ETSI MEC: An Introduction
(almost) everything you want to know about ETSI MEC

Presented by: ETSI MEC Leadership Team For: Public consumption
ETSI MEC – What we do

Foundation for Edge Computing created – Fully standardized solution to enable applications in distributed cloud created by ETSI MEC + 3GPP

MEC Application Development Community

Application Life Cycle Management

RESTful based APIs for Runtime Application Services

110 members - Operators – Technology Vendors – IT players – Application developers
Existential questions of applications “on the edge”

- How do I reach my cloud service?
- How do I get discovered by my users?
- Where am I?
- What is around me?
- What is my QoS?
- How many users am I serving? And where are they?
- How can I be sure I am running when and where they need me?
- What if my users move?

Figure 2: New application development paradigm introduced by MEC.

Where do the APIs play their part?

- Application Support
- Service Management
- Radio Network Information
- Location
- UE Identity
- Bandwidth Management
- Fixed Access Information
- WLAN Information API
- V2X Information Service

- Application Package lifecycle and operation granting
- Device application interface
3rd 3-year Phase of work under way

- Key overall specification
  - Technical Requirements (MEC 002)
  - Framework and Ref. Arch. (MEC 003)
  - MEC PoC Process (MEC-IEG 005)
  - API Framework (MEC 009)

- IaaS Management APIs
  - Platform mgmt. (MEC 010-1)
  - Application mgmt. (MEC 010-2)
  - Device-triggered LCM operations (MEC 016)

- PaaS Service Exposure
  - Required Platform Svcs / App. Enablement (MEC 011)
  - Service APIs (MEC 012, 013, 014, 015)

- Key Studies for Future Work
  - Study on MEC in NFV (MEC 017)
  - Study on Mobility Support (MEC 018)

- Evolution of Phase 1 and closing open items
  - Application Mobility (MEC 021)
  - Lawful Intercept (MEC 026 - published)

- Addressing key Industry Segments
  - V2X (MEC 022 - published, MEC 030)
  - IoT (MEC 033), Industrial Automation, VR/AR

- Key use-cases and new requirement
  - Network Slicing (MEC 024)
  - Container Support (MEC 027)

- Normative work for integration with NFV
  - Incorporate in v2 of existing specs as needed

- From “Mobile” to “Multi-Access”
  - Wi-Fi (MEC 028)
  - Fixed Access (MEC 029)

- MEC integration in 5G networks (MEC 031)
- Developer community engagement
  - API publication through ETSI Forge (more overleaf)
  - Hackathons
- Testing and Compliance (MEC 025 - published, MEC 032)

- Preliminary activities starting now.
- Full work planned to start late 2020

- MEC as heterogeneous clouds
  - Expanding traditional cloud and NFV LCM approaches
  - Inter-MEC systems and MEC-Cloud systems coordination (MEC 035)
  - Mobile or intermittently connected components
  - Consumer-owned cloud resources

- Continuing emphasis on enabling developers
  - API Serialization
  - Sandbox development
  - Testing and compliance

- Continue to defined services that meet industry demand

- Maintain completed APIs
Our Standards
## ETSI MEC – Foundation for Edge Computing

### Application Enablement and Framework

Service definition framework and baseline platform services authorized applications.
- Registration, discovery and notification;
- Methodology for authentication and authorization of apps providing/consuming services;
- Communication support for services (query/response and notifications).

### API Principles

Principles and guidance for developing and documenting APIs
- Developer-friendly approach to foster development
- **Ensures that a consistent set of APIs** are used by developers.
- Defines approach for authentication and authorization of apps providing/consuming services
- Based on TMF and OMA best practices

### Specific service-related APIs

Standardized service-exposure APIs for key services that
- Expose network and context information
- Allow definition of localized, contextual services
- Support key use cases (e.g. enterprise, vehicular)
- Allow fine-grained edge traffic management

### Management and Orchestration related APIs

Management of MEC hosts either as **stand-alone** entities or part of a larger **NFV-managed** framework
- Facilitate running of 3rd party application
- Enable deployment **at the correct location at the right time**, based on technical and business parameters
- Integrate into telco operations systems, e.g. OSS

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**Enables a myriad of new use cases across multiple sectors as well as innovative business opportunities**
Enabling Global Application Portability

RESTful based HTTP APIs presented via OpenAPI compliant descriptions (https://forge.etsi.org), in YAML & JSON including the full data model

- Simple to use, well documented APIs, published with OpenAPI Framework
- Create innovative applications quickly and easily, reducing time-to-revenue
- New APIs (compliant with the MEC API principles) can be added
- Increase the Total Addressable Market (TAM)
Application portability via the ETSI MEC APIs ecosystem

That’s all you need as a MEC App developer

✔ Discover network, users, capabilities and local services

✔ Manage traffic, DNS, mobility, V2X, etc.

