ETSI WEBINAR:

CAPIF from Standards to Practice:
Synergy between 3GPP, ETSI MEC and OpenCAPIF

30 April 2024

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Uwe Rauschenbach, ETSI ISG MEC Vice Chair, Nokia
David Artunedo, ETSI SDG OpenCAPIF Chair, Telefonica

https://www.etsi.org/about/10-events/2349-capif-from-standards-to-practice-synergy-between-3gpp-etsi-mec-and-opencapif

Agenda

- Introduction
- Overview and update on 3GPP CAPIF
- Reuse of CAPIF at ETSI MEC
- Presentation from OpenCAPIF
- Q&A live session
- Conclusion and way forward

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This webinar provides a guide to the MEC Service API application enablement and its interworking with the Common API Framework (CAPIF) defined in 3GPP. The speakers, as key experts in the area, will present the latest achievements and alignments in standardization in ETSI and 3GPP. The webinar also provides an overview of the recently established Software Development Group (SDG) in ETSI called OpenCAPIF, an important open-source initiative in the area, as complementary effort to standardization. Attendees can benefit not only from this comprehensive overview but can also have the chance to get (in the final Q&A session) technical insights both from standards and open-source software points of view.

Introduction

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

3GPP A GLOBAL INITIATIVE · Wi Fi · broadband forum

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

ETSI ISG MEC

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

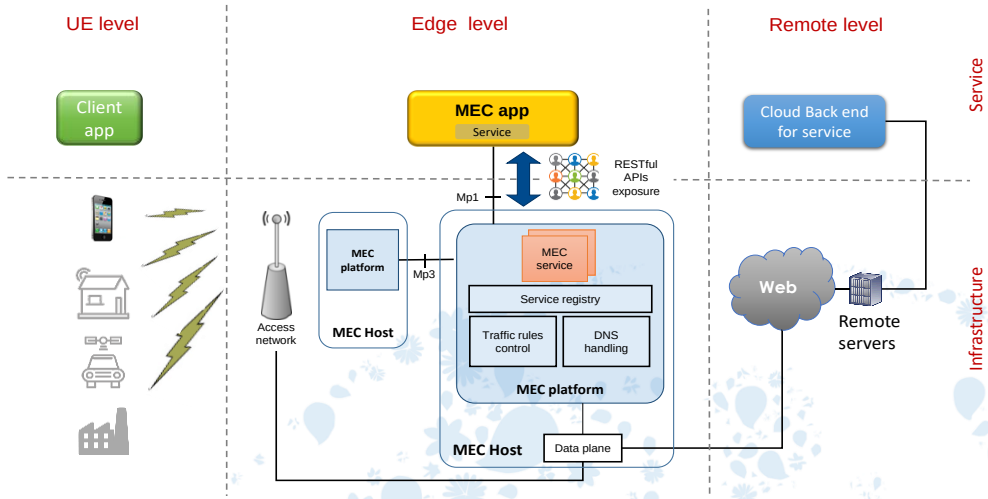
MEC Application Development Community
Interaction & Information Exposure

- **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"**

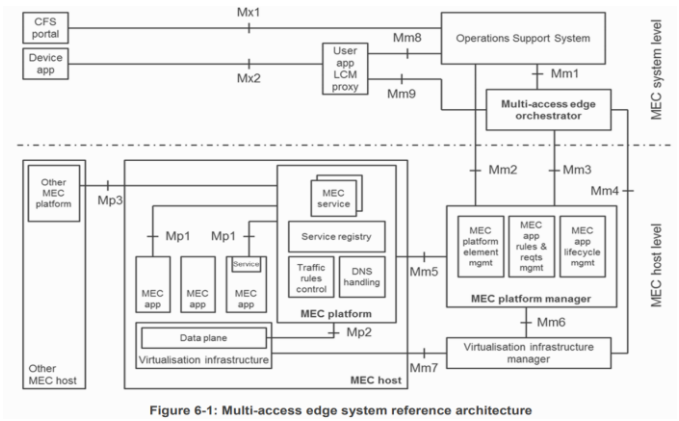
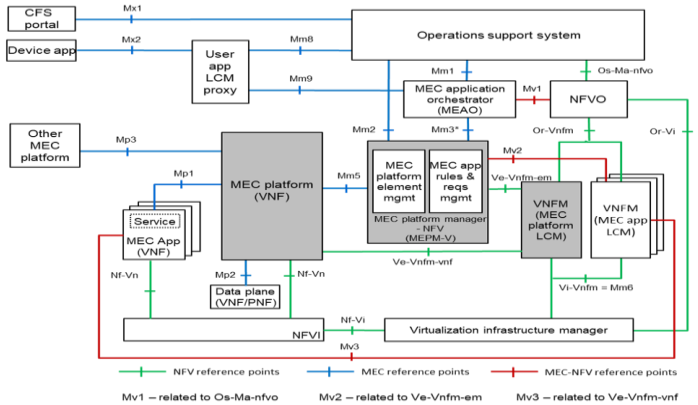
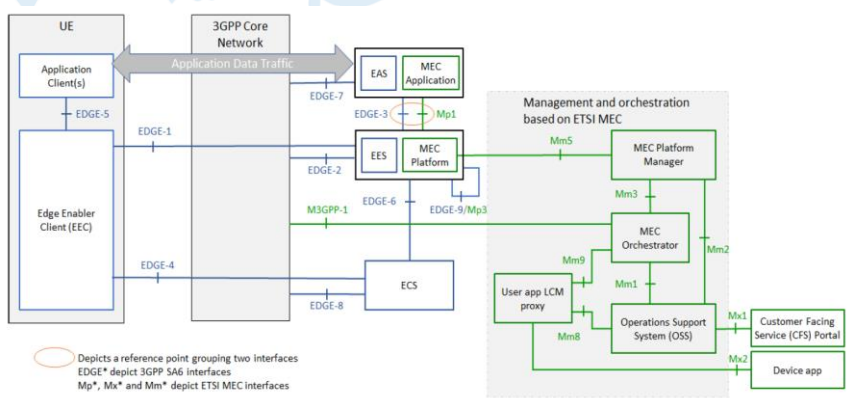


