MEC federation: standards overview

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Agenda

| 1 | General idea for distributed MEC environment |

| 2 | Inter MEC host management (WP on Enhanced DNS support) |

| 3 | Inter-system coordination with MEC federation |

| 4 | "KDDI accelerate 5.0" (presentation only) |

| 5 | Concluding remarks |

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General idea for Distributed MEC environment

Form of MEC deployment

■ **MEC for specific facilities**
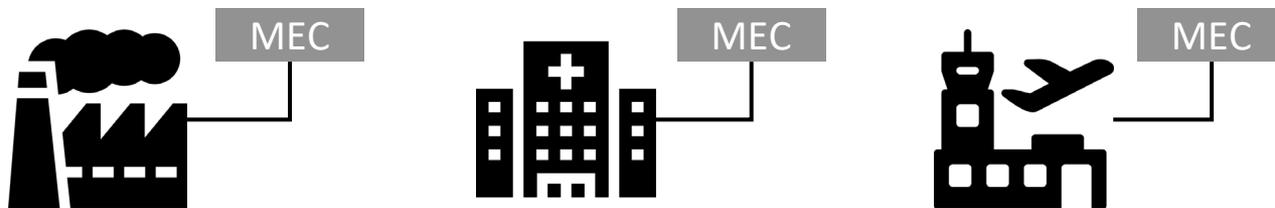
■ **MEC for widely distributed users, e.g., V2X services, AR/VR gaming**
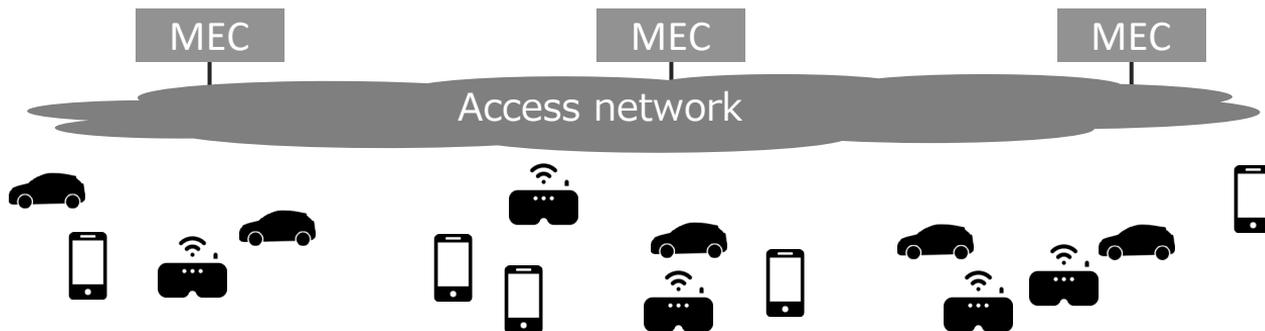
MEC for widely distributed users

■ **It requires certain levels of coordination**

- ● **Inter MEC host (Intra MEC system) management**
  → already supported by ETSI MEC
  → extensions for deployment are captured in ETSI WP#39

- ● **Inter MEC system/ MEC-Cloud system coordination**
  → main scope of GR MEC 035
  - • MEC-MEC system
  - • MEC-Cloud system

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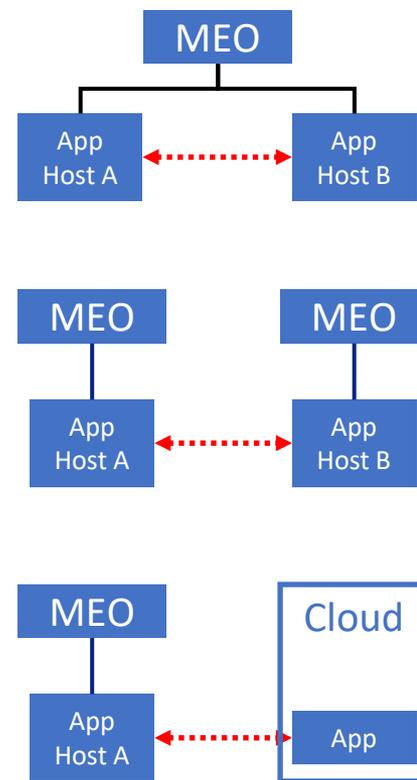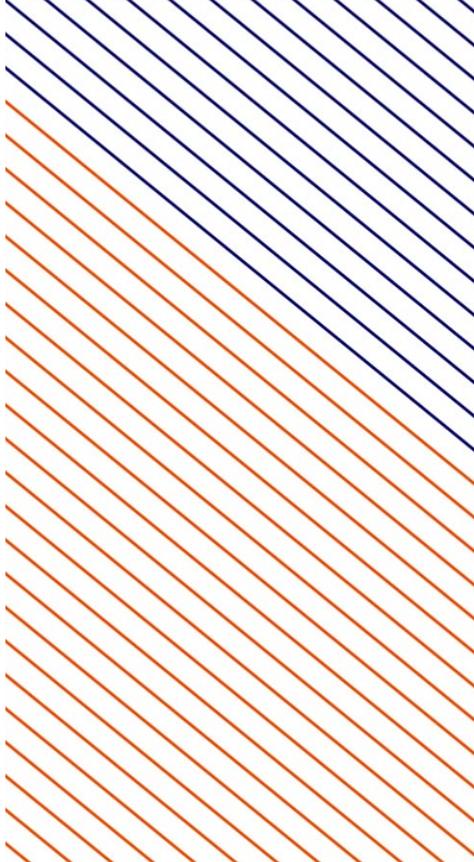
Inter MEC host management (Enhanced DNS Support Towards Distributed MEC Environment)

Scope and motivation of the white paper

- **(Again) Application mobility is supported by ETSI ISG MEC specifications**
  - **"Reference architecture" is specified in MEC 003**
  - **"Application Mobility Service API" is specified in MEC 021.**
    - Corresponding study was conducted in GR MEC 018

- **Fill in the gap between specification and deployment**
  - **It is complicated for deployment (for me)**
  - **Need some extensions for implementation adapting to operation policies**

