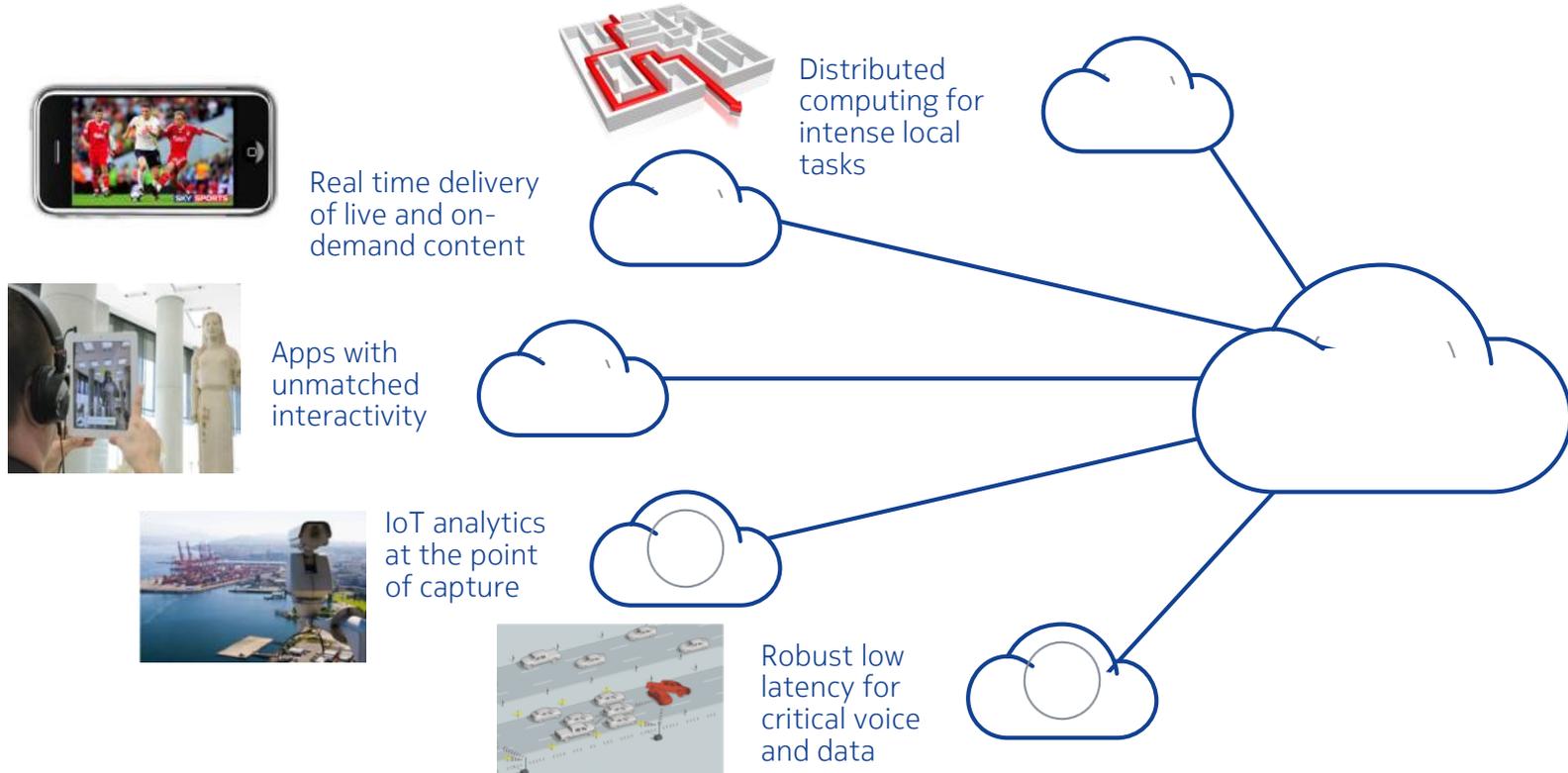# Multi-access Edge Computing (MEC) Applications

- Hannu Flinck
- 29-03-2017

   <Public>

Multi-access Edge Computing extends the cloud to where people and objects connect

Introduces micro data centers at the edge of the network

Real time delivery of live and on-demand content

Distributed computing for intense local tasks

Apps with unmatched interactivity

IoT analytics at the point of capture

Robust low latency for critical voice and data

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Why Multi-access Edge Computing?

