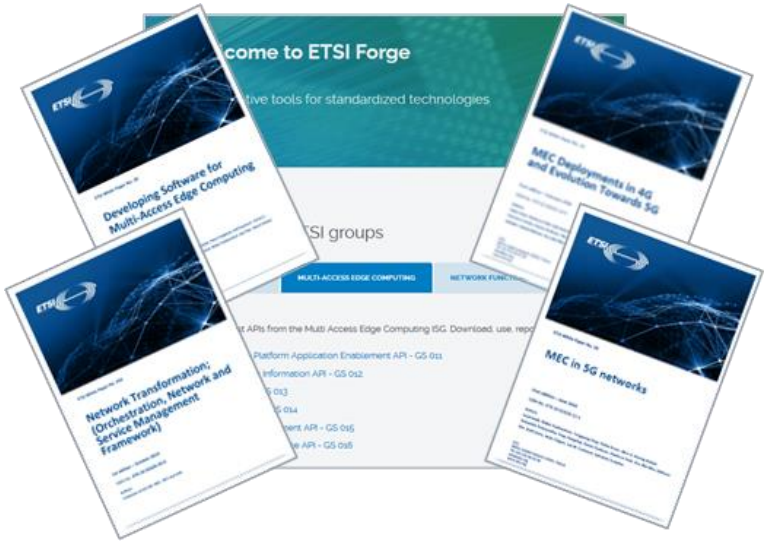
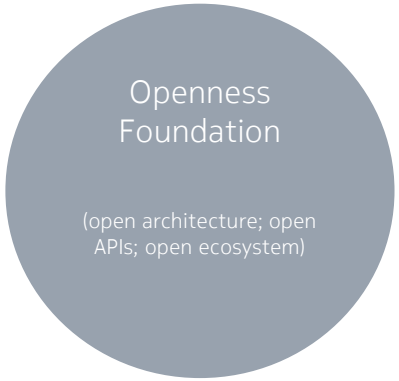


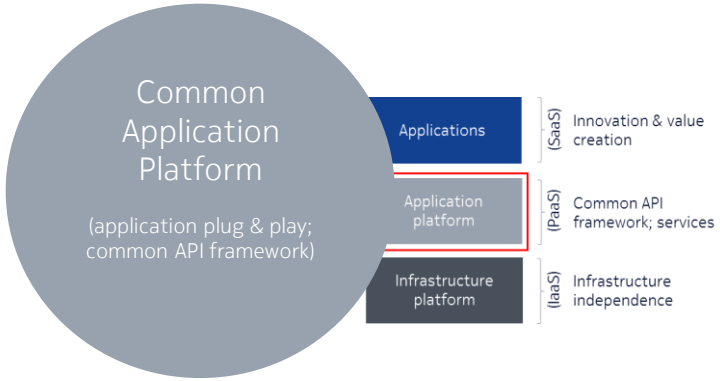


103 members - Operators – Tech Vendors – IT players – Industries – App developers

ETSI MEC: foundation for edge computing (1)

MEC provides:





Agile, value-sharing digital platform

- MEC enables speed of innovation and value co-creation with the ecosystems of different industries.
- MEC exposes information that can be used by applications to create value and enhance user experience.
- MEC opens new business opportunities with enterprises and verticals, especially in ultra-low latency use cases.

Flexible applicability & deployment options

- MEC provides a common and extensible universal application platform which is aligned with the overall cloud transformation and is a natural element of 5G.
- MEC can be brought to all locations: far edge, enterprise edge, access, aggregation hub, distributed data center, centralized data center.
- MEC can be deployed in different cloud environments.

A key stone of the URLLC transformation

- MEC enables new class of premium SLA-driven applications that require real-time delivery of live and on-demand content as well as a high degree of interactivity.
- MEC supports the digital transformation and mobilization of the enterprise industries. It is a key enabler for IoT and mission critical, vertical solutions.

