ETSI MEC overview

focus on MEC support for V2X

Dario Sabella
(Chairman, ETSI MEC - Multi-access Edge Computing)

ETSI MEC / CCSA joint workshop on V2X

January 25th, 2023

ETSI MEC: Enabling *Edge* through *Standardization*

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

Watch the MEC video

https://www.youtube.com/watch?v=crnPWql-0oo

Application Life Cycle Management

RESTful based APIs for Runtime Application Services

ETSI ISG MEC

ETSI: The Standards People
producing globally applicable standards for ICT-enabled systems

ISG: Industry Specification Group
open to all of industry, regardless of ETSI membership and focused on all industry needs

MEC: Multi-access Edge Computing
Cloud Computing at the Edge of the network.

ETSI MEC The Standards People

ETSI NFV The Standards People

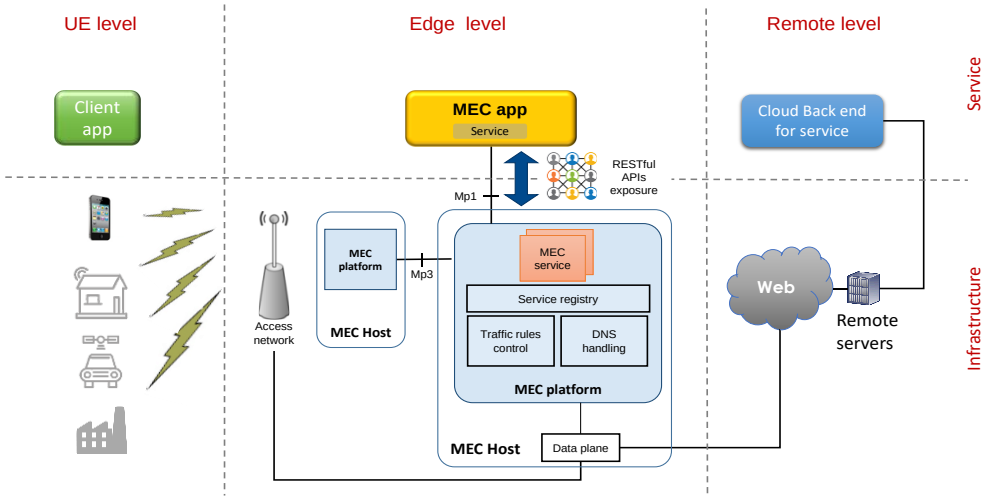
MEC Application Development Community
Interaction & Information Exposure

- **Continuously growing MEC membership:** 127 (in April 2023); e.g. in June 2021 it was 114
- **Diverse ecosystem:** Operators - Technology Providers - IT players - Application developers - Startups - …

Renewed webpage: **ISG MEC Leadership Team, LS officers for Vertical Industries** and **MEC Support Team:** https://portal.etsi.org/TB-SiteMap/MEC/MEC-Leaders-and-Support-Team

ETSI MEC – Foundation for Edge Computing

MEC offers to application developers and content providers cloud-computing capabilities and an IT service environment at the edge of the network



Basic principles:

- *Open standard* → allowing multiple implementations and ensuring interoperability
- MEC exploiting ETSI *NFV framework* and definitions → enabling MEC in NFV deployments
- Alignment with *3GPP* based on fruitful collaboration of common member companies → enabling MEC in 5G
- Access-agnostic nature (as per MEC acronym - Multi-access Edge Computing) → enabling other accesses
- Addressing the needs of a wide ecosystem → enable multiple verticals (e.g. automotive), federations