Figure 6-1: Multi-access edge system reference architecture





Enabling Global Application Portability

MEC Application Development Community

Interaction & Information Exposure

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

ISG MEC Spec: MEC009 API Principles & Guidelines

MEC012 Radio Network Info API

MEC013 Location API

MEC014 UE Identity API

MEC015 Bandwidth Mgmt API

MEC028 WLAN Info API

MEC029 Fixed Access Info API

MEC0xy Your Service API

MEC011 Application Enablement API

MEC API Framework

MEC Services exposed via individual APIs

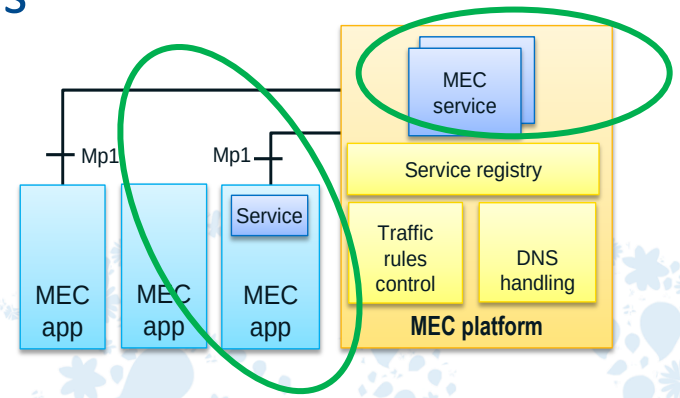
MEC Platform

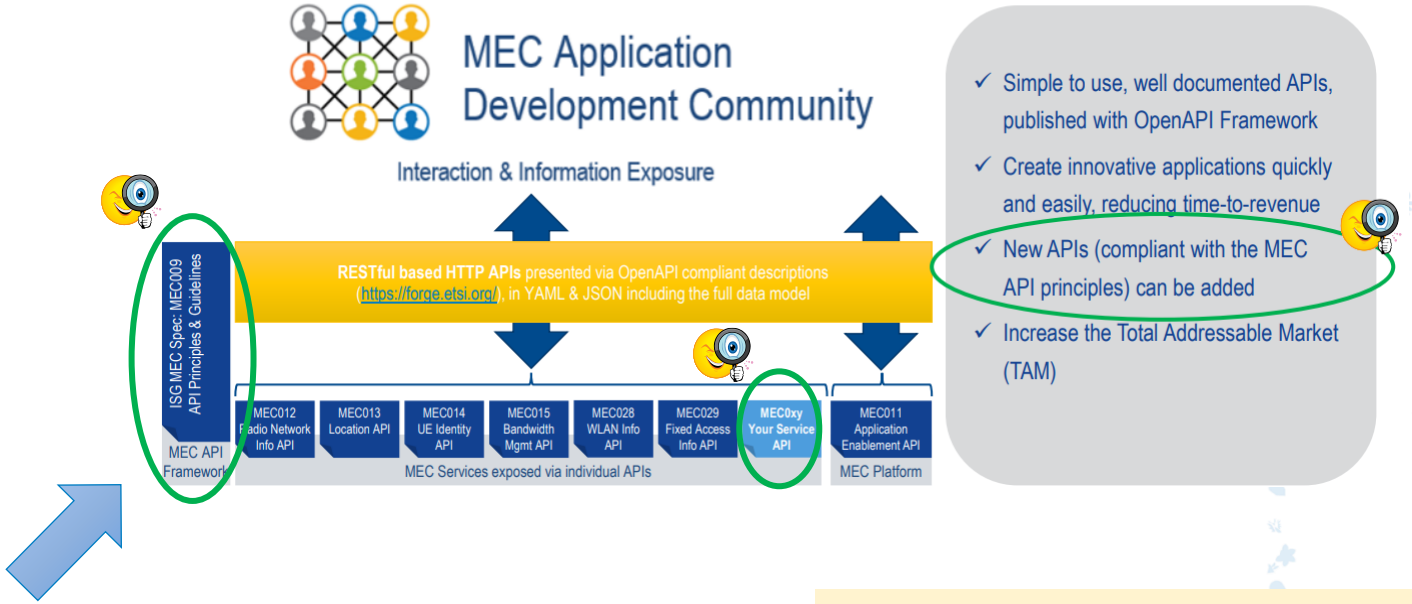
- ✓ Simple to use, well documented APIs, published with OpenAPI Framework
- ✓ Create innovative applications quickly and easily, reducing time-to-revenue
- ✓ New APIs (compliant with the MEC API principles) can be added
- ✓ Increase the Total Addressable Market (TAM)

Extending MEC with new MEC Service APIs

MEC Services: value-added capabilities to enable MEC applications

- "Built-in" MEC standardized services provided via the MEC Platform.
- MEC applications can offer new MEC Services APIs, extending the MEC system





NOTE: ETSI GS MEC 009 is defining General principles, patterns and common aspects of MEC Service APIs

NOTE: also, the MEC Sandbox includes capabilities to advertise, discover, and consume New MEC Services