Real time	Interactive	Private	IoT	Data and compute heavy
Lowest application latency end-to-end, for a real time user experience or critical communications	Maximum transaction rate between device and cloud for an interactive user experience	Local communications for robust performance, privacy, and security	Real time insights from data exploited at the point of capture, minimum cloud ingress bandwidth	Local compute and storage for most demanding workloads to go mobile

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ETSI MEC Release 1 work
Focusing on Application Enablement & APIs

Application Enablement (API Framework)	**API Principles**	**Specific service-related APIs**	**Management and Orchestration related APIs**
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).	A set of API principles and guidance for developing and documenting APIs inside or outside ETSI which *ensures that a consistent set of APIs* are 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.	Services *expose network and context information* via specific service-related APIs. A different set of services may be applicable at different locations	Facilitate the running of applications *at the correct location at the right time*, based on technical and business parameters

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Multi-access Edge Computing (MEC) applications

Subscribers
Better and more mobile broadband, and exciting new services

Throughput guidance (video optimization)

User and network analytics

LTE coverage extender

Edge video orchestration

Augmented reality

User engagement

Indoor navigation

Enterprises and corporates
Extends traditional footprint

Local breakout to enterprise network

Private LTE (local EPC, HSS, IMS)

Footfall analysis

Mission critical group communications

Video surveillance

Object tracking

Local content

Internet-of-Things and Verticals
New frontiers for network-based service innovation
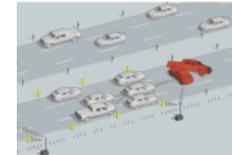

Edge video analytics

Edge audio analytics

IoT gateway

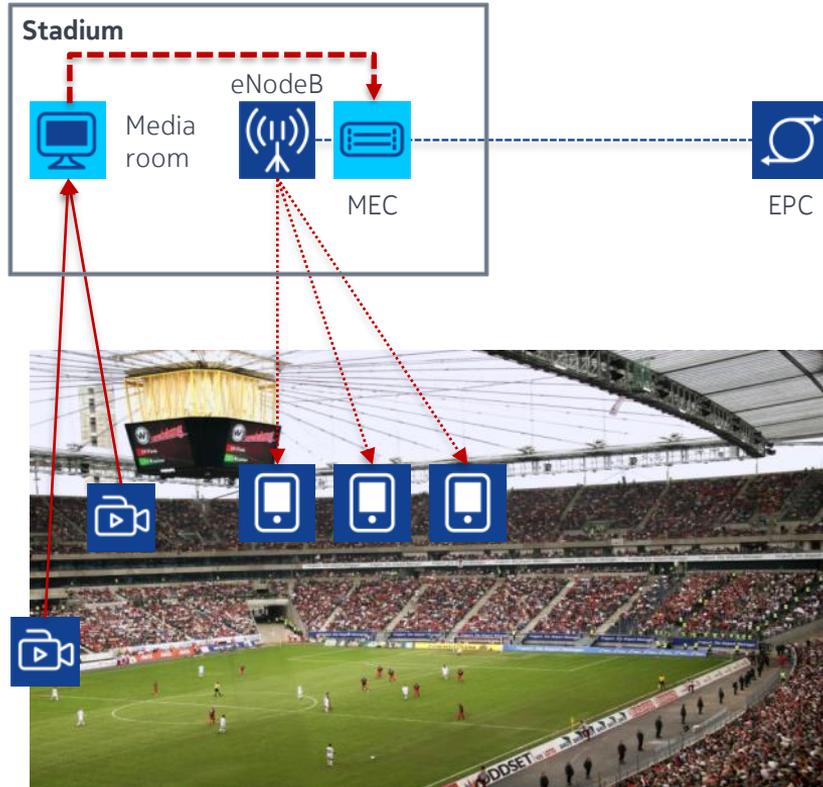Deployable LTE system (network-in-a-box)

Mission critical group communications

Car-to-car and car-to-roadside communications

CopCar2.0

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MEC application: Edge video orchestration
Create exciting live views for stadium visitors

Stadium

eNodeB

Media room

MEC

EPC

Use case

- Live camera signals are locally ingested and played out to visitors in real time.
- Visitors can select between different cameras, which are presented in HD and SD quality levels.
- Distribution over unicast and broadcast (based on local eMBMS gateway).

