Multi-access Edge Computing (MEC) Applications

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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
- Apps with unmatched interactivity
- IoT analytics at the point of capture
- Robust low latency for critical voice and data
- Distributed computing for intense local tasks
Why Multi-access Edge Computing?

Real time
- Lowest application latency end-to-end, for a real time user experience or critical communications

Interactive
- Maximum transaction rate between device and cloud for an interactive user experience

Private
- Local communications for robust performance, privacy, and security

IoT
- Real time insights from data exploited at the point of capture, minimum cloud ingress bandwidth

Data and compute heavy
- Local compute and storage for most demanding workloads to go mobile
## ETSI MEC Release 1 work

**Focusing on Application Enablement & APIs**

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<th>Application Enablement (API Framework)</th>
<th>API Principles</th>
<th>Specific service-related APIs</th>
<th>Management and Orchestration related APIs</th>
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| 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. |
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

**YouTube**

1. Throughput guidance (video optimization)
2. Edge video orchestration
3. User engagement

**Nokia Bell Labs**

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

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 delay from camera to device, including encoding, play-out, decoding.
- Video traffic does not put any strain on venue backhaul.
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.
MEC application: Multiple Access Management Services (MAMS)
Optimal access and path selection for multi-access

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

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
MEC application: Augmented reality
Create an interactive “wow” experience

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

Source: 360.HERE.com

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

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.
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.
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 Edge Computing To Multi-access Edge Computing
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