MEC is focused on *existential* questions of **applications "on the edge"**

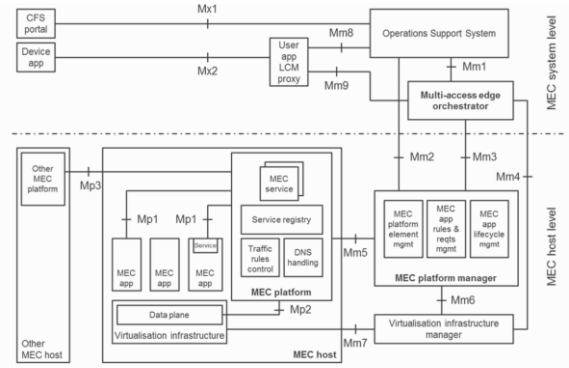
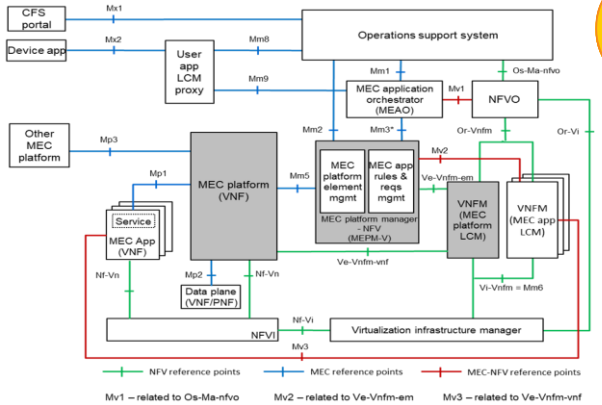
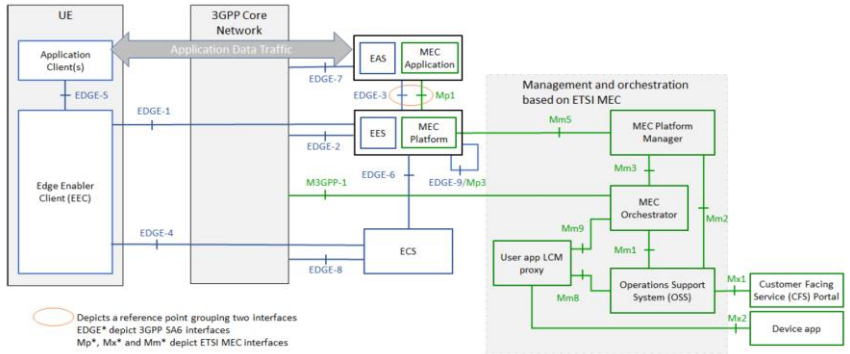
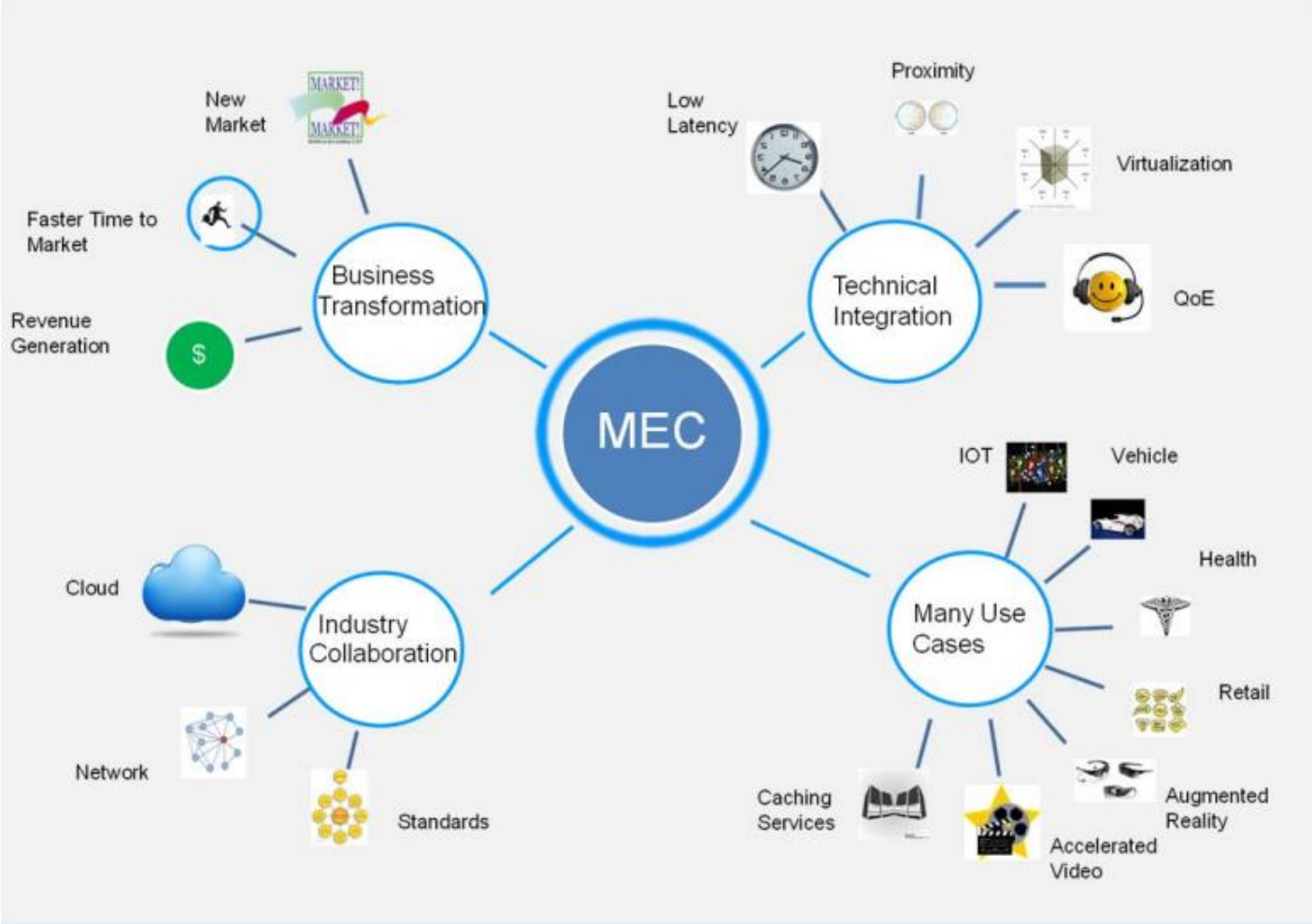


Figure 6-1: Multi-access edge system reference architecture





MEC supports many 5G use cases and market segments



More info at this ETSI White Paper on MEC https://www.etsi.org/images/files/ETSIWhitePapers/etsi_wp11_mec_a_key_technology_towards_5g.pdf

MEC and vertical industries

MEC is a key enabler for **<u>many vertical market segments</u>**.