Benefits

- Exciting service for event visitors, providing an immersive real time experience: Minimal dealy from camera to device, including encoding, play-out, decoding.
- Video traffic does not put any strain on venue backhaul.

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MEC application: Video Analytics
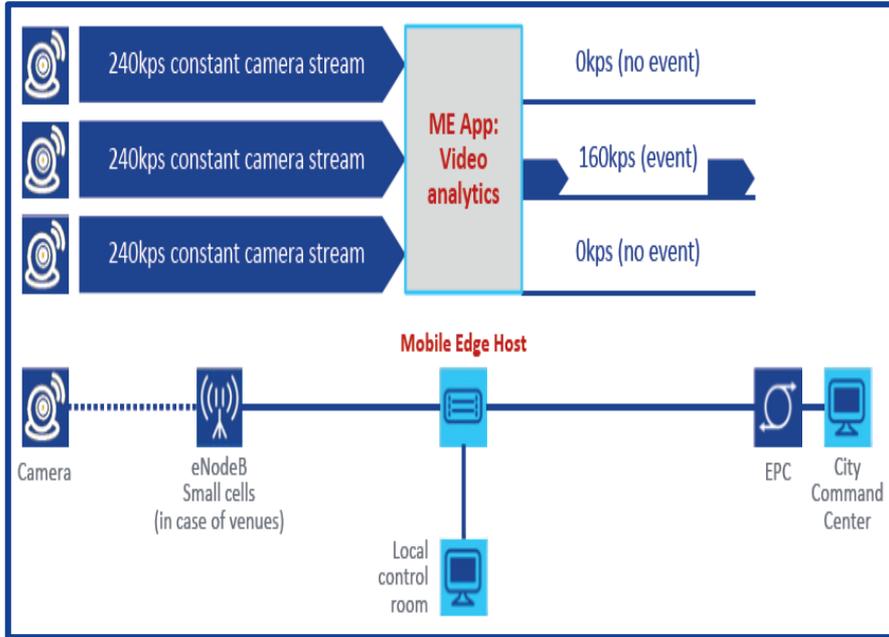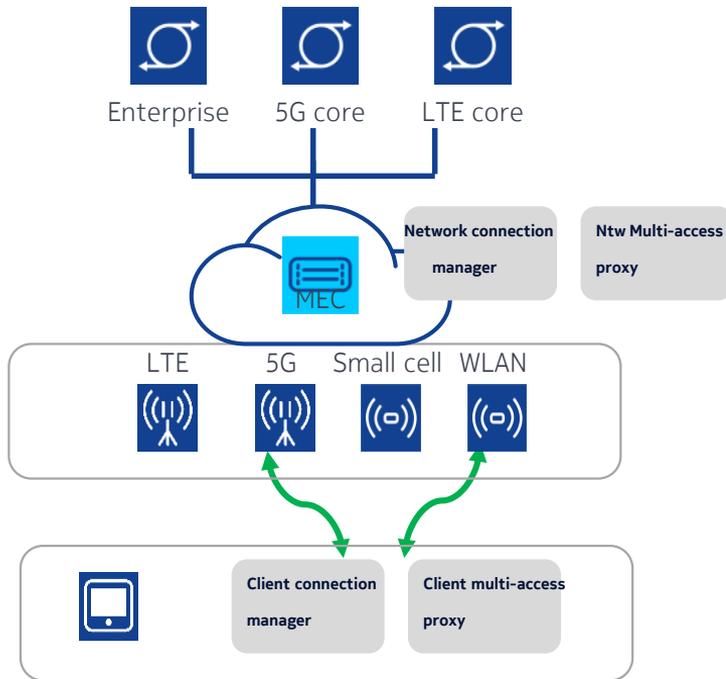

Use case

- Provides video surveillance to cities, municipalities, and enterprises over an LTE network.

Benefits

- MEC is used for analyzing raw video streams from surveillance cameras connected over LTE, and for forwarding the relevant incidents to the city command center.
- The camera streams can be broken out to the local control room to reduce latency and to relieve the burden on backhaul.

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MEC application: Multiple Access Management Services (MAMS)
Optimal access and path selection for multi-access

Enterprise 5G core LTE core

Network connection manager

Ntw Multi-access proxy

MEC

LTE 5G Small cell WLAN

Client connection manager

Client multi-access proxy

Use case

- Dynamic and per-user best path selection based on network policies and link quality measurements on user devices.
- Ideal for 5G/LTE/Wi-Fi integration for enterprises, public venues and stadiums.