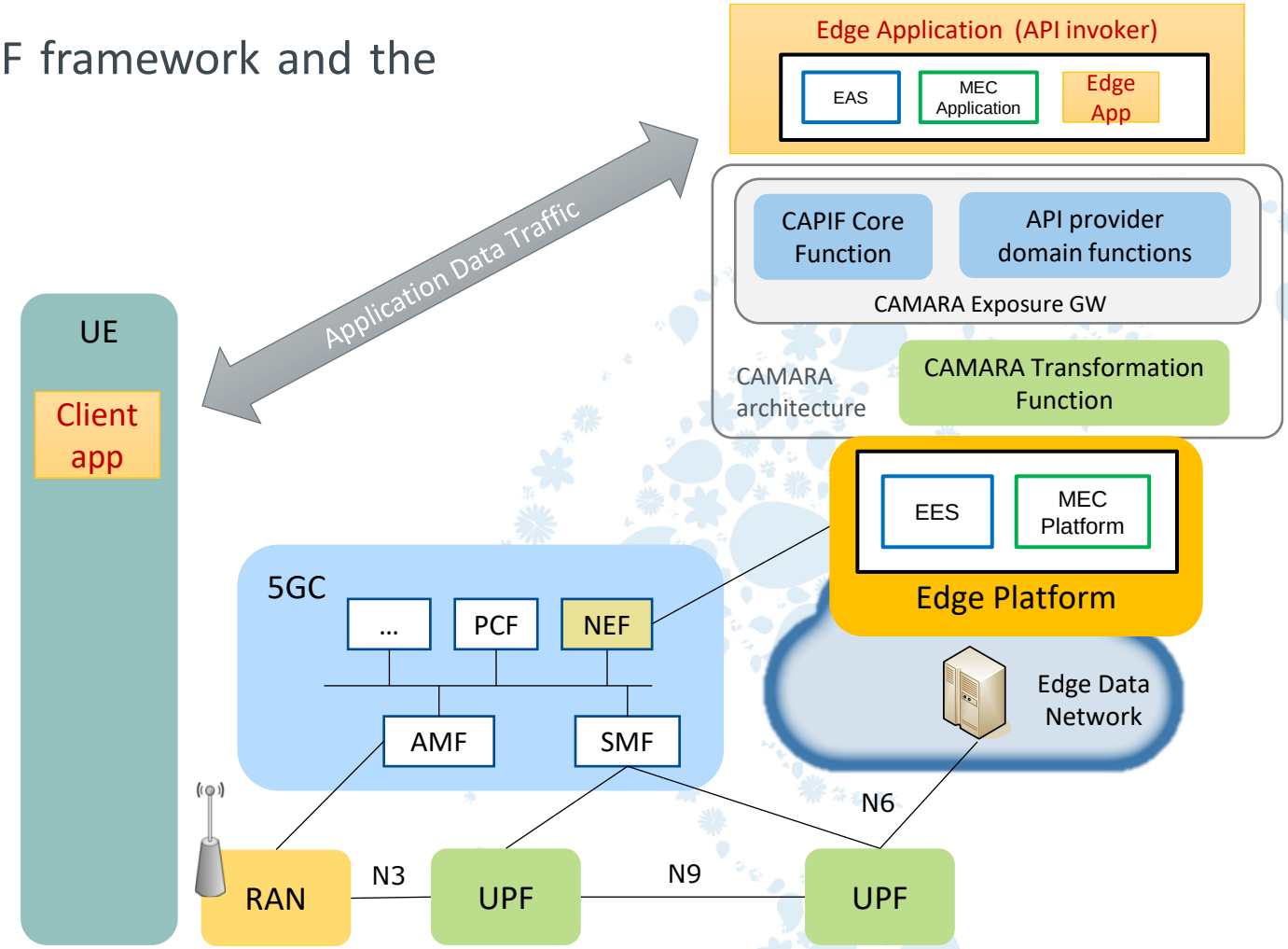
try-mec.etsi.org

www.etsi.org/deliver/etsi_gs/MEC/001_099/009/03.01.01_60/gs_MEC009v030101p.pdf

API Exposure and cross-consumption in a MEC Federation

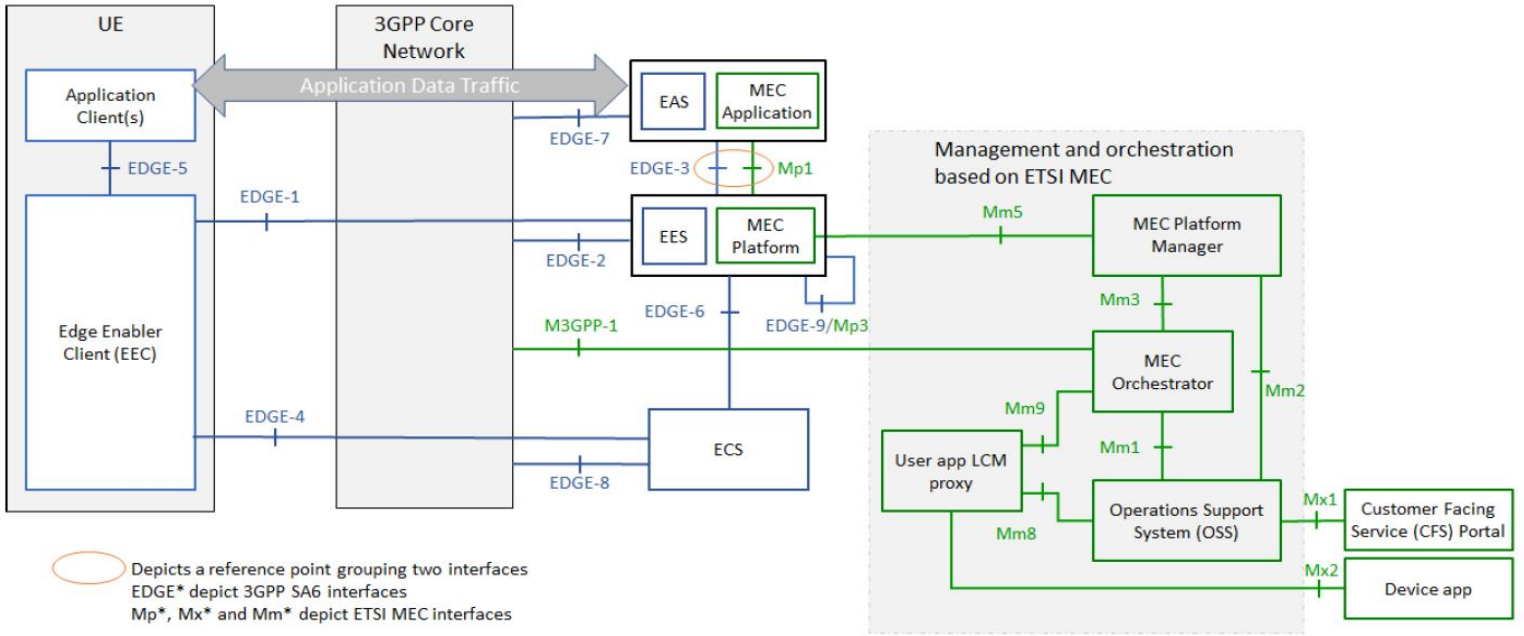
- Option for Edge Native applications to consume MEC services in a MEC federation (via CAPIF framework and the CAMARA architecture)

NOTE: this option also facilitates the synergies with ETSI MEC and GSMA OPG architecture, as API exposure can be exploited also in the MEC federation for edge native application development.



(*) ETSI White Paper “MEC Support for Edge Native Design”, https://www.etsi.org/images/files/ETSIWhitePapers/ETSI-WP55-MEC_support_towards_Edge_native.pdf

MEC harmonized architecture with SA6 EDGEAPP

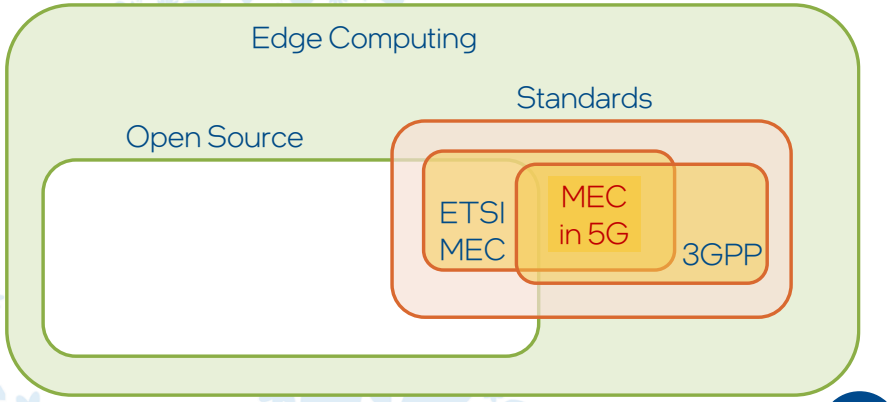


- Joint white paper (*) from both ETSI and 3GPP officials
- 3GPP TS 23.558 "Architecture for enabling Edge Applications; (Release 17)" v1.1.0, Oct. 2021 (informative Annex C)
- Alignment between 3GPP and ETSI MEC in scope of eEDGEAPP in 3GPP SA6 Rel. 18 (ref. S6-211858 and TR 23.958).

Notes:

- In 5G, alignment of the 2 standards is the key.
- General consensus to align ETSI and 3GPP in order to *avoid duplication of work*.
- Anyway, alignment doesn't mean equivalence

  (Note: ETSI MEC is *Multi-access* Edge Computing, thus including also Wi-Fi, fixed access, etc..)



(*) Ref. ETSI White paper: "Harmonizing standards for edge computing - A synergized architecture leveraging ETSI ISG MEC and 3GPP specifications", July 2021, link here

Overview and update on 3GPP CAPIF

3GPP and APIs – Network Capabilities Exposure

Since 4G, 3GPP has been defining "**Network Capability Exposure**" APIs.

Objective: Enable external applications to make use of network capabilities via:

- 3GPP "**Northbound**" APIs:
  - ✓ Exposed via the **SCEF** (for 4G) or **NEF** (for 5G) network functions.
  - ✓ Use/influence 3GPP networks for application related purposes.
  - ✓ Examples:
    - Nnef_**EventExposure** API (various events reporting, e.g., UE location information, UE roaming status, application traffic information, network slice admission control, etc.)
    - Nnef_**TrafficInfluence** API (influence application related traffic within the network)
    - Nnef_**ServiceParameter** API (provision application related service parameters)
    - Nnef_**MBSSession** API (create and manage multicast/broadcast sessions)
    - etc. (cf. **TS 29.122** and **TS 29.522**)
- 3GPP "**Application Layer**" APIs:
  - ✓ Used within "Application Layer Frameworks" which are "enabler" abstraction layers for specific applications (e.g., **EDGE**, **UAS**, **V2X**, etc.) or common for "vertical" applications (e.g., **SEAL**).
  - ✓ Enable application enabler layer entities to interact with each other.
  - ✓ Enable to efficiently use an application (e.g., UAS, V2X, etc.) over 3GPP networks.