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DNS support in MEC system
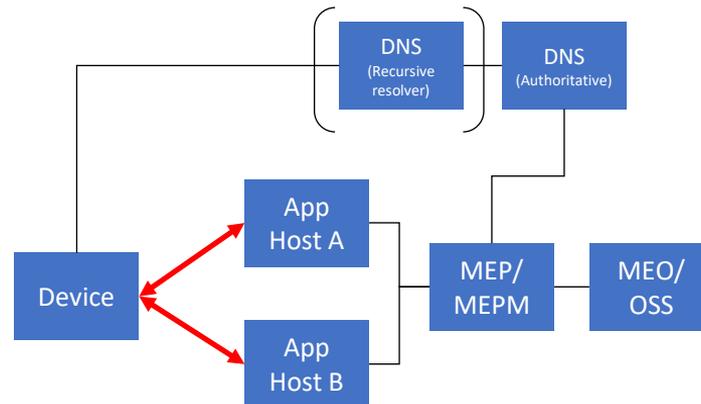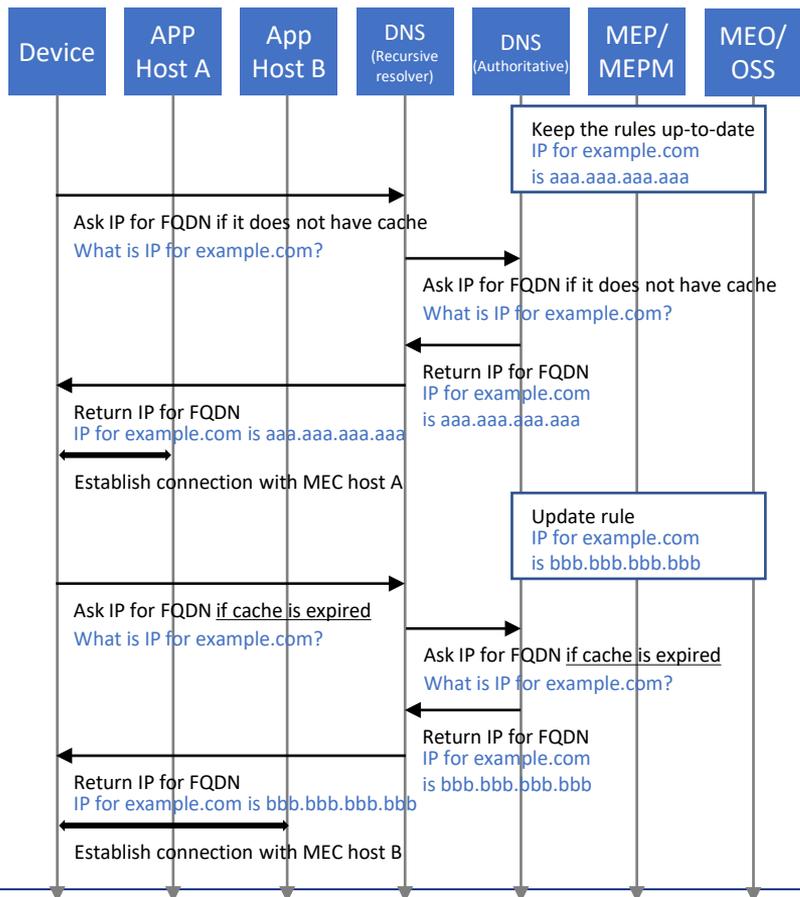

- MEO supervises overall system

- MEP provides connectivity with DNS server

- Device associates with the desired DNS server

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Extension for implementation

Operators want to dynamically choose the serving MEC host based on operation policies other than location, e.g., available resources.
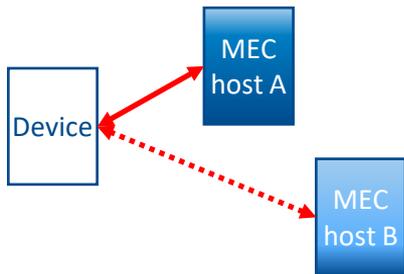
Different device may need to connect to different MEC host due to, e.g., location, available resources, etc.
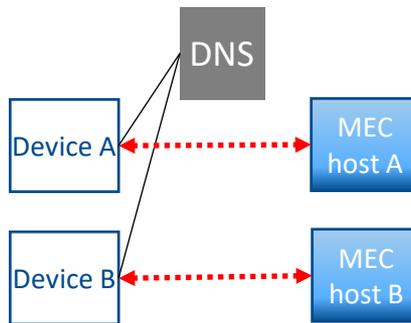
Dynamically update the serving MEC host as device moves.

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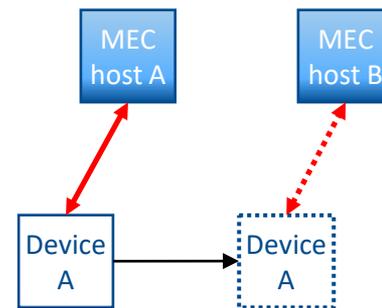
Potential solutions

- **3GPP specific solution**
  - **More informed DNS query solution for local DNS services in 5GC**
- **Generally applicable solutions**
  - **Enhanced DNS solution (Extension of EDNS0 protocol)**
  - **HTTP redirection solution**
  - **Device application interface solution (Use of MEC016 DevApp)**
  - **VIP solution (IP anycast solution)**
  - **Edge DNS solution**

Detailed information is available at
https://www.etsi.org/images/files/ETSIWhitePapers/etsi-wp39-Enhanced-DNS-Support-towards-Distributed-MEC-Environment.pdf

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E.g., Device application interface solution