ETSI MEC: foundation for edge computing (2)

Application enablement
(API framework)

A framework for delivering services which may be consumed or offered by (***locally hosted or remote***) authorized applications. It enables:

- registration, announcement, discovery and notification of services;
- authentication and authorization of applications providing and consuming services;
- communication support for services (query/response and notifications).

API principles

A set of API principles and guidance for developing and documenting APIs inside or outside ETSI which ***ensures that a consistent set of APIs*** is used by developers.

The work was inspired by the TMF and OMA best practices.

The APIs are designed to be ***application-developer friendly*** and easy to implement so as to ***stimulate innovation*** and foster the development of applications.

Specific service-related APIs

Services ***expose network and context information*** via specific service-related APIs.

A different set of services may be applicable at different locations.

Services include:

- Radio Network Information
- Wireless LAN Information
- Fixed Network Information
- Location Information
- UE Identify Information
- V2X Information
- IoT Information
- Third-party services

Management, orchestration and mobility-related APIs

Facilitate the running of applications ***at the correct location at the right time***, based on technical and business parameters

Ensure service continuity

Enables a myriad of new use cases across multiple sectors as well as innovative business opportunities

ETSI MEC: foundation for edge computing (3)

MEC in 5G

3GPP 5G MEC integration, with enablers specified in 3GPP SA2

Multi-access support: LTE, WiFi, MulteFire, CBRS, 5G, Fixed network

Security

Ensures security and privacy

Compliance with regulatory and legal requirements

Federation

Interaction and coordination between MEC platforms and MEC systems, supporting multi-operator, -network, -vendor environment

Operator-driven work item in ETSI MEC

Engagement with the developers

MEC OpenAPIs available at the ETSI forge site; white paper on “developing software for MEC”

Sandbox environment

Successful MEC Hackathons

Testing framework

MEC API conformance test specifications, based on MEC testing methodology guidelines and framework

Support for mobility

Support for UE (User Equipment) mobility and service continuity, for both stateless and stateful applications

Industry enablement

5GAA, 5G-ACIA, Akraino

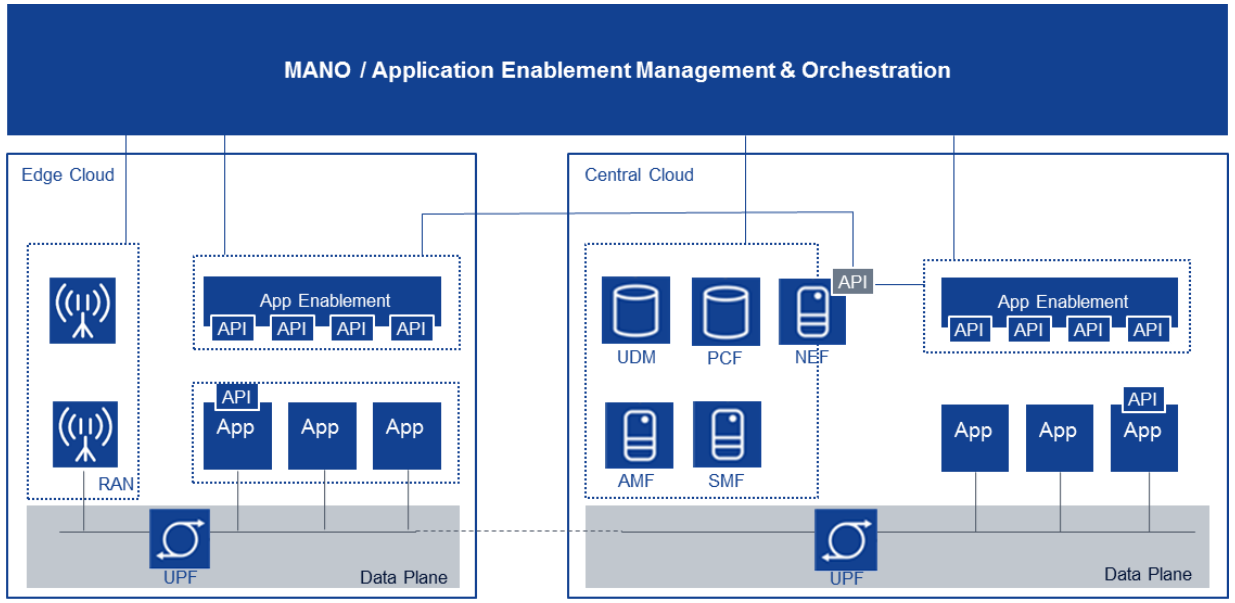
A bunch of white papers describing deployment options and solutions for Industries: - MEC in an Enterprise setting - MEC in 5G networks - MEC deployments in 4G and evolution towards 5G - cloud RAN and MEC : a perfect paring