Several (specialized) use cases driven by different verticals:

- automotive,
- industrial automation,
- VR/AR,
- Videostreaming,
- Gaming,
- e-health,
- Smart Cities,
- Etc …

Edge Exposure Day (Sept 18th, 2022, Kfar Saba, Israel) supported by ETSI

MEC Panels Series

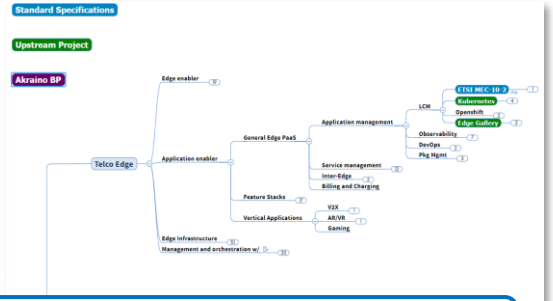
Attendance from diverse people, e.g. local companies, MEC delegates, repr from 5GAA and AECC, …

ETSI ISG MEC DECODE Working Group: MEC Deployment and Ecosystem engagement activities

- OpenAPI representations: ETSI Forge
- Testing and Conformance
- MEC Ecosystem wiki
- PoCs (proof-of-concepts)
- MDTs (MEC Deployment Trials)
- Collaborations: CAMARA, Akraino
- MEC Sandbox
- Hackathons
- Plugtests
- MEC Tech Series

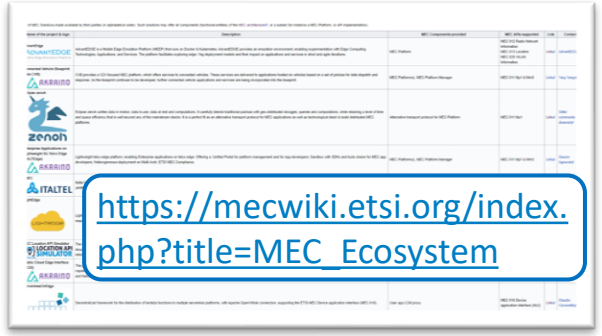
https://try-mec.etsi.org/

https://www.opencompute.org/summit/global-summit/hackathon
17-19 Oct 2023



https://apiportal.akraino.org/apimap.html

NFV&MEC IOP Plugtests



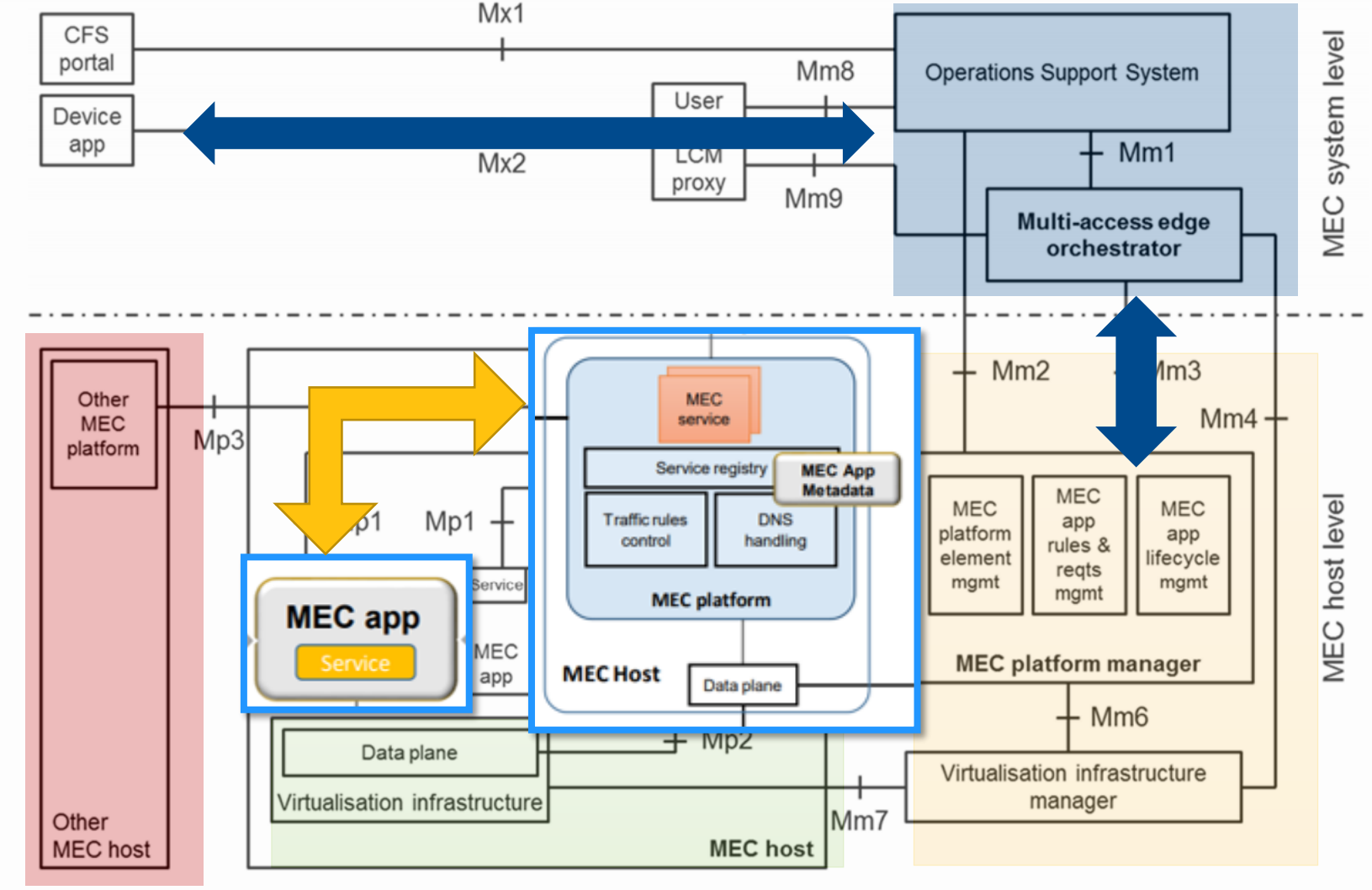
https://mecwiki.etsi.org/index.php?title=MEC_Ecosystem