Inter MEC system/ MEC-Cloud system coordination

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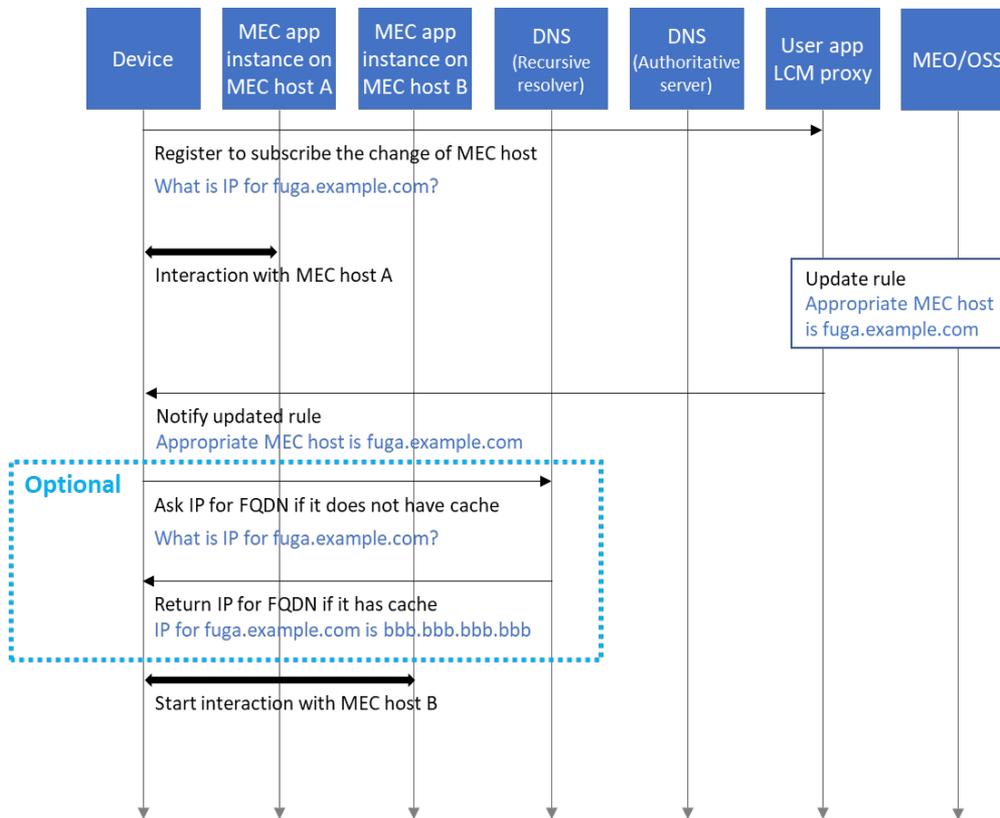
NOTE:

- **MEC 035 is on-going study work.**
  - **Some of the following contents are not agreed in the ISG yet.**
  - **Some of the following contents may change when publication.**
  - **The following contents include KDDI's opinion.**

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Think about the case of V2X safety

Role of MEC:

- **Offloading computing task to MEC system**
- **Better latency to the device**
- **Data localization**

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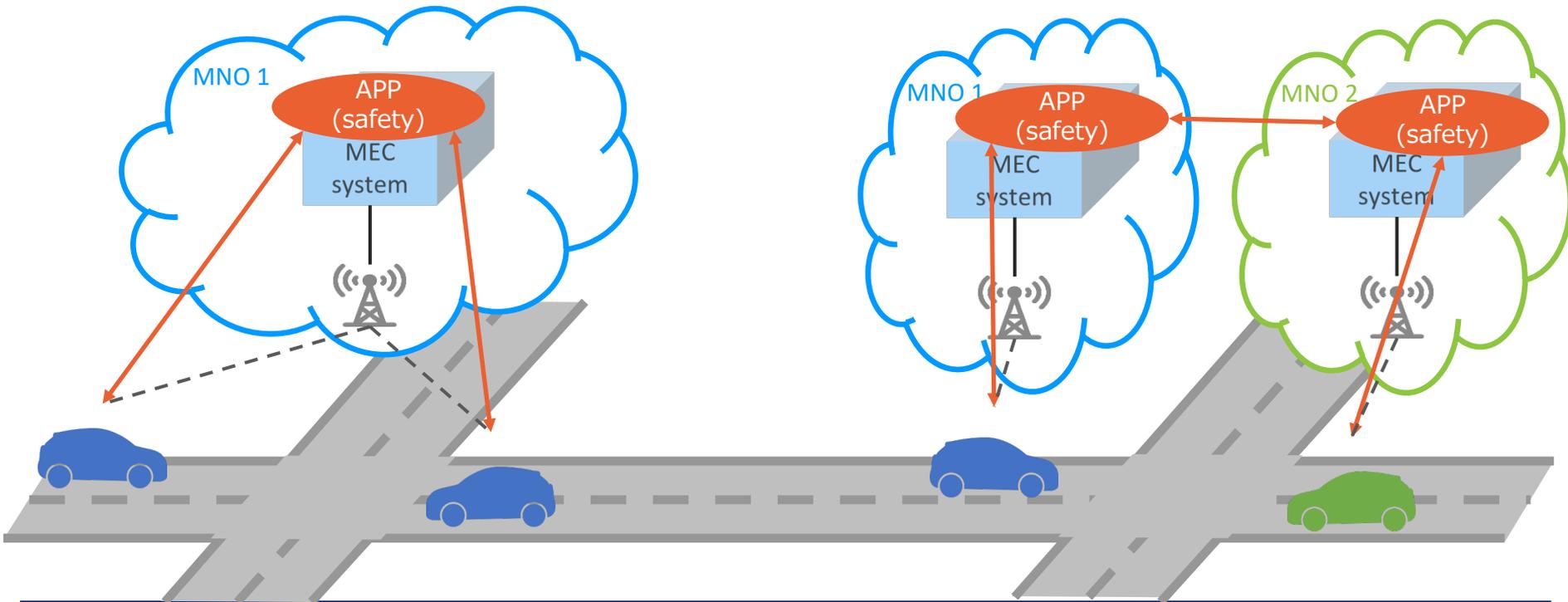
Think about the case of platooning

Role of MEC:

- **Offloading computing task to MEC system**
- **Better latency to the device**
- **Data localization**
- **Handover between MEC also occur**