Benefits

- Lightweight integration of different access technology domains.
- Synergetic use of cellular network and local Wi-Fi network for optimum quality of experience.
- Allows combining unique MEC applications with high capacity local radio access for all venue visitors.

Ref. draft-kanugovi-intarea-mams-protocol-03

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MEC application: Local breakout
Create superfast and secure LTE zones for high value enterprise customers
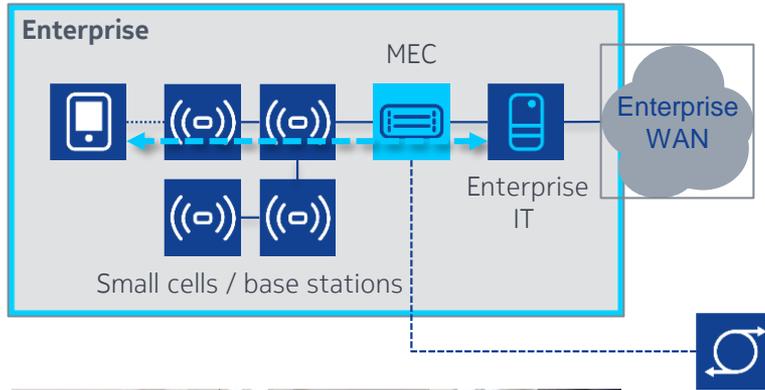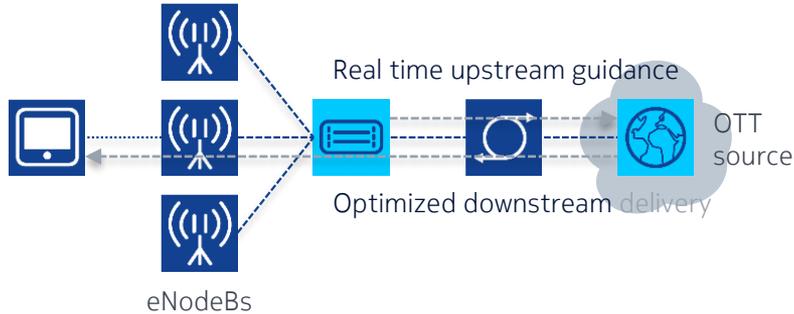

Use case

- Local breakout from Mobile Edge Computing to enterprise network, keeping enterprise traffic local.
- Optional integration with corporate communications, Intranet and other services.
- Use case applies to small cell and macro base station environments, in particular indoors.

Benefits

- Superfast and secure LTE zones for enterprises.
- Provides high quality and secure connectivity.

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MEC application: Throughput guidance for an optimal video experience
Developed and tested with Google, proposed for standardization to IETF

Real time upstream guidance

OTT source

Optimized downstream delivery

eNodeBs

Capacity
TCP guided

Use case

- Computes real time throughput guidance for individual user connections.
- Guidance is sent within upstream user packets, no extra signaling is required.
- Largely eliminates the inefficiencies in mobile delivery today, which are caused by sources being unable to gauge network capacity.

Benefits

- Best video experience as a differentiator.
- Network resources freed up along the entire delivery chain, including the air interface.
- Simple and completely non-intrusive optimization, also for encrypted content.
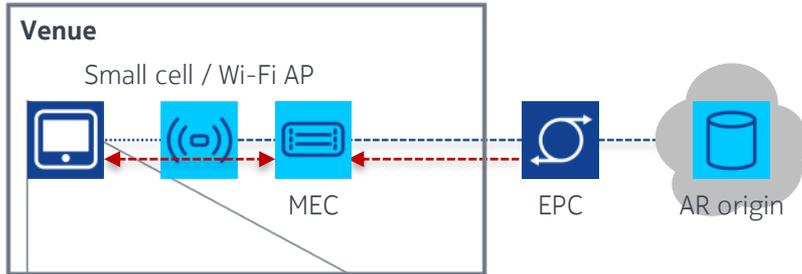
Ref
- draft-sprecher-mobile-tg-exposure-req-arch-03.txt
- draft-flinck-mobile-throughput-guidance-04