Our Standards

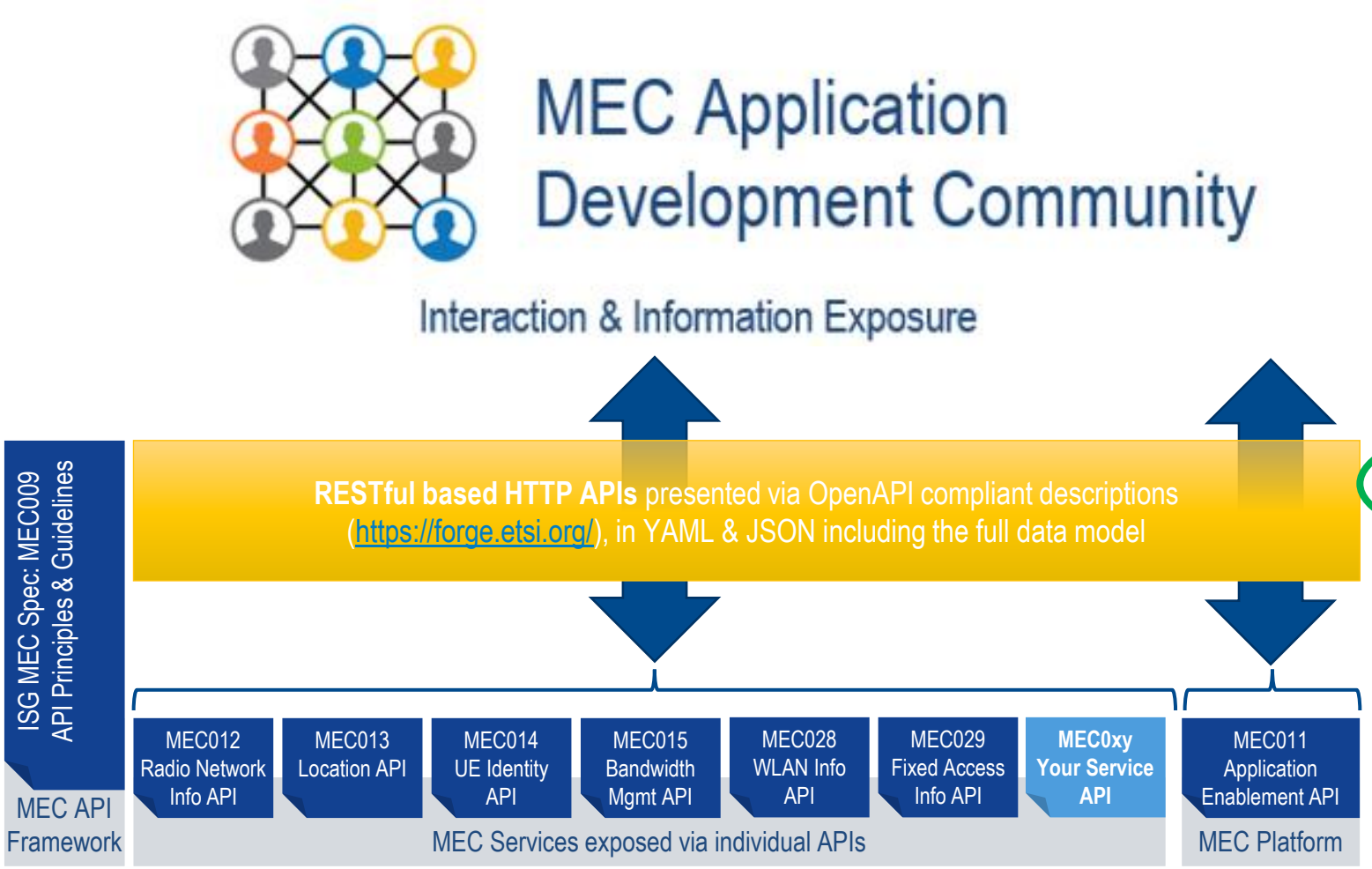
MEC reference architecture

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

- Application Package lifecycle and operation granting
- Device application interface