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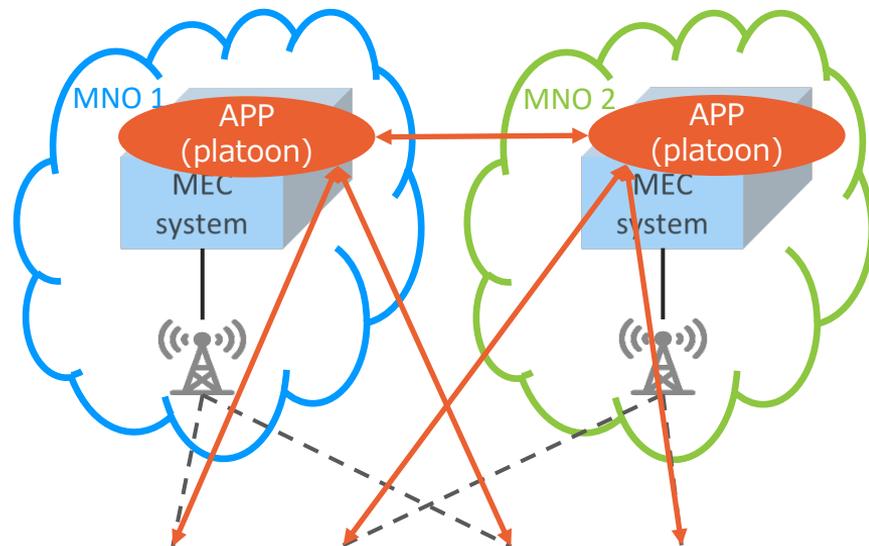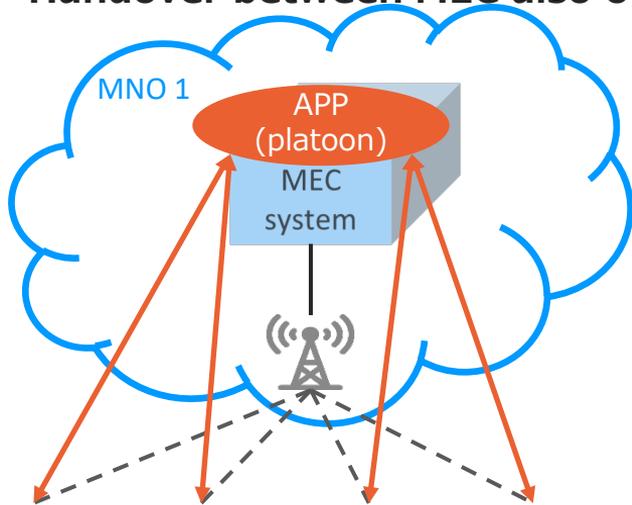
Think about the case of AR/VR gaming

Scenario:
1. **Players join the game on Cloud system**
2. **Couple users and move to MEC system (multi-player room)**
3. **Coupled users may be associating with different MNO network. Coordination between different MEC system is required**

Role:
- **Offloading computing task to MEC system**
- **(After coupling users), better latency to the device**
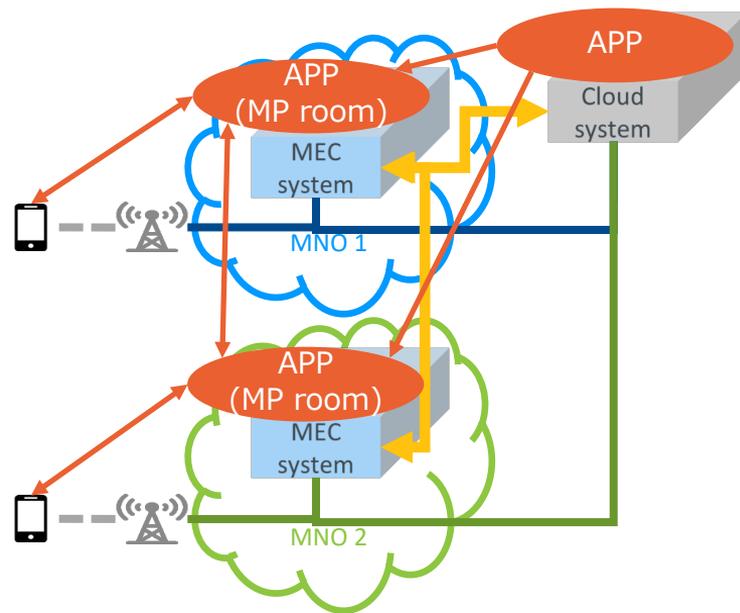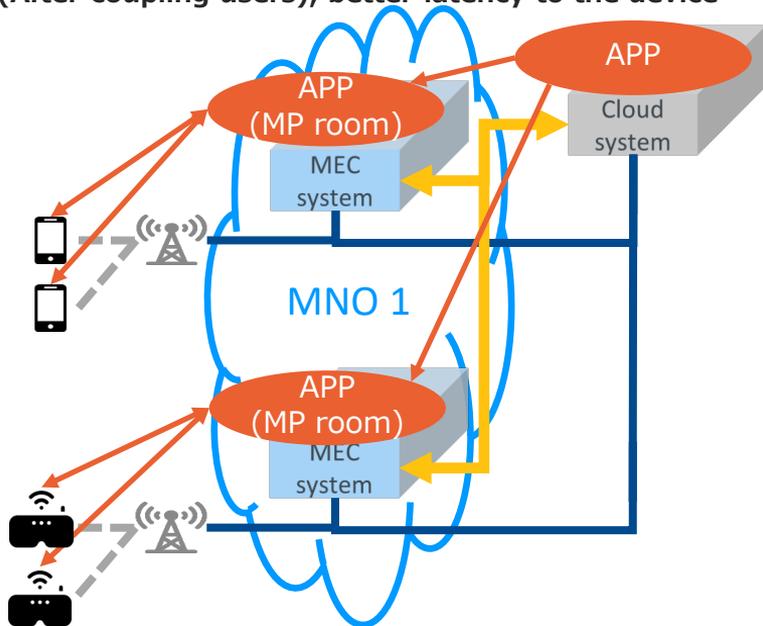
Relationship between MEC-MEC, MEC-Cloud

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Relationship between MEC-MEC, MEC-Cloud