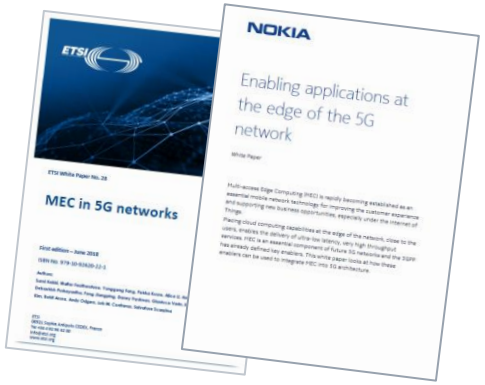
Openly available

MEC in open source: several MEC-based Blueprints in the Linux Foundation Akraino project

From proof of concept to proof of viability in a live network environment

MEC in 3GPP 5G





Nokia White Paper (published on December 2017): [Enabling applications at the edge of the 5G Network]

ETSI White Paper (published on July 2018): [MEC in 5G]

MEC considered in 3GPP 5G Architecture from the beginning

3GPP SA2 specified enablers for MEC as an AF

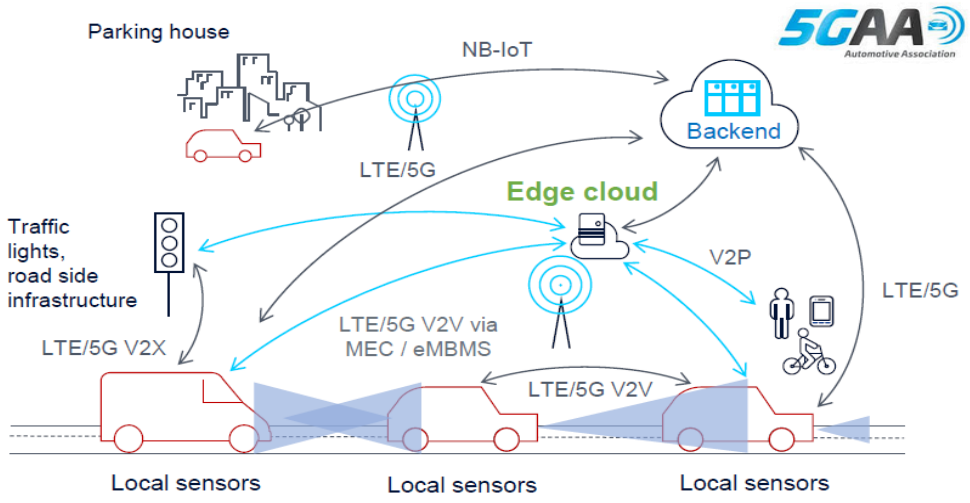
- Selection of User Plane Function (UPF) close to the UE
- Local UPF re-selection (based on UE mobility events)
- Concurrent access to local DN (Data Network) and central DN in a single PDU session.
- Support MEC request for local traffic steering locally (per UE or a group of UEs).
- Local UPF access to the application
- Delivery of UE mobility information to a MEC application and also an interface for applications to send a trigger for UPF re-selection
- For specific MEC services offered only in certain location: Indication for UEs about LADN availability(Local Access Data Network)
- Interface of Information Exposure towards MEC applications
- Charging support for locally steered traffic

MEC for Industries

5GAA as a spearhead: MEC is one of the Key Focus areas in 5GAA "Flexible Service Architectures – distributed cloud and edge computing".