Enabling Global Application Portability



- ✓ 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)

MEC Standard work: from Phase 1 to Phase 3

- 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 – published)
  - Lawful Intercept (MEC 026 – published)
- Addressing key Industry Segments
  - V2X (MEC 022 – published; MEC 030 – published)
  - Industrial Automation, VR/AR
- Key use-cases and new requirement
  - Network Slicing (MEC 024 – published)
  - Container Support (MEC 027 – published)
- Normative work for integration with NFV
  - Incorporate in v2 of existing specs as needed
- From "Mobile" to "Multi-Access"
  - Wi-Fi (MEC 028 – published)
  - Fixed Access (MEC 029 – published)
- MEC integration in 5G networks (MEC 031)
- Developer community engagement
  - API publication through ETSI Forge (more overleaf)
  - Hackathons, MEC Delpoyment Trials
- Testing and Compliance (MEC-DEC 025 – published; multipart specification MEC-DEC 032-x)

- Full Phase 3 work ongoing (with some pre-Phase 4).
- MEC as heterogeneous clouds
  - Expanding traditional cloud and NFV LCM approaches
  - Inter-MEC systems and MEC-Cloud systems coordination: "MEC Federation" (MEC 035 – published / MEC040 -- published)
  - Mobile/intermittently connected and resource constrained devices (MEC 036), MEC IoT API (MEC 033)
- MEC Security (GR MEC 041)
- MEC deployments (MEC in Park enterprises: MEC 038)
- MEC Application Slices (MEC 044)
- Continuing emphasis on enabling developers
  - Application Package Format and Descriptor Specification (MEC 037)
  - API Serialization
  - MEC Sandbox development
  - Testing and compliance
- Continue to define services that meet industry demand (e.g. Abstracted Radio Network Info for Industries, GR MEC 043)
- Maintain and enhance existing APIs (e.g. MEC 013)

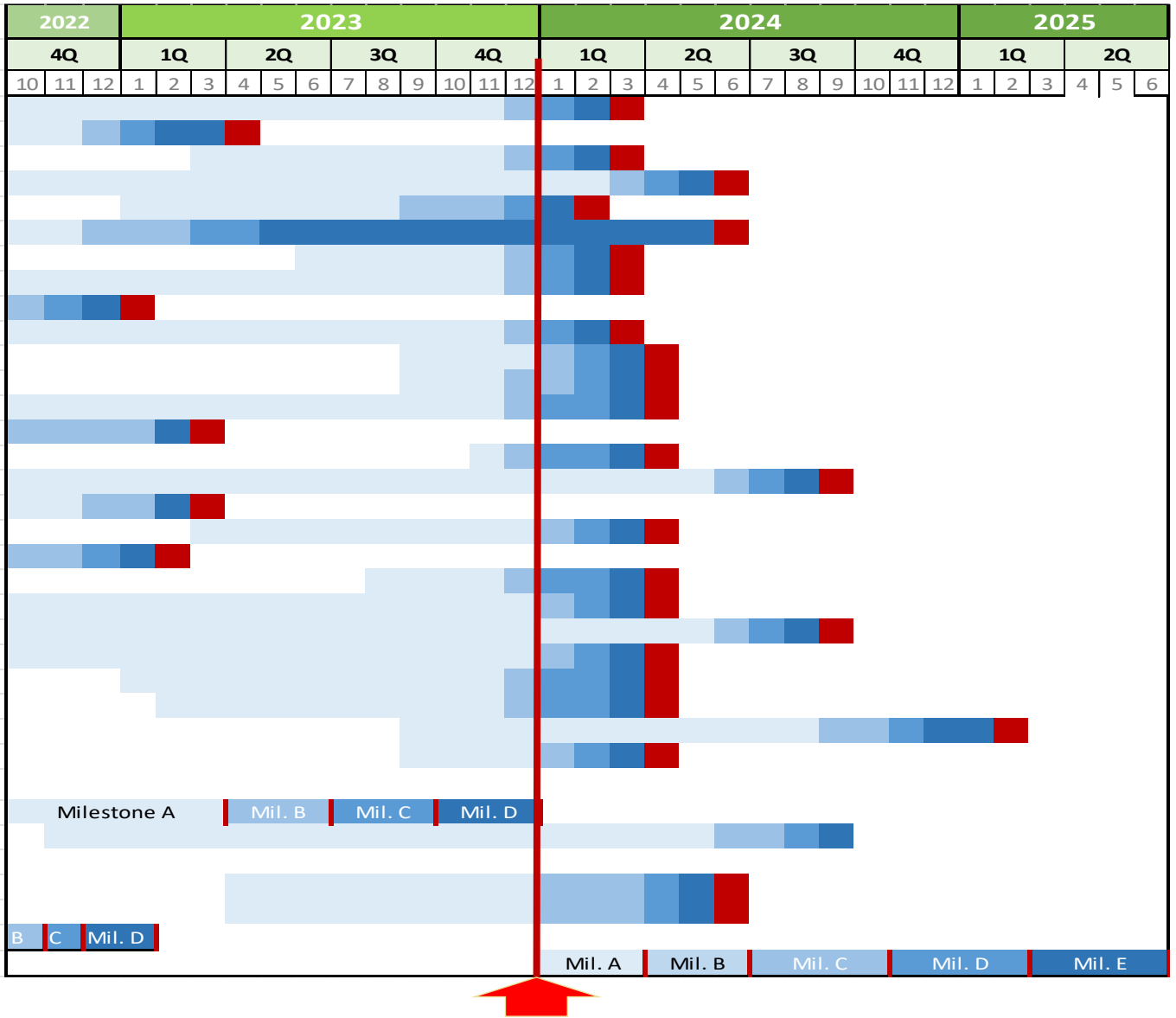
2015 ETSI MEC phase 1 (Completed) → 2018 ETSI MEC phase 2 (Completed) → 2021 ETSI MEC phase 3 (almost completed)