Perfectly supported by Federated MEC
Not fully supported by Federated MEC

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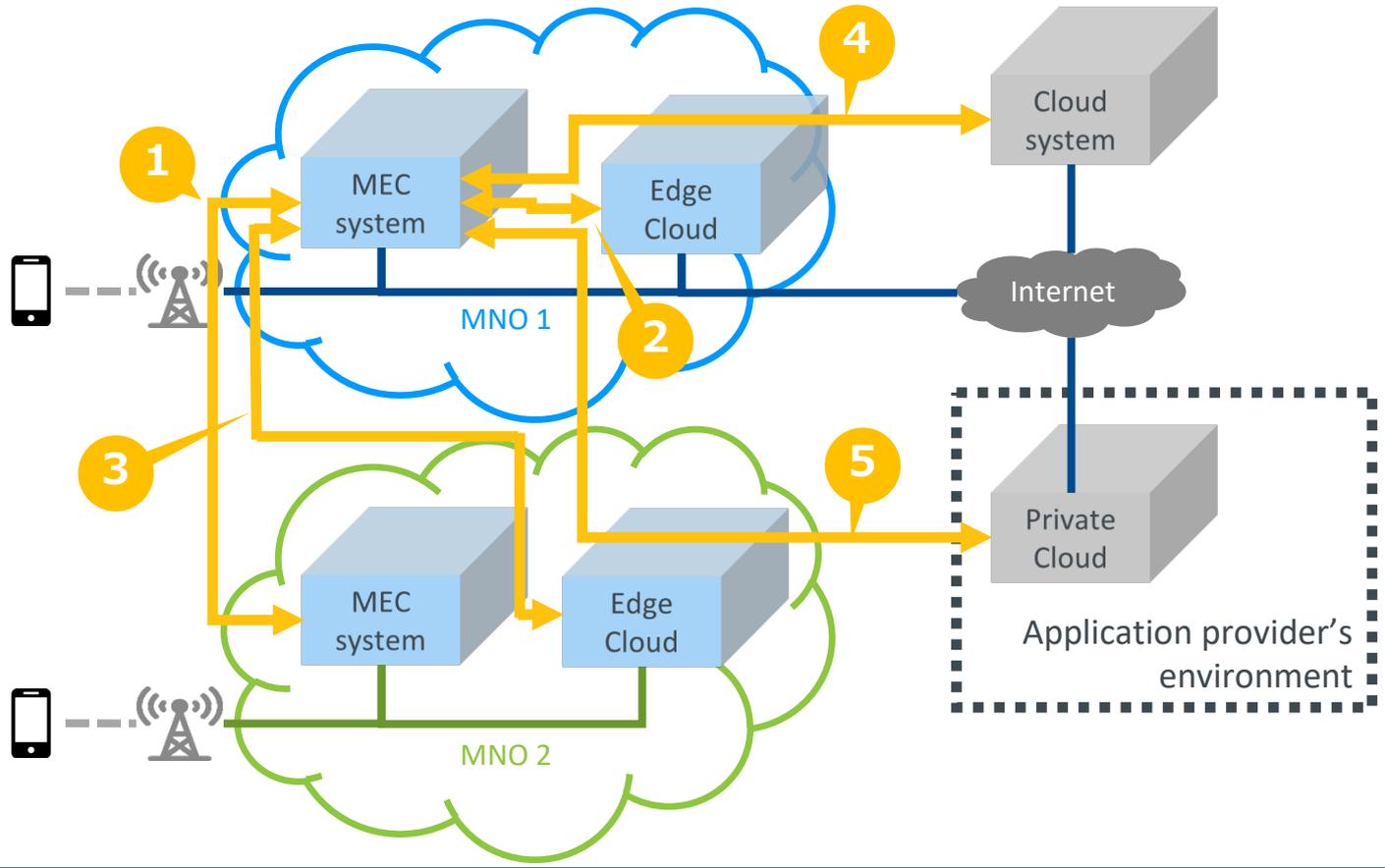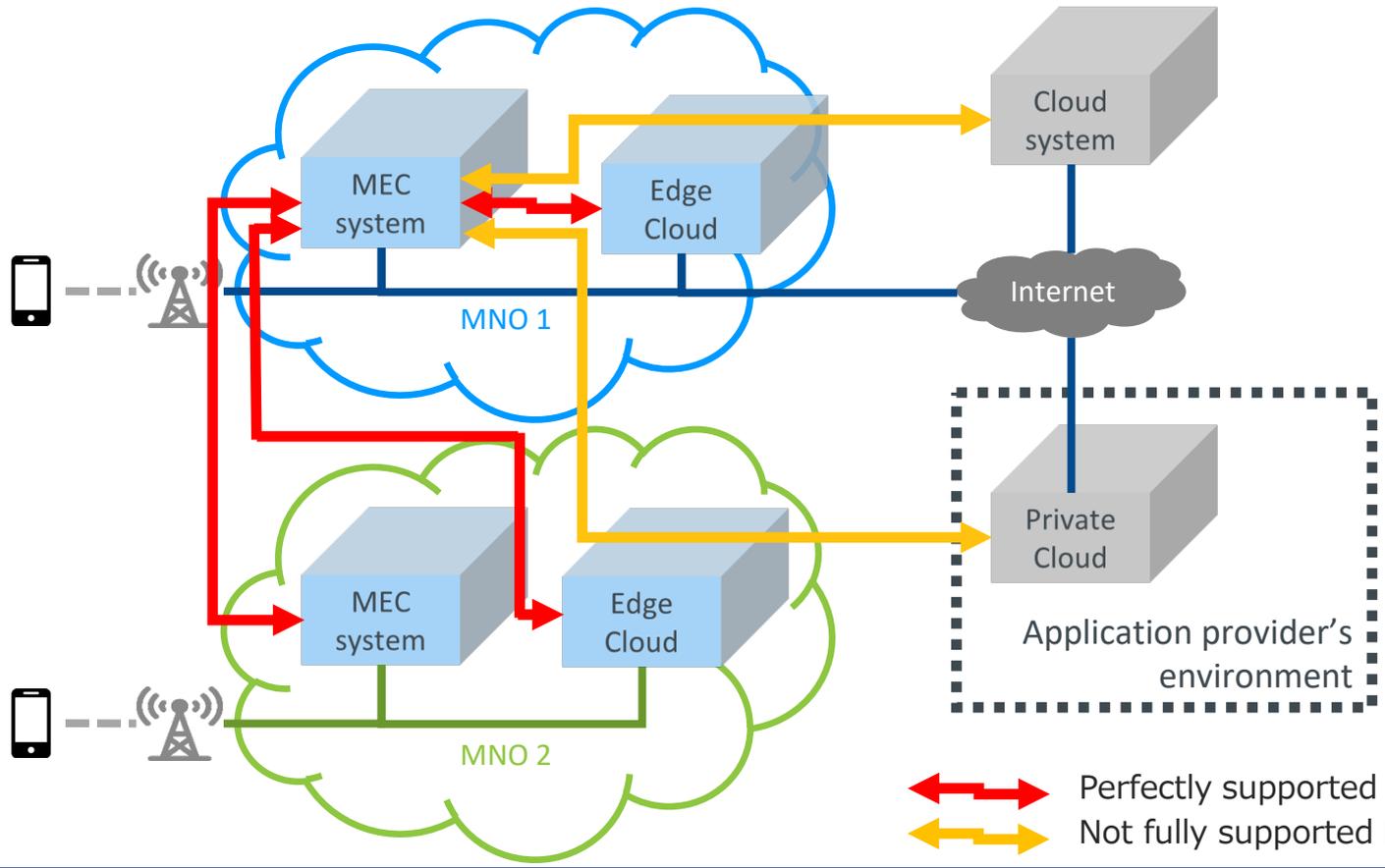
Federated MEC system