MEC is a key building block in the MEC4Auto work, especially in the multi-MNO V2X scenario.

Cross-System, Cross-Operator, Cross-Vendor – ongoing work by Telefonica, KDDI, Vodafone on Federated MEC solutions



GSMA has published white papers:

- Business opportunities and monetization options for MEC
- Stakeholder analysis and feasibility study for MEC
- Mobile throughout guidance
- Implementation guidance for MEC

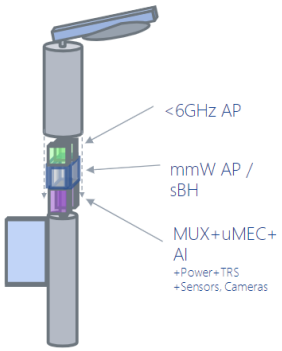
GSMA has created additional (internal) white paper:

- Multi-access Edge Computing API Analysis

MEC-compliant open-source Blueprints in the Akraino project

µMEC concept

- µMEC is a small form factor HW+SW platform for especially the Smart City services on Ultra Far Edge
- It can use 5G, WLAN or fiber connection
- It can be installed on light poles, vehicles, etc
- The µMEC proof-of-concept is based on LuxTurrim5G and open source components



µMEC deployment example: LuxTurrim5G

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ETSI MEC and LF Edge signsed MoU on Collaboration

Working towards moving the industry forward together

"The MEC ISG within ETSI and LF Edge'e Akraino project have been working towards moving the industry forward together. The first fruit of this labor is about to ripen – an Akraino Mini-Hackathon, endorsed by ETSI, to be held in San Diego the day before KubeCon." (see Blog by Alex Reznik, Chair of ETSI MEC ISG)

Integration Projects (aka "Blueprints")

- 5G MEC System Blueprint Family
- AI/ML and AR/VR applications at Edge
- Connected Vehicle Blueprint(Aka CVB)
- Edge Video Processing
- ELIOT: Edge Lightweight and IoT Blueprint Family
- Integrated Cloud Native NFV/App stack family (Short term: ICN)
- Integrated Edge Cloud (IEC) Blueprint Family
- KubeEdge Edge Service Blueprint
- Kubernetes-Native Infrastructure (KNI) Blueprint Family
- Micro-MEC
- Network Cloud Blueprint Family
- Public Cloud Edge Interface (PCEI) Blueprint Family
- StarlingX Far Edge Distributed Cloud
- Telco Appliance Blueprint Family
- The AI Edge Blueprint Family
- Time-Critical Edge Compute