MEC Phase 3 Work Items

Legenda

early draft	stable draft	final draft	TB approval	publication/ completion

MEC Phase 3 (2021-2023)
MEC Phase 4 (2024-2026)



Focus on MEC support for V2X

ETSI ISG MEC – focus on V2X

- Specifications (MEC 002, MEC 022, MEC 030, MEC 035)
  - ETSI GS MEC 002 v3.1.1: “Use Cases and Requirements”
  - ETSI GR MEC 022 v2.1.1: ”Study on MEC Support for V2X Use Cases”
  - ETSI GR MEC 035 v3.1.1: “MEC Study on Inter-MEC systems and MEC-Cloud systems coordination”
  - ETSI GS MEC 030 v3.1.1: “MEC V2X Information Services API”

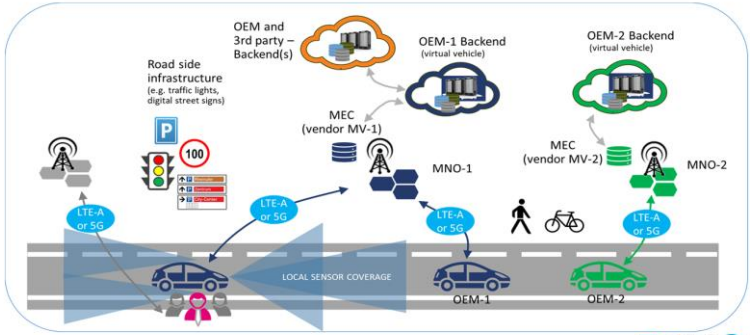


Figure A.39.1: Typical V2X multi-stakeholder scenario (source: 5GAA member's symposium in Turin, November 2019)

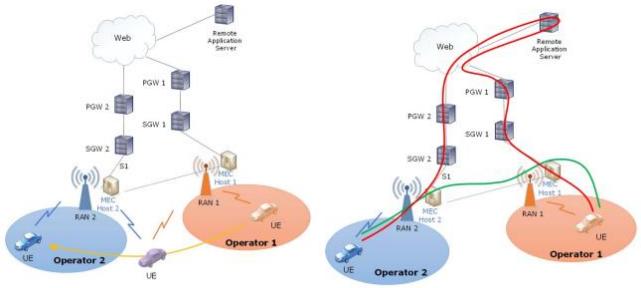
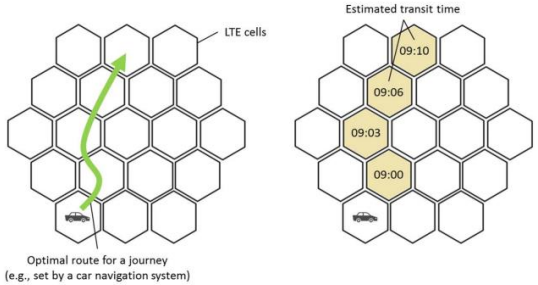
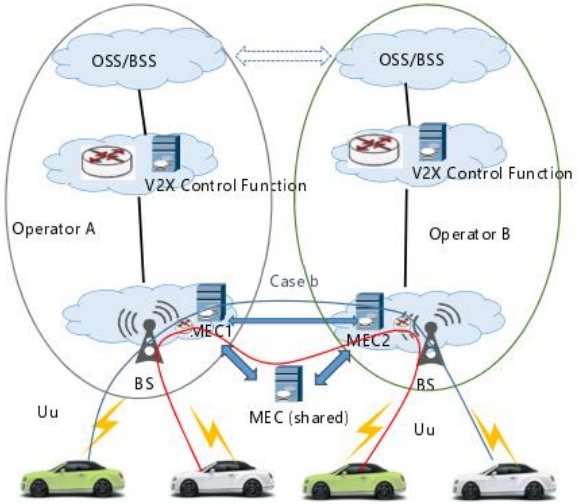
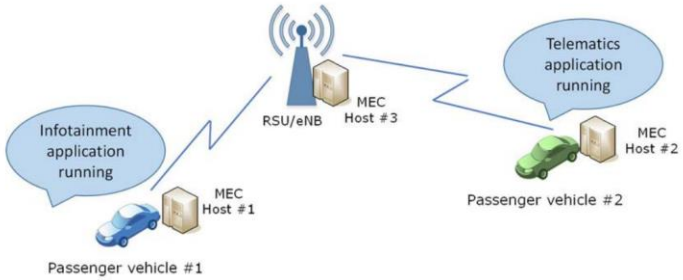