- **Based on the idea of East and West Bound Interface defined by GSMA OPG**
  - Operator Platform Concept – Phase 1: Edge Cloud Computing
    https://www.gsma.com/futurenetworks/resources/operator-platform-concept-whitepaper/
   *"operators will collaborate to offer a unified operator platform. In Phase 1, the Operator Platform will federate multiple Operators' edge computing infrastructure to give application providers access to a global edge cloud to run innovative, distributed and low latency services through a set of common APIs"*
    → MEC 035 study is respecting the idea of East-West Bound Interface

  - GSMA Operator Platform Telco Edge Proposal Whitepaper
    https://www.gsma.com/futurenetworks/resources/op-telco-edge-proposal-whitepaper/
  - Telco Edge Cloud: Edge Service Description & Commercial Principles Whitepaper
    https://www.gsma.com/futurenetworks/resources/telco-edge-cloud-october-2020-download/
    → MEC 035 study tries to extract the applicability of federated MEC and to provide further alignment

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What should be enabled by MEC federation

- **Application level**
  - **Synchronization**
  - **Transfer**
  - **Deletion**
  - **Etc.**

- **Required to be supported by MEC systems**
  - **MEC system discovery**
  - **MEC platform/application discovery**
  - **MEC service consumption**
  - **Etc.**

Hierarchical signaling
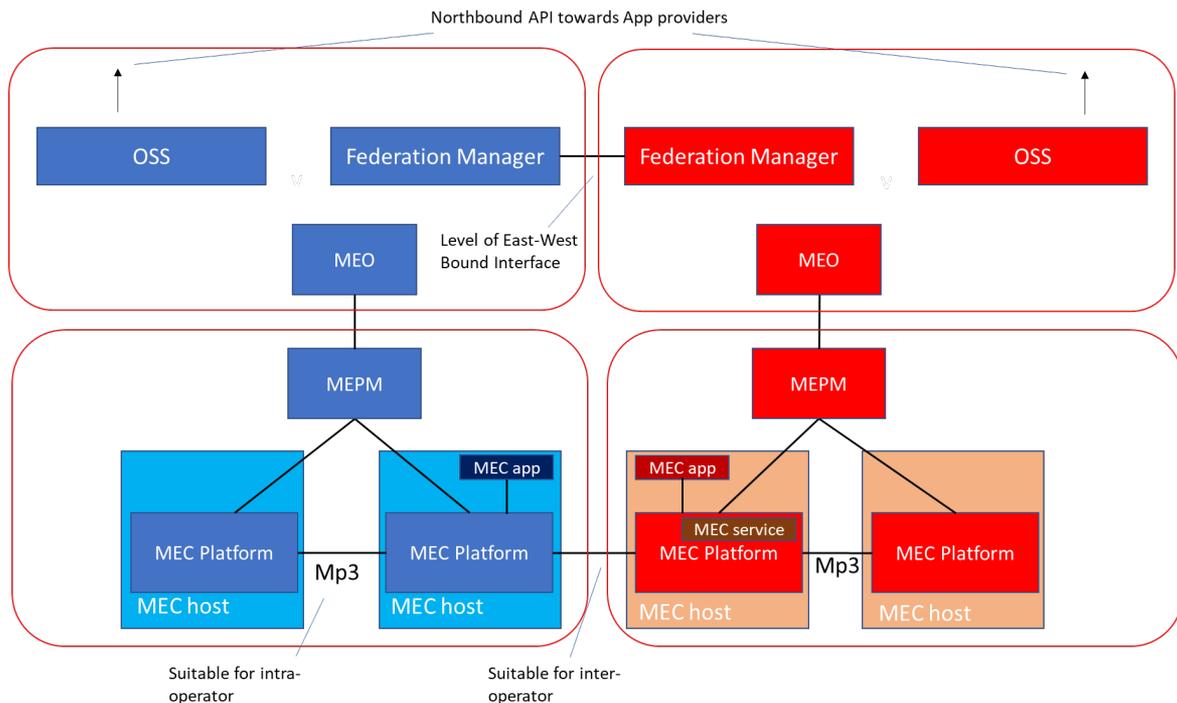
- Signaling among specific functional entities of the involved MEC systems.
  - For systems to establish a security trust by authorizing each other
  - For an application provider/ customer to deploy its application across multiple MEC systems using a single MNO relationship and integrations
  - For a MEC application in need of consuming a MEC platform service
  - For a MEC application in need of communicating with each other MEC applications
- **"Federation manager" is newly added (next page)**