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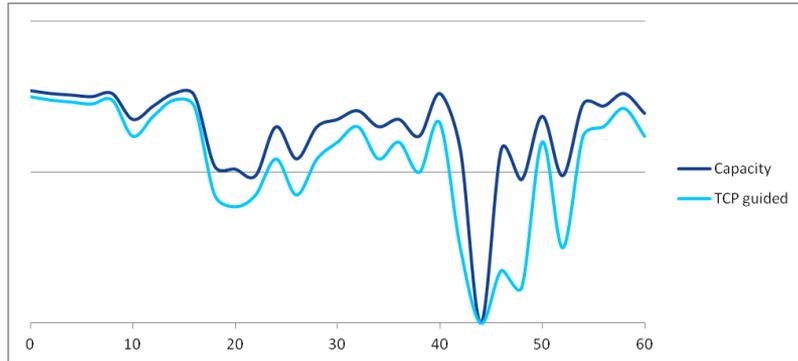
MEC application: Augmented reality
Create an interactive „wow" experience

Venue

Small cell / Wi-Fi AP

MEC   EPC   AR origin

Use case

- Quickly determine user location based on network data.
- Local augmented reality (AR) server performs fast image recognition and subsequent delivery of AR contents.
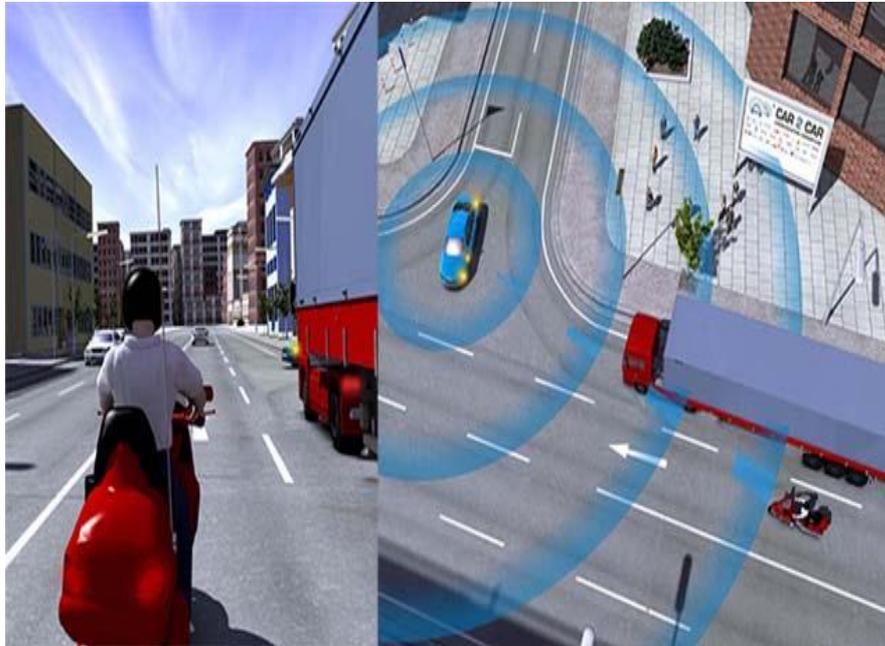- Aggregates all locally relevant AR channels.

Benefits

- Unique experience with an unmatched degree of interactivity.
- Ease of discovery and delivery of locally relevant AR content.

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MEC application: Connected car
Digital A9 Motorway Test Bed - Nokia, Deutsche Telekom, Continental and Fraunhofer ESK

Source: 360.HERE.com

Use case

- See through the traffic in front of you.
- When the truck's cameras detect dangerous situations images are shared and alarm is sent.

Benefits

- Enables vehicle-to-vehicle communications allowing latencies below 20ms which is particularly important for traffic safety applications.
- Increased road safety.
- New applications and service providers.

See more: https://www.youtube.com/watch?v=rbPH3OGO2F4&feature=youtu.be

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Conclusions

Multi-access Edge Computing (MEC) is evolving into a key building block in the evolution of the networks, complementing NFV and SDN.

- a key enabler for IoT and mission-critical, vertical solutions.

- widely recognized as one of the key architectural concepts and technologies for 5G.

- enables new use cases across multiple sectors as well as innovative business opportunities.

The work on Release 2 of ETSI will extend the applicability of the MEC technology and render the MEC environment even more attractive to third-party application developers.