Figure 5.2-1: (left): Example of a multi-operator scenario for V2X services; (right): Example of path for data exchange without the VIS service (in red) and with the VIS service (in green)







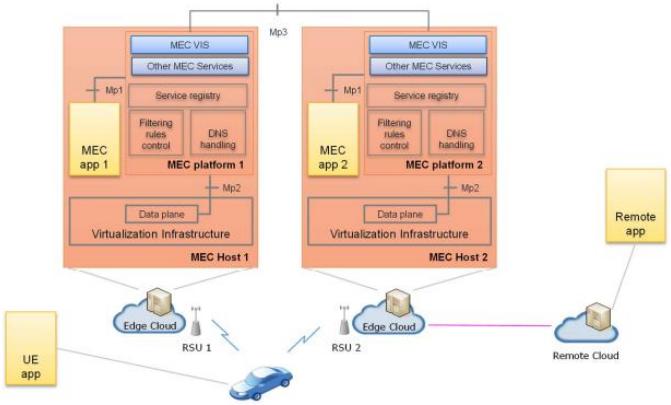
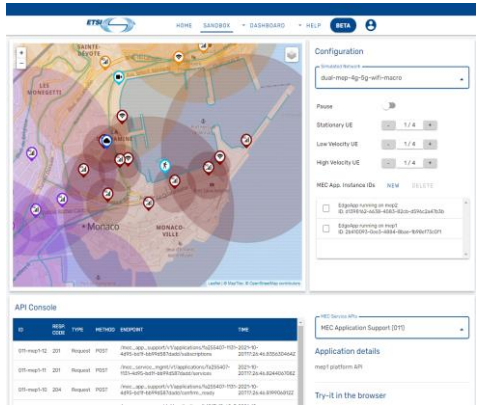
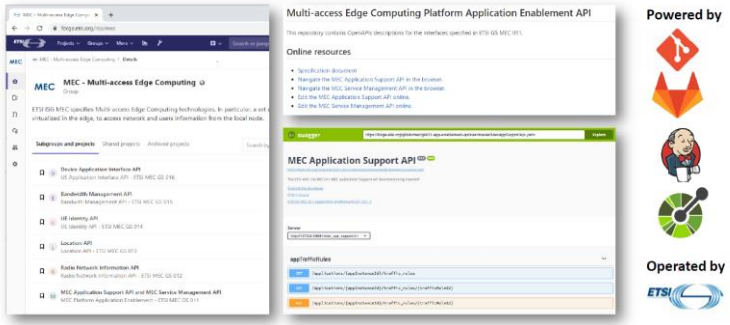


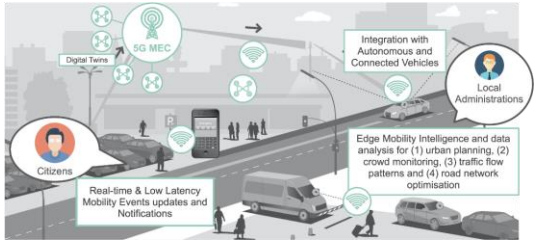
Figure 5.4.1-1: Example of application instances in a V2X service with VIS API