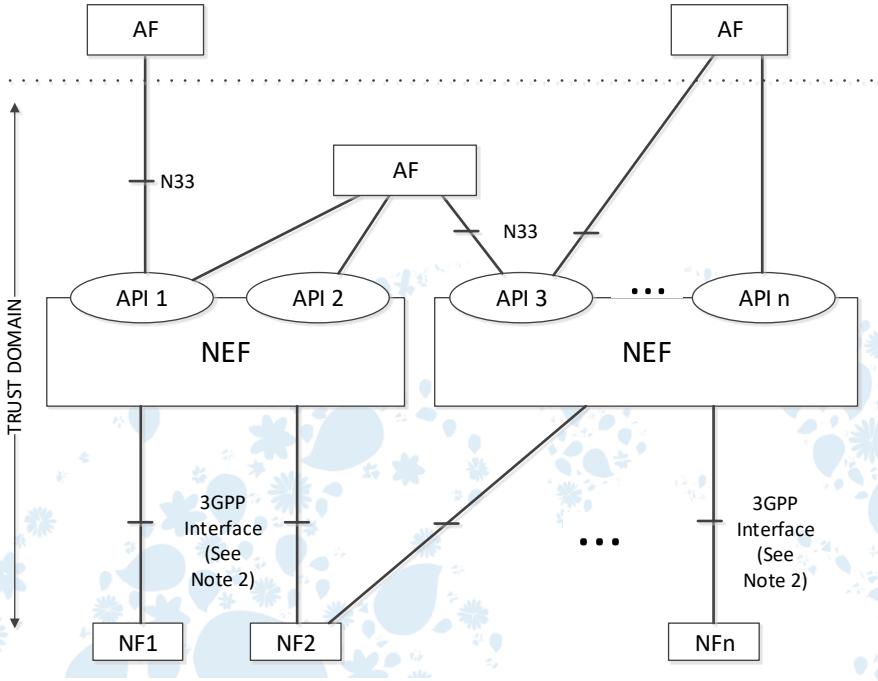


Figure 4.2.3-5 of 3GPP TS 23.501 "System architecture for the 5G System (5GS); Stage 2", Link here

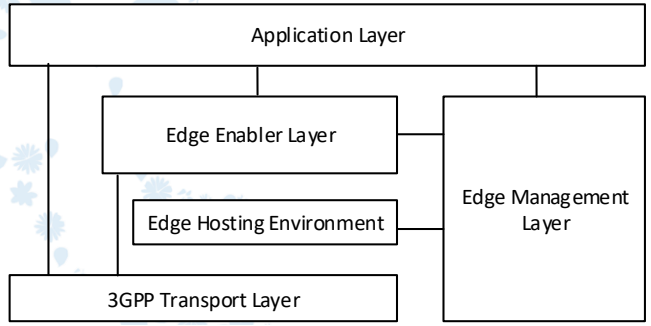


Figure 4.1-1 of 3GPP TS 23.558 "Architecture for enabling Edge Applications", Link here

NEF: Network Exposure Function *SCEF: Service Capability Exposure Function* *UAS: Unmanned Areal Systems*
AF: Application Function *SEAL: Service Enabler Architecture Layer for Verticals* *NF: Network Function* *V2X: Vehicule to Everything*

3GPP and APIs – Why CAPIF?

3GPP "**Northbound and Application Layer**" (**NBI**) APIs need to be exposed in an efficient, consistent and secure way, i.e.:

- Avoid heterogeneous approaches.
- Avoid duplication.
- Foster reusability, modularity and extensability.
- Support a common protocol and API design.
- Focus on the core business of application needs.

3GPP decided to define **CAPIF** as a **common enabler framework** to cover the common functionalities applicable to all "Northbound and Application Layer" APIs.

- NBI API publication and management.
- NBI API discovery.
- API exposing function (e.g., NEF) management.
- API invoker (e.g., Application Function) onboarding management.
- Authorization and security (e.g., NBI API access control).
- Routing management.
- Events reporting, auditing, charging, etc.