✔ Register your own service and discover third party services available locally

✔ Plus: APIs for interoperability among MEC systems and infra
MEC and Management: The Killer Use Case for Automation

MEC deployments present challenging environment

- (large scale: geography) x (small scale: cloud footprint)
- Unmanned/lights out location
- Outside traditional service areas

While supporting “critical infrastructure”

- Telco, public safety, etc.
- “9’s” of availability requirements

Unique requirements and processes

- Minimize need for human presence
- Maximize service time intervals
- Minimize skills required from those on site

In other words

- Get as close as possible to the web-scale maintenance model
- In a very non-web-scale environment

The following ETSI White Papers address the MEC deployment aspects:

- WP#23: Cloud RAN and MEC: A Perfect Pairing
- WP#24: MEC Deployments in 4G and Evolution Towards 5G
- WP#28: MEC in 5G networks
- WP#30: MEC in an Enterprise Setting: A Solution Outline

All white papers are available in
A key part of ETSI Network Automation Standards

Device-triggered LCM Enablement (MEC 16)

Inter-MEC & MEC-Cloud (MEC 035 Study)

Management of MEP as a VNF (MEC 10-1)

LCM Mgmt of 3rd party Apps (MEC 10-2)

ZSM: overall approach

NFV, OSM: managing telco clouds

MEC: managing edge telco clouds
MEC White Papers: A view of a whole picture

Standards are necessarily tools, not solutions

- Enable interoperability
- Support a broad range of use cases and system architecture
- Address only a specific part of the whole picture

MEC White Papers: how we help industry see the whole picture

- Harmonizing Standards for Edge Computing: a synergized architecture leveraging ETSI MEC and 3GPP

- MEC in an Enterprise Setting


- and many more to come!

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WG DECODE: Enabling Edge Computing in the Telco Industry
Discover the APIs on forge.etsi.org/rep/mec

Multi-access Edge Computing Platform Application Enablement API

This repository contains OpenAPIs descriptions for the interfaces specified in ETSI GS MEC 011.

Online resources

- Specification document
- Navigate the MEC Application Support API in the browser.
- Navigate the MEC Service Management API in the browser.
- Edit the MEC Application Support API online.
- Edit the MEC Service Management API online.

MEC Application Support API

The ETSI MEC ISG MEC11 MEC Application Support API described using OpenAPI

appTrafficRules

- /applications/appInstanceId/traffic_rules
- /applications/appInstanceId/traffic_rules/traffic_ruleId
Discovering what an API is about

Specification document (e.g. ETSI GS MEC 013)

Machine readable representation
Testing for MEC Server implementations

✓ General testing framework for MEC Technologies (MEC 0025)
✓ API Conformance testing developed for server implementations
  ✓ Standardized test suite (MEC-DEC 032)
  ✓ Test implementations in Robot Framework and TTCN-3
✓ Openly available and released under BDS-3 license
Discover solutions at the MEC Ecosystem wiki

- Collects projects and implementations of MEC components
- Open to any organization
- A starting point to find solutions to build upon
- An opportunity to reach users and devs
- Reach out at cti_support@etsi.org