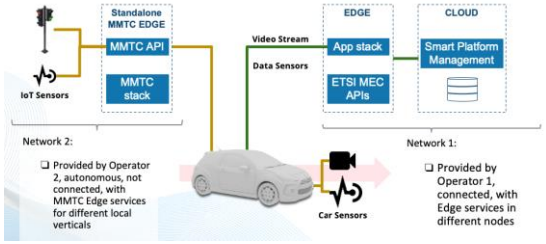
ETSI ISG MEC – focus on V2X

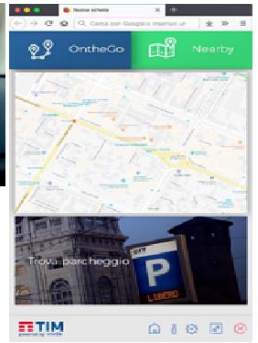
- Specifications (MEC 002, MEC 022, MEC 030, MEC 035)
- OpenAPI representations in open source (ETSI Forge)
  - Example: MEC 030 (V2X API): forge.etsi.org/rep/mec/gs030-vis-api
- MEC Sandbox (try-mec.etsi.org/)
  - Support for MEC V2X API (offered at the MEC Hackathon 2023)
- MEC Hackathons
  - 2020 winner – project on "Cognitive mobility at the Edge"
  - 2022 Special Best Automotive Prize winner – "K.I.T.T Knowledge in the traffic"
- MEC Ecosystem (mecwiki.etsi.org/index.php?title=MEC_Ecosystem)
  - LF Akraino Connected Vehicle Blueprint - supporting APIs over Mp1 and Mm5
- MEC Proof-of-Concepts (mecwiki.etsi.org/index.php?title=Ongoing_PoCs)
  - PoC#11: "Communication Traffic Management for V2X"
  - PoC#13: "MEC infotainment for smart roads and city hot spots"
- MEC Tech Series
  - Episode #9 - VIS API in MEC Sandbox

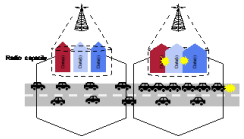


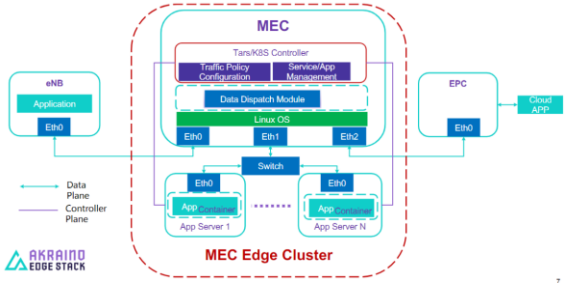








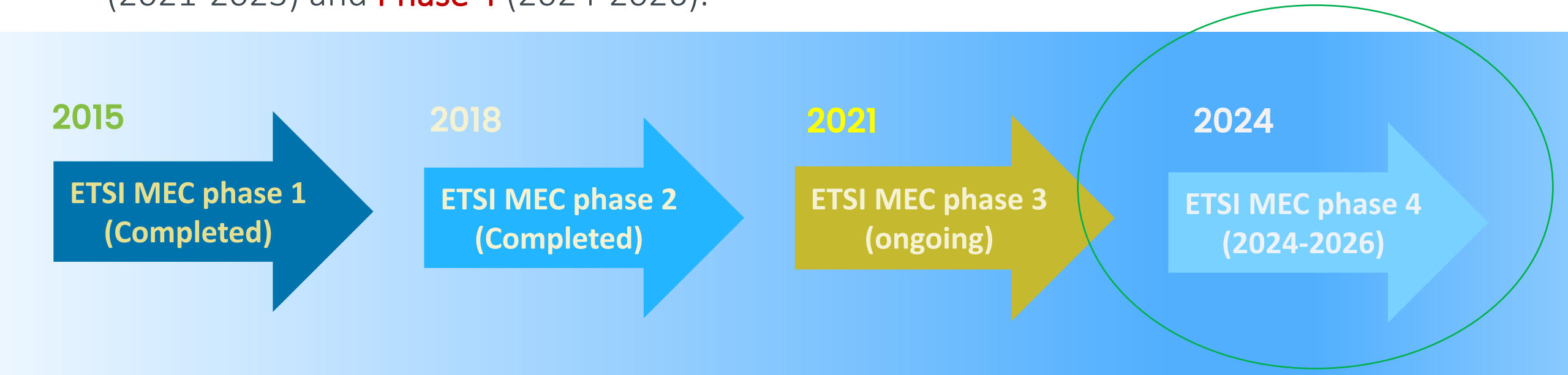




Looking forward to the future…

MEC *toward 6G*

- CAVEAT: nobody knows yet *what 6G will be*! So, we cannot claim (still) what MEC in 6G will be, of course.
- On the other hand, MEC evolution and vision can be shaped (in a pragmatic way).
- The newly approved ToR#5 of MEC (available here) is related to the period 2023-2024.
  - Thus, it will include also the beginning of MEC Phase 4 (2024-2026).
- So, at least, we could draw (from the ToR#5) some differences between MEC Phase 3 (2021-2023) and Phase 4 (2024-2026).



MEC *toward 6G* : planning MEC Phase 4

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In a nutshell, a transition from MEC Phase 3 to MEC Phase 4 can lead to:

- *more consolidated work on MEC Federation, including exposure of resources managed by multiple operators, e.g. addressing multi-domain and multi-tenancy slicing and MEC support for application slicing;*
- *MEC architectural/service updates needed to support cloud native communication systems and edge native design for app developers (also with container support)*
- *introduction of proper normative work to improve security and privacy in MEC systems*
- *Further promotion of MEC as an attractive development environment for the industry by creating "developer-friendly environments" (e.g. portals, SDK) that enable convergence of key industry ecosystem, e.g. app developers and operators*
- *Further outreach efforts, e.g. Hackathons/trials in collab with open source communities, industry groups (e.g. 5GAA, etc..)*

Thank you for your attention

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