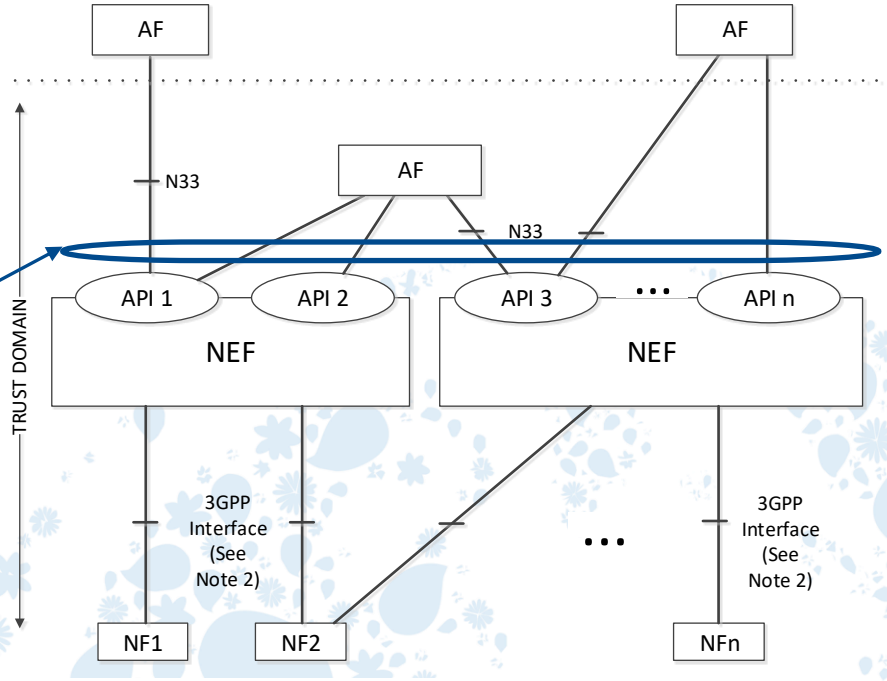


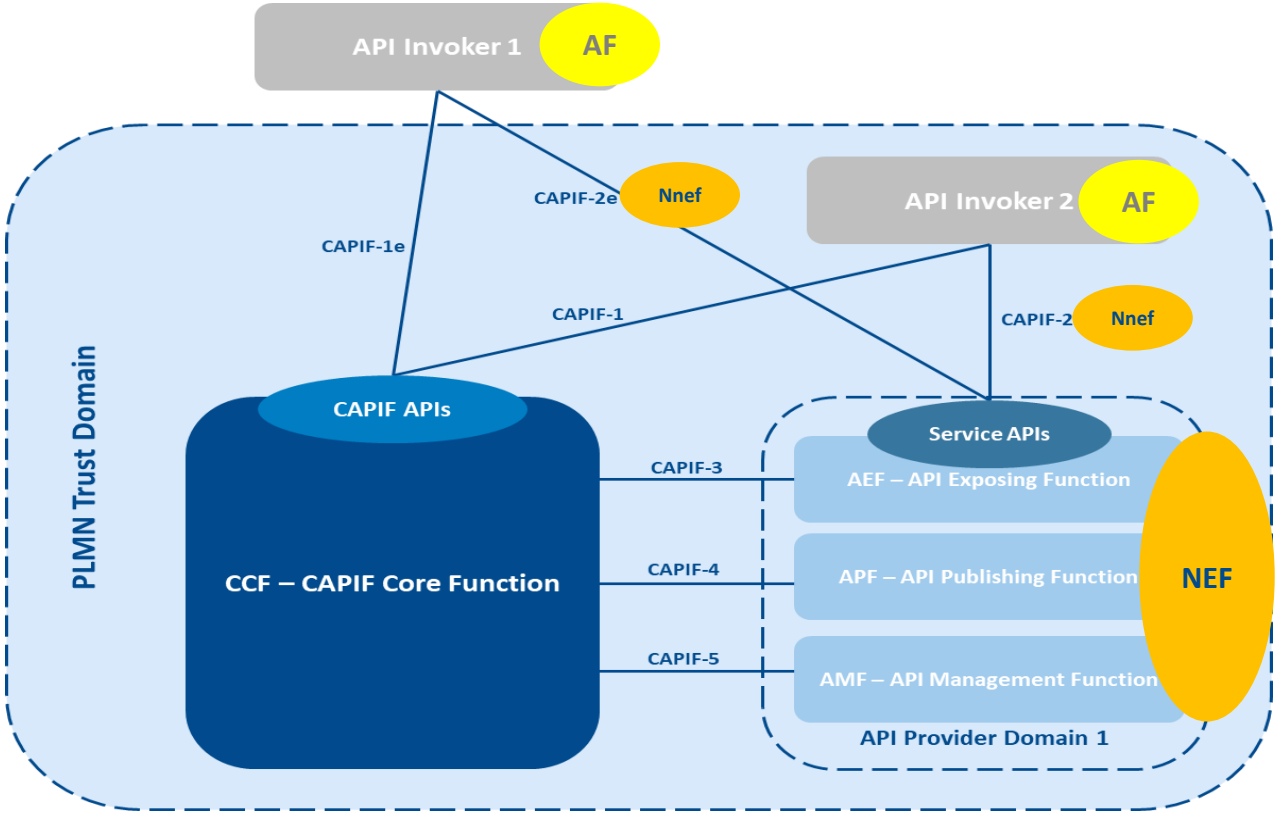
Figure 4.2.3-5 of 3GPP TS 23.501 "System architecture for the 5G System (5GS); Stage 2", Link here

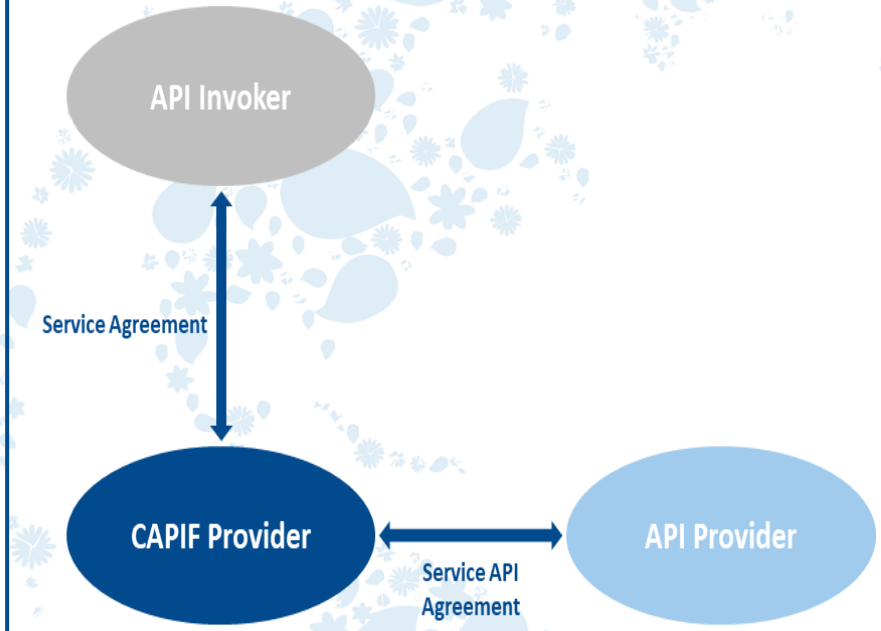
***NEF**: Network Exposure Function*
***AF**: Application Function*
***CAPIF**: Common API FrameworK*
***NF**: Network Function*
***NBI**: NorthBound and application layer Interfaces and APIs*

3GPP CAPIF – Common API Framework (1/2)

Functionalities and services common to all NBI APIs.

- Can be deployed within the PLMN trust domain (e.g., by an operator) **or by a 3rd party**.
- Can be used for 3GPP defined NBIs **or any other set of APIs**, e.g., defined by other SDOs (e.g., ETSI MEC), etc.
- Main functions and roles: **CAPIF Core Function** (CCF), **API Exposing Function** (AEF), **API Publishing Function** (APF), **API Management Function** (AMF), **API Invoker** and **API Provider**.