<table>
<thead>
<tr>
<th>MEC Applications</th>
<th>Description</th>
<th>MEC Components</th>
<th>MEC APIs</th>
<th>Link</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unibo MEC API Tester</td>
<td>This is a web-based application that can be used to test the capability of a MEC Platform to support the MEC O11 defined APIs.</td>
<td>MEC Platform</td>
<td>O11 (M1)</td>
<td>NA</td>
<td>Davide Scardigno</td>
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<th>MEC Solutions</th>
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<th>Contact</th>
</tr>
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<tbody>
<tr>
<td>AdvantEDGE</td>
<td>Provides an environment to enable experimentation with MEC APIs and applications.</td>
<td>MEC Platform</td>
<td>O2 (MEC Information)</td>
<td>Link</td>
<td>AdvantEDGE@etsiDigitalCenter</td>
</tr>
<tr>
<td>Connected Vehicle Blueprint</td>
<td>Provides a blueprint template for developing connected vehicle applications.</td>
<td>MEC Platform</td>
<td>O2 (MEC Information)</td>
<td>Link</td>
<td>Ying Yang</td>
</tr>
<tr>
<td>AKRAKIND</td>
<td>Enables the deployment of edge applications.</td>
<td>MEC Platform</td>
<td>O2 (MEC Information)</td>
<td>Link</td>
<td>Giuseppe Alpaca</td>
</tr>
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<td>Note</td>
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<td>Public Cloud Interface (PCI)</td>
<td>Provides an interface for integrating with various cloud services.</td>
<td>MEC Platform</td>
<td>O2 (MEC Information)</td>
<td>Link</td>
<td>Oleg Beshal</td>
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MEC Sandbox – the ultimate app development companion

A simulator of a real 4G/5G network as seen via the MEC APIs

✔️ 4G/5G/Wifi access points
✔️ Steady and moving UE (~devices)
✔️ API Console, integrated Swagger UI, and more

https://try-mec.etsi.org/
Collaborations: Akraino

Work in progress

- Examining opportunities for collaboration, e.g. highlighting and marketing MEC APIs along with Akraino blueprints and other MEC related implementations

http://janeslogic.com/api_portal_v2.html
MEC Hackathons

ETSI ISG MEC Hackathon Framework:

- **Open Call** for proposers and hosts interested in organizing a MEC Hackathon
- Submit on our Wiki page [https://mecwiki.etsi.org](https://mecwiki.etsi.org)

MEC Hackathons

- **18-19 September 2018: 3 parallel events**
  - Berlin (co-located with Edge Computing Congress)
  - Beijing (China)
  - Turin (Italy)

- **17-18 September 2019: 2 parallel events**
  - London, UK (co-located with Edge Computing Congress)
  - Shenzhen (China)

- **18 November 2019, in collab. with LF Edge and Akraino**
  - San Diego (USA) (with KubeCon + CloudNativeCon North America)

- **25-26 November 2020**
  - Turin (co-located with Droidcon Italy)

We encourage new proposals for MEC Hackathons!

For further details, please see: [http://mecwiki.etsi.org](http://mecwiki.etsi.org) or contact CTI_Support@etsi.org

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MEC Plugtests – 2021 Timeline

1 – 28 February 2021
NFV&MEC API Plugtests 2021

Register for the NFV&MEC API Plugtests 2021 (Remote)
Remote Integration & Pre-Testing
Regular conf-calls

Individual self-service Remote API Test Sessions

Plugtests Report

Registration

4 - 8 Oct 2021
NFV&MEC IOP Plugtests 2021

Register for the NFV&MEC IOP Plugtests 2021 (F2F if possible)
Remote Integration & Pre-Testing
Remote API Test Sessions
Regular conf-calls

On-site (if possible) Interop Test Sessions
ETSI Sophia Antipolis
Plugtests Report
MEC PoCs: Show off YOUR cool Edge

Recent PoCs (first 9 are complete)

PoC #10
Service-Aware MEC Platform to Enable Bandwidth Management of RAN
Industry Technology Research Institute - Linker Network - FarEasTone

PoC #11
Communication Traffic Management for V2x
KDDI Corporation - Saguna Networks Ltd. - Hewlett Packard Enterprise

PoC #12
MEC Enabled OTT Business
China Unicom, ZTE, Intel, Tencent, Wow Video, UnitedStack

PoC #13
MEC infotainment for smart roads and city hot spots
TIM, Intel, Vivida, ISMB, City of Turin

We encourage new POC submissions to ETSI MEC!