Potential new entities for MEC federation

■ Federation Manager
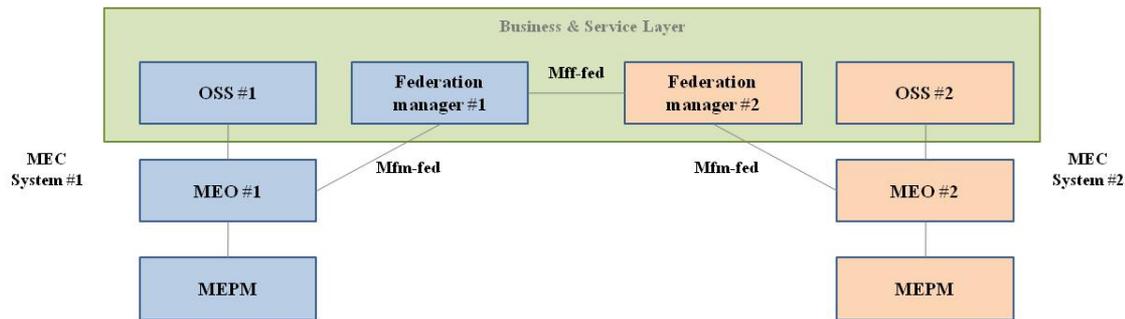
- Authorization
- Security
- Application life cycle management
- Resources/platform publishing and discovery
- Exposure of the catalog of MEC systems
- Publishing and discovering dealing all assurance functionalities

■ Federation Broker
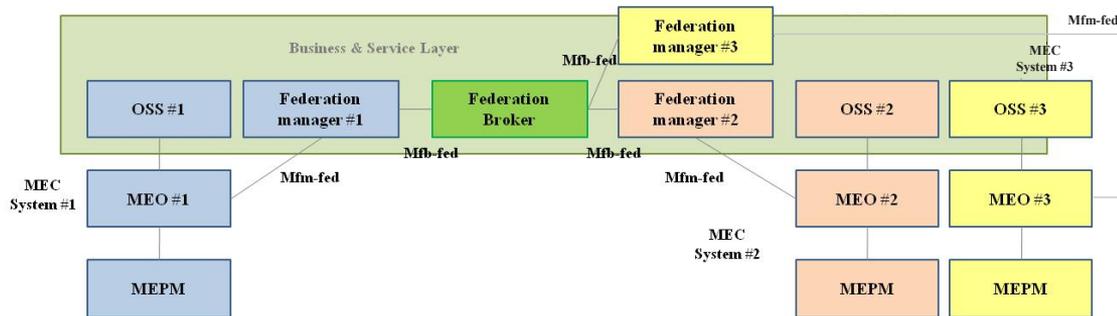
- Hub among the multiple Federation Managers

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MEC system discovery
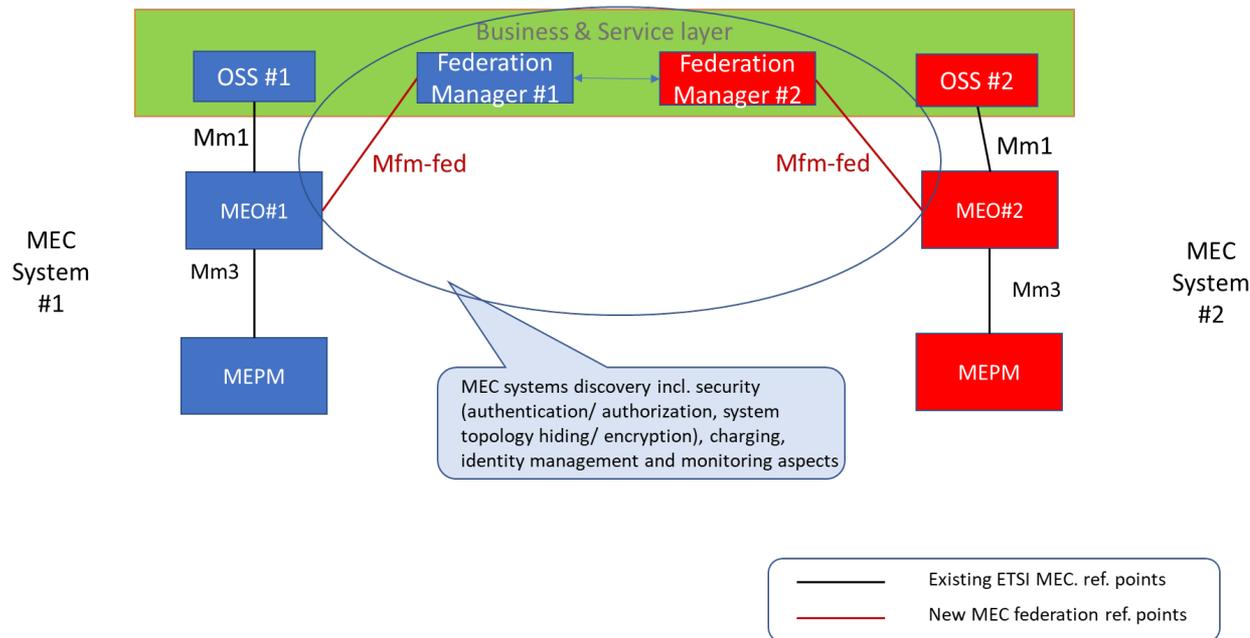
- To enable service consumption or MEC app-to-app communication
- MEC system needs to identify
  - which MEC systems are members of an already established MEC federation
  - which MEC systems are available to form a new MEC federation
- Basic flow
  1. a service communication query is issued by a MEC application instantiated at MEC system #1
  2. MEO #1 contacts the Federation Manager to obtain the necessary information of other MEC systems via Federation Managers (each MEO shares those information in advance)
  3. MEO #1 finds out (or selects) the desired MEC system