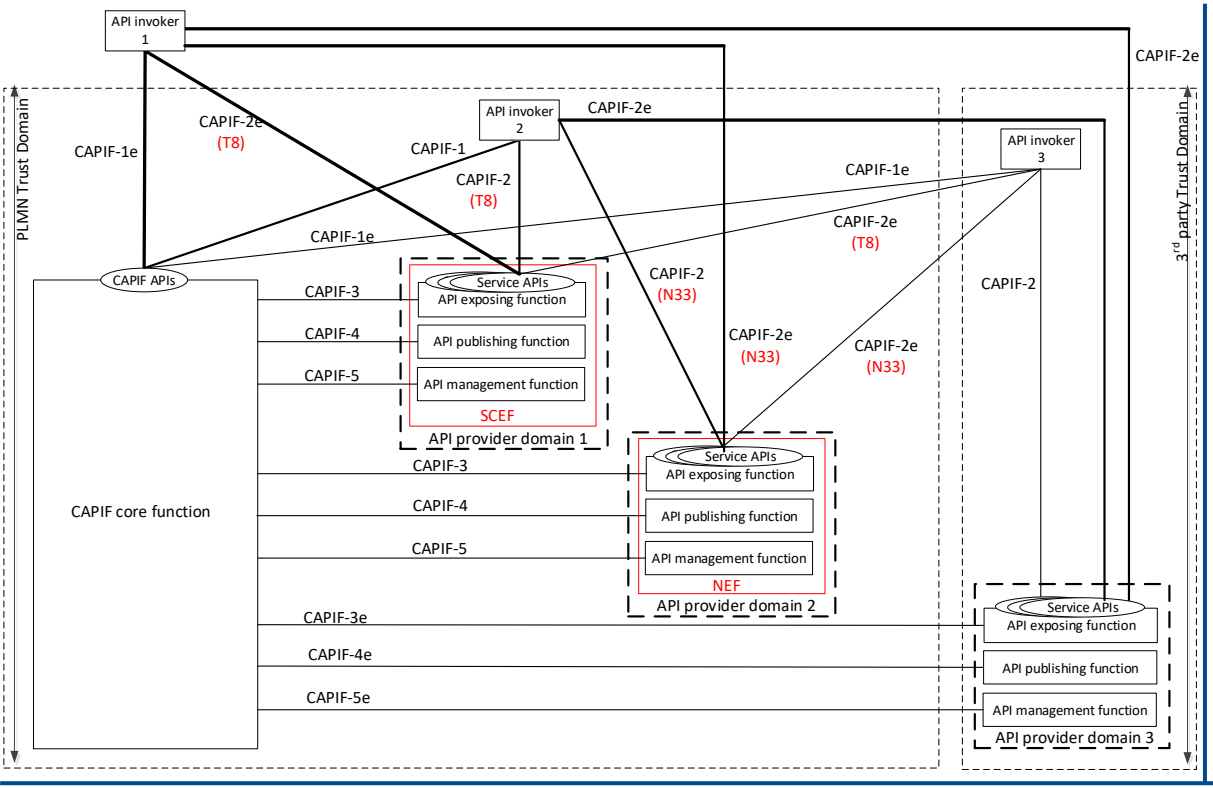


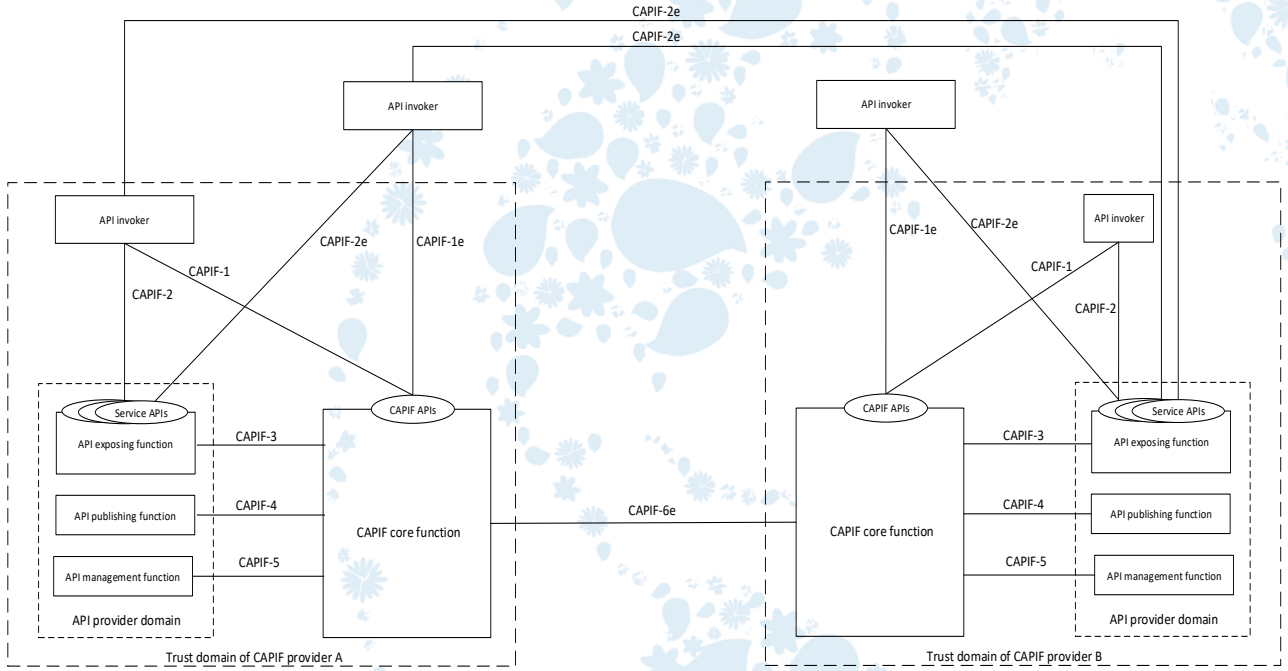
Figures 6.2.0-1 and 5.1-1 of 3GPP TS 23.222 "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2", Link here

3GPP CAPIF – Common API Framework (2/2)

Functionalities and services common to all NBI APIs (starting from 3GPP **Rel-15**, **2018-06**)

- Can be deployed within the PLMN trust domain (e.g., by an operator) **or by a 3rd party**.
- Can be used for 3GPP defined NBIs **or any other set of APIs**, e.g., defined by other SDOs (e.g., ETSI MEC), etc.
- Main functions and roles: **CAPIF Core Function** (CCF), **API Exposing Function** (AEF), **API Publishing Function** (APF), **API Management Function** (AMF), **API Invoker** and **API Provider**.





Figures B.3.2.2-1 and 6.2.2-1 of 3GPP TS 23.222 "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2", Link here

3GPP CAPIF – Rel-18 work on extensibility (1/2)

1) CAPIF APIs **Data Model extensibility**:

- Mechanism Name: "**Vendor-specific extensions to the data model**". Cf. clause 5.2.13.2 of TS 29.122 (**Link here**).
- "**Vendor**" --> e.g., external SDO, network equipment vendor, verticals, industry forums/alliances, projects, etc.
- Enables to better support **AEFs defined outside 3GPP** (e.g., ETSI MEC).
- Extends the data model of all CAPIF APIs without any impact on the 3GPP defined data model for CAPIF.
- **Main Benefits**: Broaden the use/reuse of CAPIF in the industry (e.g., ETSI MEC requirements, CAMARA, GSMA OPG, etc.).
- Examples:
  - ✓ Use **other signalling protocols** (e.g., MQTT) or **serialization protocols** (e.g., XML) other than the 3GPP defined HTTP + JSON.
  - ✓ Provide **additional parameters** to describe the service APIs, other than the ones already defined by 3GPP.

Outline of the "**Vendor-specific extensions to the data model**" mechnism:

- The naming of a vendor-specific extension is defined as:

  "**vendorSpecific-nnnnnn**"

  - ✓ with "nnnnnn" set to the IANA vendor-specific member name**,** a domain name registered to the vendor **OR** a URN from the URN space managed by the vendor.
  - ✓ Ensures its uniqueness and differentiation from the 3GPP-defined attributes and the other vendor-specific extensions.
- **Only JSON objects (i.e., data types) can be extended**. Enumerations can be extended by either defining new values in 3GPP or using the above mechanism via a new extension.

```
PublishedApiPath:
      type: object
      description:>
        Represents the published API path within the
        same CAPIF provider domain.
      properties:
        ccfIds:
          type: array
          items:                          3GPP defined
            type: string
          minItems: 1
        vendorSpecific-urn:etsi:mec:my-ext:
          type: string                    Extension for ETSI MEC
```

3GPP TS 29.222 "Common API Framework for 3GPP Northbound APIs", Link here

3GPP CAPIF – Rel-18 work on extensibility (2/2)

2) CAPIF APIs **Retrieval/Discovery filters extensibility**:

- Mechanism Name: "**Vendor-specific query parameters**". Cf. clause 5.2.13.3 of TS 29.122 (**Link here**).
- Same objectives, mainly better support **AEFs defined outside 3GPP** (e.g., ETSI MEC).
- Extends the query parameters used in HTTP GET requests (e.g., target service APIs discovery request by an API Invoker) of all CAPIF APIs without any impact on the 3GPP defined query parameters.
- **Main Benefits**: Broaden the use/reuse of CAPIF in the industry (e.g., ETSI MEC requirements, CAMARA, GSMA OPG, etc.).