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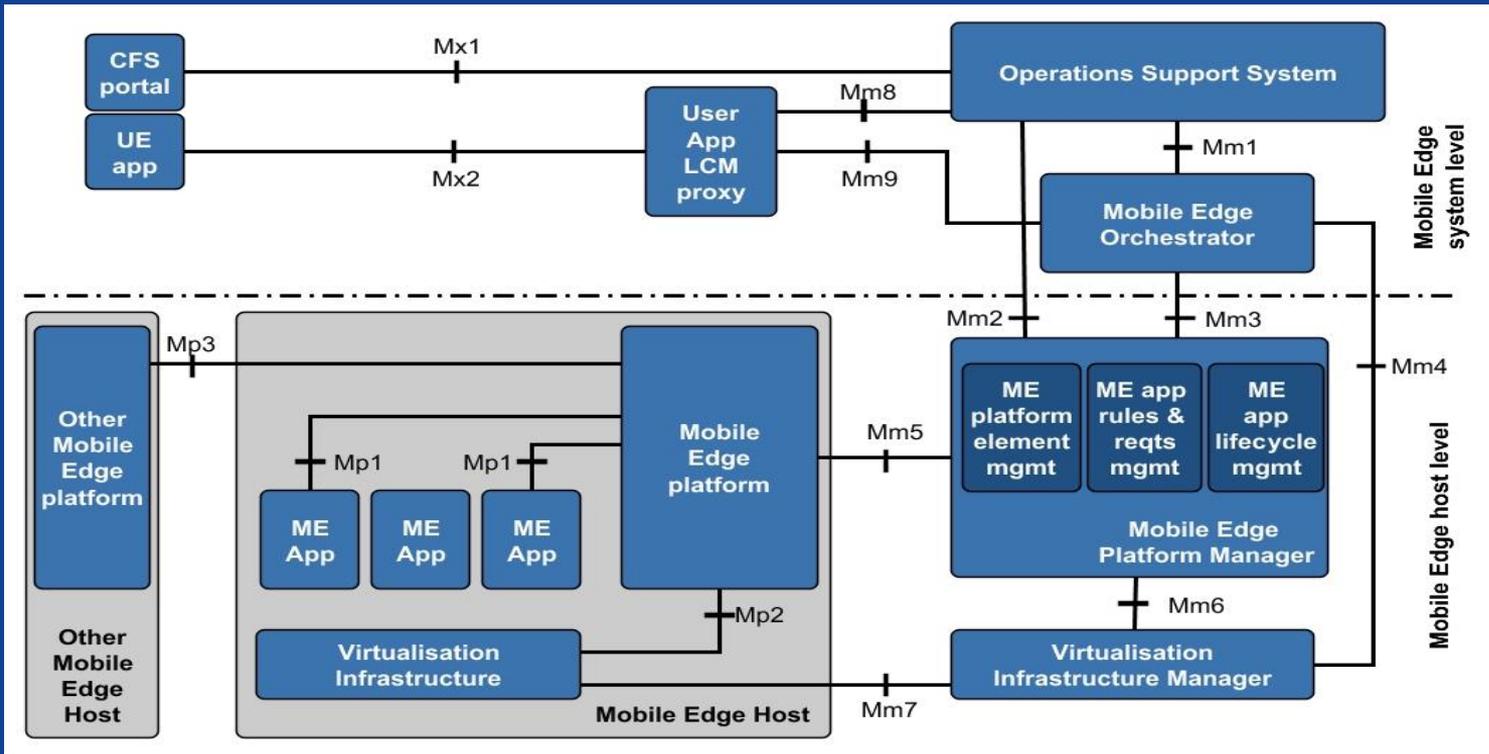
Release 2 objectives

Support 3GPP and non-3GPP access technologies (WiFi and fixed)

Expend the virtualization support types (to render the environment as attractive as possible for third-parties)

Study possible new charging models which may be applicable to MEC

Fill gaps relating to lawful interception

Develop testing specifications and test methodologies; Coordinate PlugTests

Coordinate experimentation and showcasing of MEC solutions

Expedite the development of innovative applications; ensure a low entry barrier

Disseminate the results of the work; strengthen collaboration with other organizations

Study new use cases

Enable MEC deployments in NFV environments

From
Mobile **E**dge **C**omputing

To
Multi-access **E**dge **C**omputing

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