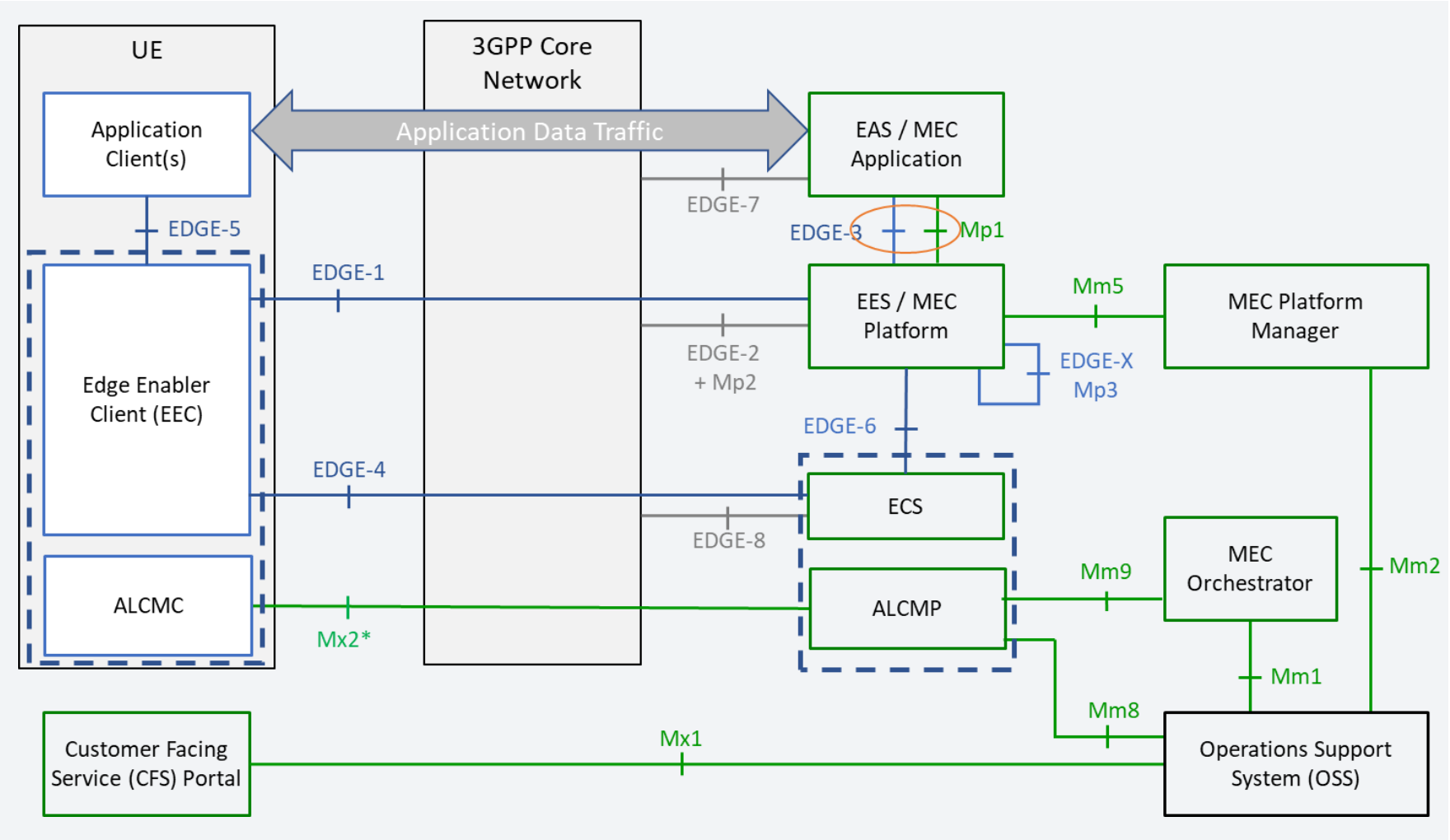
Feature Projects

- Cluster Health & Overload Monitoring Platform (CHOMP) Feature Project
- Support of OVS-DPDK in Airship
- Akraino Portal Feature Project
- Akraino Blueprint Validation Framework
- MEC API Framework
- API Gateway
- Akraino Profiling
- Akraino Regional Controller
- Backup and Restore (Snappy) Feature Project
- KONTOUR