For further details, please see: http://mecwiki.etsi.org or contact CTI_Support@etsi.org
MEC Deployment Trial: MEC in action in Live Networks

Next step from MEC PoC to keep engaging the ecosystem in MEC standards based deployments

✔ From Proof of Concept to proof of viability in a Live Network environment
✔ Follows the proven MEC PoC framework with a new set of acceptance criteria
  1. Trial deployed in Live Network
  2. Demonstrated to the industry, e.g. in an industry event or in ISG MEC
  3. Feedback to MEC standardization; improvement proposals, lessons learnt, next steps
✔ Currently the following MDTs are active:

MDT #1
CDN at the Edge
China Mobile, Nokia

MDT #2
MEC in Factory Network
China Mobile, Huawei

MDT #3
Edge-Cloud VR cloud game scheme based on 5G network
China Unicom, Huawei, Tencent, Intel

MDT #4
ARVR navigation based on 5G MEC
China Telecom, Huawei, 21CN

For further details, please see: http://mecwiki.etsi.org or contact CTI_Support@etsi.org

We encourage new MDT submissions to ETSI MEC!
The larger Telco World: ETSI MEC and 5G
MEC Phase 2 – Study Item MEC in 5G (MEC 031)

- The ETSI white paper MEC in 5G networks sets the scene for this study item
- ISG MEC investigates the opportunities offered to MEC by the 5G system and its edge computing enablers

The scope includes the following

1. C-plane interactions with 5GC,
2. Functional split between MEC and 5GC wrt. API framework,
3. Organization of MEC as an AF,
4. Pertinent interactions of MEC with (R)AN
MEC as an AF (Application Function) can request the 5GC to
- Select a local UPF near the target (R)AN node
- use the local UPF for PDU sessions of the target UE(s)
- control the traffic forwarding from the local UPF so that the UL traffic matching with the traffic filters received from MEC (AF) is diverted towards MEC hosts while other traffic is sent to the Central Cloud
In case of UE mobility, the 5GC can
- re-select a new local UPF more suitable to handle application traffic identified by MEC (AF)
- notify the AF about the new serving UPF
MEC as an AF can provide the following to 5GC
- traffic filters identifying MEC applications deployed locally on MEC hosts in Edge Cloud
- the target UEs (one UE identified by its IP/MAC address, a group of UE, any UE)
- information about forwarding the identified traffic further e.g. references to tunnels towards MEC hosts
5GC allows MEC as an AF

- subscribe to UE mobility events that may affect traffic forwarding to MEC applications
- Receive notifications of UE mobility events affecting MEC application instances
Same UP session allows the UE to obtain content both from local server and central server

Service continuity enabled by IP address anchoring at the centralized UPF. No impact on UE in case of Uplink Classifier (ULCL) option is used.
MEC and NFV
a common approach to management
MEC and NFV: MANO for the Telco Edge

**MEP as a VNF**: must be running for any other VNF/app to run

**MEPM**: EMS for MEP

**MEPM is (part of) App's EMS**

**MEPM can be App's VNFM**

App can be a VNF: even if it doesn’t know it
MEC management: MEC-specific Operations

Mm1 required APIs:
- Application Package Management
- Application Lifecycle Management

Mm3 required APIs:
- Application Package Management
- Application Lifecycle Management
- Application Lifecycle Change Notification

These NFV semi-agnostic
- Information models designed to be feasible without NFV
- Data models are NFV-consistent and compatible
3 “Hybrid” Reference points identified as shown

- **Mv3**: at this point no specific changes to Ve-Vnfm-vnf are expected (i.e. it can be used as is)
- **Mv2**: Necessary changes are being addressed by NFV IFA as part of FEAT12 work (MECinNFV)
- **Mv1**: work identified, coordination plan is on-going

Additionally, MEC descriptor (AppD) must be linked to NFV descriptor (VNFD). This has been addressed as part of Rel 3 work using Non-MANO artifact capability as defined in Annex B of ETSI GS NFV-SOL 004 v. 2.5.1 and higher.
The END
ETSI ISG MEC is the leading voice in standardization & industry alignment around MEC

- Key building block in the evolution of mobile-broadband networks, complementing NFV & SDN
- Key enabler for IoT and mission-critical, vertical solutions
- Widely recognized as one of the key architectural concepts and technologies for 5G
  - Can be used to enable many 5G use cases without a full 5G roll-out (i.e. with 4G networks)
- Enable a myriad of new use cases across multiple sectors as well as innovative business opportunities