Outline of the "**Vendor-specific query parameters**" mechanism:

- The naming of a vendor-specific query parameter is defined as:

  "**vend-spec-<query parameter name>**"

- The value of the query parameter is defined as a JSON object containing the following parameters:

Attribute name	Data type	P	Cardinality	Description
target	string	M	1	Contains the JSON pointer (as per RFC 6901 [70]) to **the attribute in the resource representation that the provided vendor-specific query parameter is targeting**.
value	<Any simple or structured data structure>	M	1	Contains the **vendor-specific query parameter value**.

3GPP TS 29.122 "T8 reference point for Northbound APIs", Link here

- Example:

```
GET {apiRoot}/service-apis/<apiVersion>/allServiceAPIs?api-name=monitoring-events&vend-spec-event-type={"target":
"/vendorSpecific-urn:etsi:mec:my-ext", value: location}
```

3GPP CAPIF – Other CAPIF related work in 3GPP

Main other Rel-18 enhancements:

- **RNAA** (Resource-owner aware Northbound API Access):
  - ✓ Support the case where the owner of the resource targeted by an API call is not the initiator of the request.
  - ✓ Enables to get the consent of the end user prior to the consumption of a resource owned by the user.
  - ✓ CAPIF was hence extended to support the OAuth2.0 « **authorization code flow** » grant type for this purpose in addition to the already supported « client credentials » grant type.
- ✓ Various additional **protocol and interface enhancements** (e.g., API status information management, API Invoker onboarding expiration control, enhancements to the query filters for API logs retrieval and API discovery, CAPIF events reporting enhancements, etc.).
- ✓ Further enhancements to the security related requiements of CAPIF to support the above requirements, e.g., the security requirements for AEFs defined outside 3GPP is out of 3GPP scope. Cf. 3GPP TS 33.122 (**Link here**).

Main planned/ongoing Rel-19 enhancements:

- Further **RNAA** related enhancements (cf. ongoing Rel-19 study, link here), e.g.:
  - ✓ Progress the support of **authentication and Authorization related interactions between the Resource Owner and the CCF** (that plays the role of the OAuth2.0 Authorization Function for CAPIF and NBIs).
  - ✓ Support that **API invokers deployed within a UE accesses resources owned by other users**.
  - ✓ Support **more granular OAuth2.0 scopes** (more granular than API resouce/operation level scopes currently supported).
  - ✓ Any new requirements from other SDOs/industry forums to further foster the reusability of CAPIF in the industry.
- Definition of new "**guide**" **on CAPIF usage**: **3GPP TR 23.946** (**Link here**).

3GPP TS 23.222 "Common API Framework for 3GPP Northbound APIs", Link here
3GPP TS 29.222, "Common API Framework for 3GPP Northbound APIs", Link here
3GPP TS 33.122, "Security aspects of Common API Framework (CAPIF) for 3GPP northbound APIs", Link here

Re-use of 3GPP CAPIF in ETSI MEC

The 3GPP CAPIF API registry and the ETSI MEC service management solve the same problem (differently) and offer synergy potential.

To align, ETSI MEC has defined a profile of CAPIF, re-using the CAPIF service registration, discovery and announcement functionalities.

Similarities between 3GPP CAPIF API Registry and MEC Service Management

MEC Service Management	CAPIF API Registry
Register Service	Publish Service API
Discover Service	Discover Service API
Notify Service Changes	Events API

Differences between 3GPP CAPIF API Registry and MEC Service Management

MEC Service Management	CAPIF API Registry
REST+JSON + alternative API architectures (protocols, data formats)	REST+JSON only
REST APIs: Endpoint only	REST APIs: Endpoint and structure (resources, methods)
Discovery filters: core set + MEC specific	Discovery filters: core set + CAPIF specific
REST security: MEC profile of OAuth	REST security: TLS-PSK, PKI, 3GPP profile of OAuth
Security for alternative API architectures	n/a

Requirements for the mapping

MEC has identified the following requirements for CAPIF extensibility:

a) **Allow** ETSI ISG MEC **to extend enumerations**, e.g., for data formats, protocols and security mechanisms, without breaking "native" CAPIF API invokers

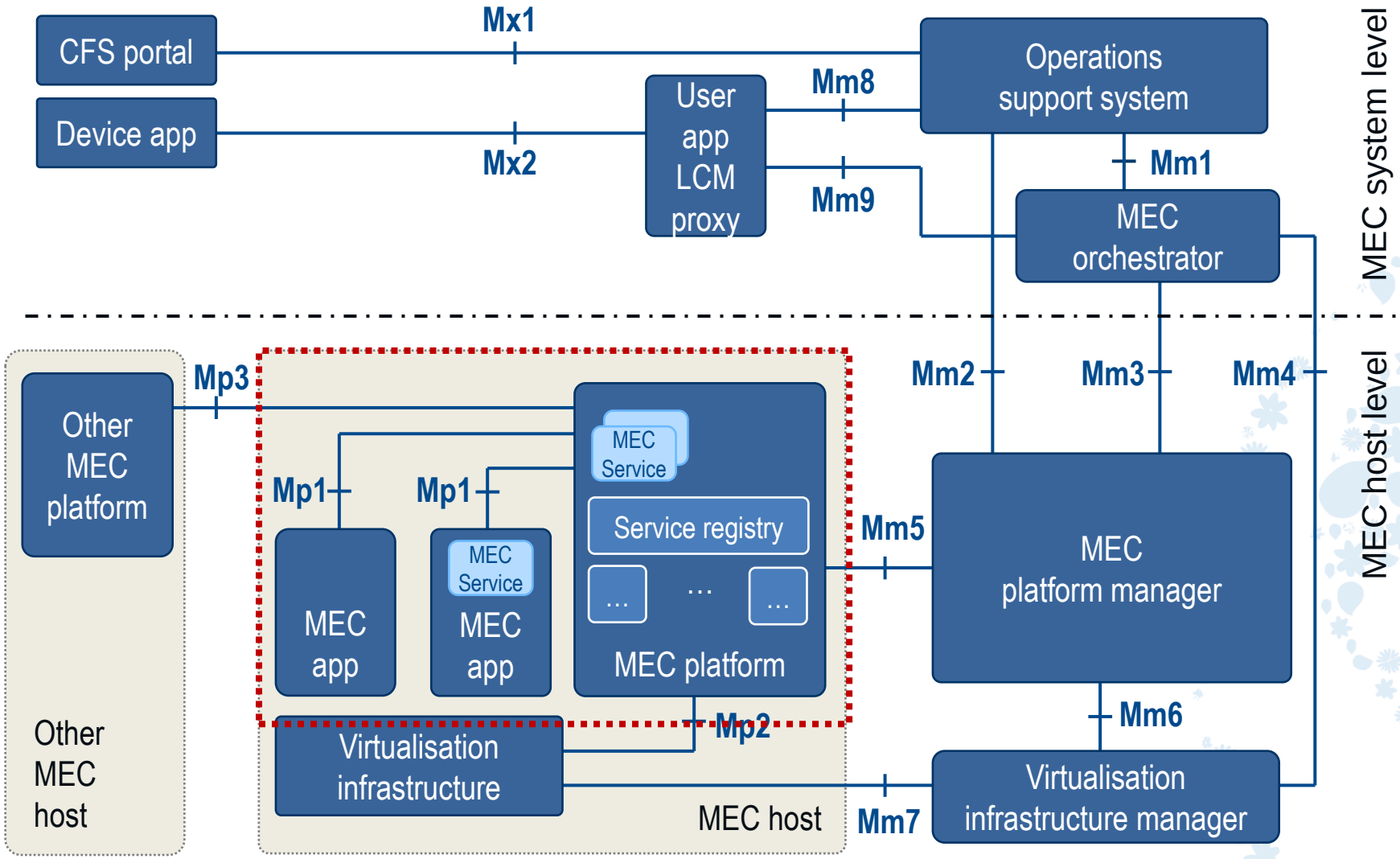
b) **Support extension containers for additional** (e.g. MEC-specific) **information** during service API publication that can be returned as part of the service API discovery result.

c) **Provide a mechanism that allows** definition of **additional filtering criteria** for service API discovery queries.