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MEC platform discovery

■ Direct communication between MEOs

MEC System #1

MEO#1

Mm3

MEPM

Mm5

MEC Platform

Meo-fed

- MEC platform discovery including capability exposure

MEO#2

Mm3

MEPM

Mm5

MEC Platform

MEC System #2

——	Existing ETSI MEC. ref. points
——	New MEC federation ref. points
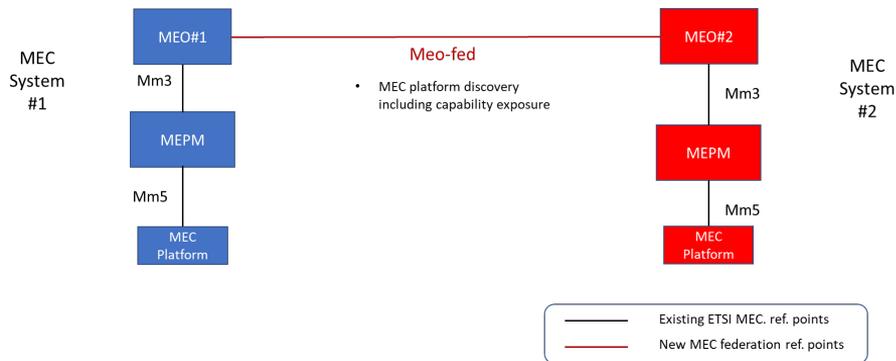
■ Coordination via Federation Managers

Federation manager #1

Mff-fed

Federation manager #2

MEC platform discovery including capability exposure

Mfm-fed

Mfm-fed

MEC System #1

MEO #1

Mm3

MEPM

Mm5

MEC platform

MEO #2

Mm3

MEPM

Mm5

MEC platform

MEC System #2

——	Existing ETSI MEC ref. points
——	New MEC federation ref. points

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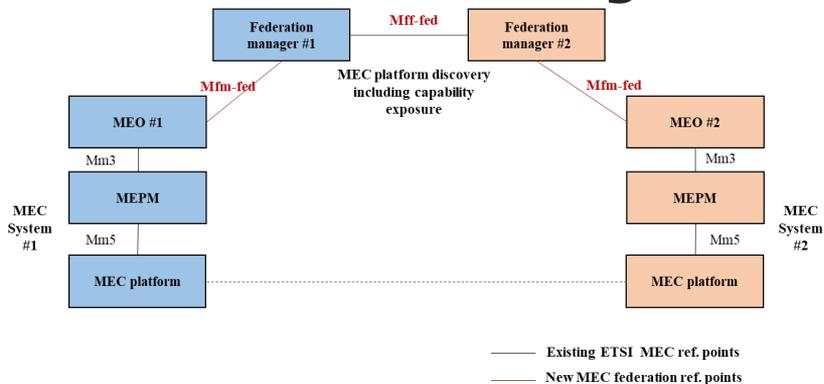
Service consumption/app-to-app communication
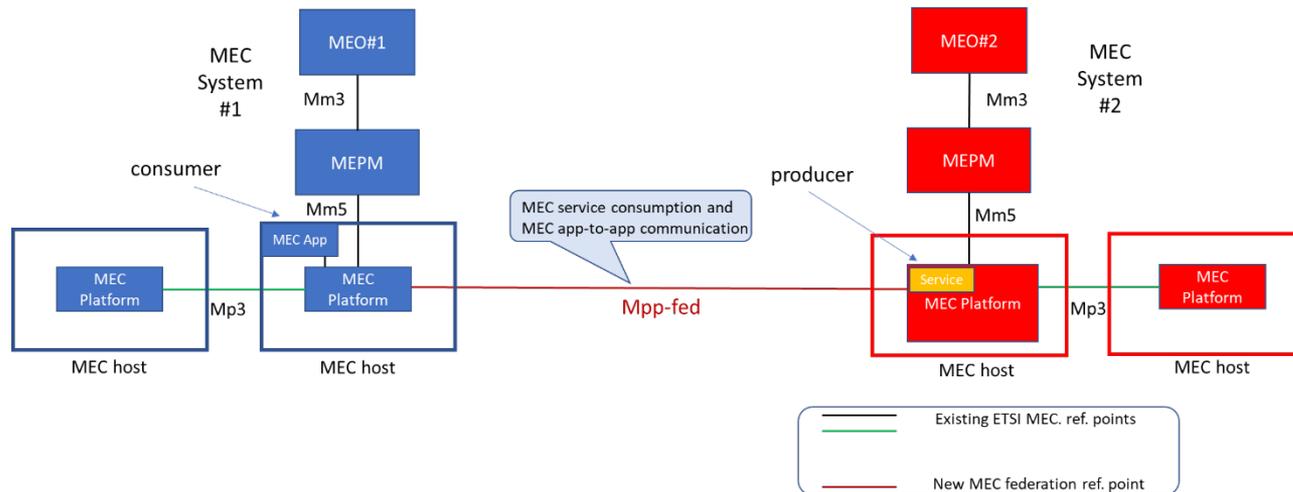
- This is the simplest option for realizing Service consumption/app-to-app communication
  - After establishing coordination between MEC systems
  - Other option is via federation Managers

- Conducted via direct communication between MEC platforms

- Depending on MNOs agreement/condition, not all MEC platforms may be allowed to communicate with another MEC platform across different MNO network

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Summary of collaboration and alignment

- **Use cases and requirement are extracted from 5GAA**
  - **Multi MNO cases**
- **Technical requirement and outline of the potential solutions are extracted from GSMA OP**
  - **Of course, the idea of federated MEC is one of the key solution for the requirement from 5GAA**

- **Technical detailed aspects will be provided by ETSI ISG MEC**
  - **Study and analysis are on-going**
    - Hierarchical signaling framework for MEC federation
    - New element for federation considering security concerns
    - Including original options differently from 5GAA and GSMA OP activities
  - **Normative work will follow the informative work**
    - New functions, new reference points and corresponding APIs

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KDDI Accelerate 5.0 (for presentation only)

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Concluding remarks

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MEC federation is on-going study

- **The scope of the study is wide and deep, but we make it forward step by step, respecting 5GAA and GSMA OP activities, in order to provide new values to the industry and better adoption in the industry.**
  - Use cases and requirement are raised from 5GAA
  - Technical requirement and general idea are raised from GSMA OP
    → We believe the study sufficiently address those requirement

- **API level specifications will be provided from ETSI ISG MEC in future.**

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