

Mobile Edge Computing A key technology towards 5G

Nurit Sprecher (Chair of ETSI MEC ISG) 5G World 2016, London, UK

5G Use Cases and Requirements



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Build a virtual zero latency gigabit and ultra reliable experience for people and objects when and where it matters

5G Network Architecture Drivers



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Mobile Edge Computing is a key technology and architectural concept for enabling the transformation to 5G

Mobile Edge Computing An Environment for Innovation and Value Creation



Can be leveraged by applications to create value

Offers applications and content providers cloud-computing capabilities and an IT service environment at the edge of the mobile network

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This environment is characterized by:

- Proximity
- Ultra-low latency
- High bandwidth
- Real-time access to radio network and context information
- Location awareness

Why Mobile Edge Computing?

- Outparalleled Quality of Experience
- Contextualized services, tailored to individual needs and preferences

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- Efficient utilization of the Radio and the network resources
- Innovative applications and services towards mobile subscribers, enterprises and vertical segments

Mobile Edge Computing Business Benefits



A new value chain and an energized ecosystem, based on Innovation and business value

Business transformation

A myriad of new use cases

Wider collaboration can help to drive favorable market conditions for sustainable business for all players in the value chain.

New market segments (enterprises, verticals and subscribers); short innovation cycle;

revenue generation and differentiation

Video acceleration, augmented reality, connected vehicles, IoT analytics, enterprise services, network performance and utilization optimization, retail, eHealth, etc.

Mobile Edge Computing Service Scenario Categories



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Consumer-oriented Service Scenarios Augmented Reality



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- The MEC application analyses the output from a device's camera and the precise location; objects viewed on the the device camera are overlaid with local augmented reality content.
- Enables unique experience of a visitor to a museum or other (indoors or outdoors) points of interest
- Ensures low latency and high rate of data processing

Operator and Third-party Services Video Analytics



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- Ø Distributed live video streams analytics at the mobile edge
- Events are triggered automatically (e.g. movement, missing objects, crowd, etc.); enables fast detection and action triggering
- Optimizes backhaul and transport capacity
- Applicable to public safety, smart cities

Network-performance and QoE Improvements Intelligent Video Acceleration



- A Radio Analytics application provides the video server with an indication on the throughput estimated to be available at the radio downlink interface
- The information can be used to assist TCP congestion control decisions and also to ensure that the application-level coding matches the estimated capacity at the radio downlink.
- Enables improved video quality and throughput

Operator and Third-party Services Connected Vehicles



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- Existing cloud services are extended into the highly distributed mobile base station environment, leveraging the existing LTE connectivity.
- Solution operates as a roadside unit for vehicle-to-infrastructure (V2I).
- Road hazards can be recognized and warnings can be sent to nearby cars with extremely low latency.
- Enables a nearby car to receive data in a matter of milliseconds, and the driver to react instantly.

ETSI MEC ISG ETS Formed in September 2014; first meeting in December 2014 **Hosts third-party Compliance with Creates an open** NOKIA (intel) and standardized applications at the regulatory and IBM döcomo HUAWE legal requirements edge of the mobile IT service Founding environment network members Formed under the **Stimulates Exposes real-time Enables a new** radio network and innovation auspices of the value-chain, fresh **ETSI ISG** business segments context information

ETSI MEC ISG Members/Participants

A multi-stakeholder industry initiative:



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A NEW VALUE CHAIN: MOBILE OPEARTORS *** BASE STATION VENDORS *** TECHNOLOGY PROVIDERS *** APPLICATION AND CONTENT PROVIDERS

The MEC ISG work to produce normative Group Specifications that will allow the efficient and seamless integration of applications from vendors, service providers, and third-parties across multi-vendor MEC platforms.

Mobile-edge Computing platform API



Application agnostic, providing the opportunity to revolutionize, differentiate and create value

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Promotes interoperability and mass deployment; the vast majority of the population can be served

Allows smooth porting of value-creating applications on every mobile-edge server, with guaranteed SLA

Let's Reflect on the Past Year ...

Published

- Technical Requirements, including use cases (<u>GS</u> <u>MEC 002</u>)
- Framework and Reference Architecture (GS MEC 003)
- Terminology (GS MEC 001)
- MEC Proof of Concept (PoC) (<u>GS MEC-IEG 005</u>)
- Service Scenario (<u>GS MEC-IEG 004</u>)
- ETSI White Paper "Mobile Edge Computing a key technology towards 5G " (Link)
- Webinar on "Boosting user experience by innovating at the mobile network edge" (<u>Link</u>)

Work-in-progress

- Work Items relating to the MEC APIs, management interfaces and essential platform functionality:
 - API principles, mobile edge platform application enablement, radio network information API, Location API, UE identity API, bandwidth management API, system, server and platform management, application lifecycle and policies, and UE application interface
- Study items related to MEC integration in NFV environment and end-to-end mobility.
- Work Items which aim to increase MEC market acceleration (MEC metrics best practices, MEC business case examples, MEC requirements for multi-vendor eco-systems)

ETSI ISG MEC: Expected Deliverables



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Mobile Edge Computing: Framework

MEC utilizes the NFV infrastructure.

The NFV infrastructure may be dedicated to MEC or shared with other network functions or applications.

 MEC uses (as far as possible) the NFV infrastructure management entity.

NFV

MEC is fully compliant with the 3GPP architecture

• MEC uses existing 3GPP functional elements and reference points.

3GPP

Third-party applications can be intelligently and flexibly deployed in a seamless manner on different MEC platforms (based on technical and business parameters).

Orchestration

MEC supports multiple deployment scenarios, including at a multi-Radio Access Technology (RAT) cell aggregation site, at an aggregation point, at the cloud RAN and at the edge of the core network.

Deployment scenarios

Relationship to NFV

Complementary concepts which can exist independently

- Focused on porting network functions to virtual environments
- Enables the migration from a proprietary appliance-based setup to a standard, hardware and cloud-based infrastructure
- Virtual functions can be connected or chained together to create communication services.

RAN Virtualization

- Focused on creating an open environment in the RAN, allowing 3rd-party application/service integration (applicationlevel enablers and APIs)
- Creates a new value chain and an energized ecosystem, based on innovation and business value
- Enables a myriad of new use cases across multiple sectors

MEC

- MEC reuses the NFV virtualization infrastructure and the NFV infrastructure management to the largest extent possible.
- The scope of MEC is focused and its business objective differs from that of NFV.

MEC Reference Architecture



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MEC Proofs of Concept (PoC)

MEC PoCs demonstrate the viability of MEC implementations; the results and lessons learnt from the MEC PoCs will be channeled to the MEC ISG specification activities.

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MEC PoCs address at least one of the PoC topics listed on the ETSI MEC WIKI page: <u>http://mecwiki.etsi.org/</u>.



MEC POC ZONE @ MEC World Congress 21-22 September 2016 Munich, Germany

Conclusion



- Mobile Edge Computing complements SDN and NFV and advances the transformation of the mobile-broadband network into a programmable world, ensuring
 - 1) highly efficient network operation and service delivery,
 - 2) ultimate personal experience, and
 - 3) new business opportunities.
- Mobile Edge Computing is as a key enabler for IoT and mission-critical, vertical solutions. It is one of the key architectural concepts and technologies for 5G, helping to satisfy the demanding requirements for the 5G era in terms of expected throughput, latency, scalability and automation. It also offers additional privacy and security and ensures significant cost savings.
- Many of the use cases can be enabled with Mobile Edge Computing prior to 5G.





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