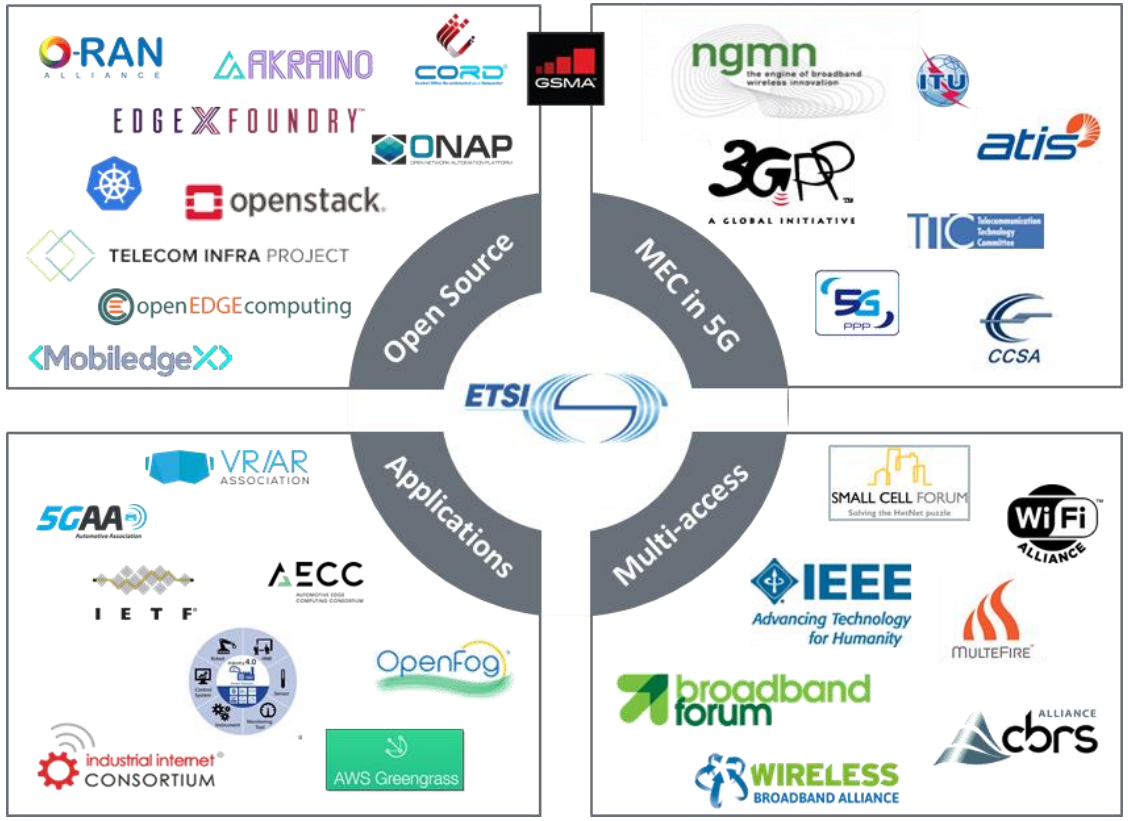
7 MEC-based Blueprints

ETSI MEC and 3GPP SA6 Edge Application Architecture
Complementary efforts

Synergized MEC / EdgeApp architecture



MEC industry landscape



- The fundamental MEC specifications are ready; ETSI MEC is widely recognized in the industry as the leading SDO for application enablement and edge computing.
- The edge cloud ecosystem is still being developed; we are witnessing a rapid expansion of edge-related initiatives with duplicated solutions.
- To accelerate time-to-market and promote industry adoption, it is essential to ensure alignment and leverage synergies. This will also help to simply innovation co-creation with agile, plug-and-play value integration.
- The MEC application enablement platform and the APIs should be leveraged by key edge computing related initiatives (including ORAN RIC); this will allow the developers to write a single application software module that can run on every edge environment.

Epilogue

MEC is coherent with the openness ambition for innovation and growth. It provides a common API framework for third-party plug-ins and open APIs for data exposure and programmability.

MEC supports multiple access technologies, application mobility, multi-operator/multi-domain, network slicing in federated cloud, V2X service in multi-operator domains, IoT, etc.

MEC is aligned with the overall cloud transformation and is a natural element of 5G.

MEC is a key enabler for IoT and mission critical, vertical solutions. It is a focal point for collaboration between operators and Enterprises.

The number of edge initiatives in the industry has considerably grown and they should leverage MEC to ensure common practices and tools for the developers. This will help to ensure adoption and accelerate time-to-market.

MEC is well positioned to satisfy the needs of an Operator Platform; it is flexible and can be extended to fill gaps if identified and as needed.

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