MEC has suggested these requirements to 3GPP in September 2022.

These are now met by CAPIF extensibility mechanisms defined in 3GPP Rel-18.

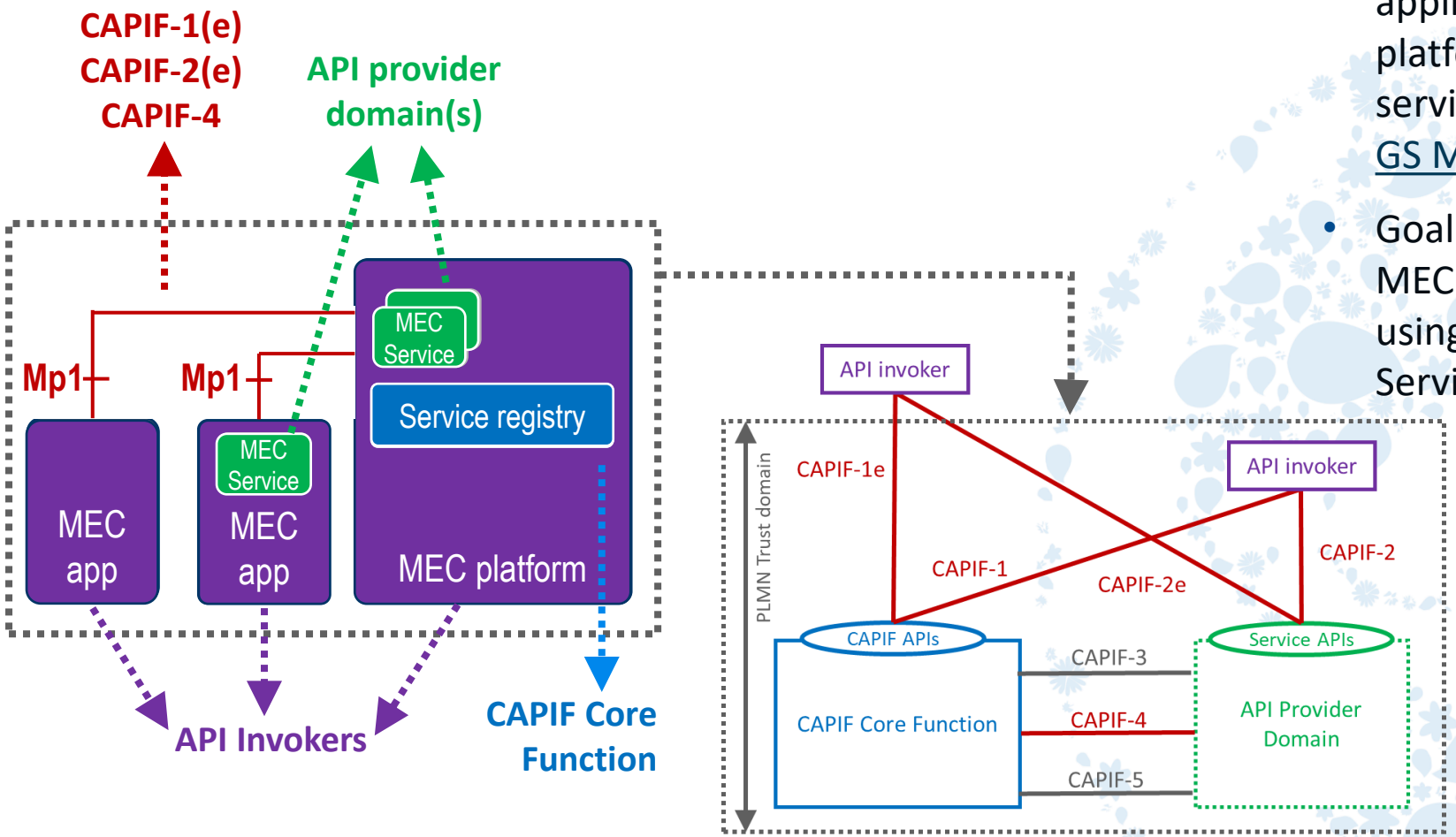
Mapping MEC and CAPIF Architectures



- ETSI MEC enables MEC applications and the MEC platform to provide MEC services via APIs - see ETSI GS MEC 011 V3.2.1
- Goal: Harmonization of MEC with 3GPP by re-using CAPIF for the MEC Service registry

See ETSI GS MEC 003 V3.2.1 "Framework and Reference Architecture"

Mapping MEC and CAPIF Architectures



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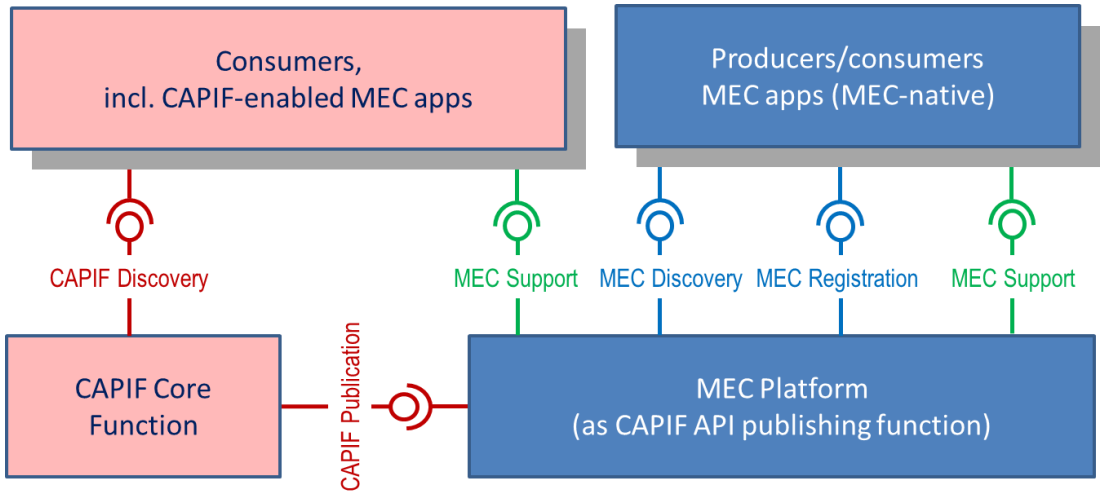
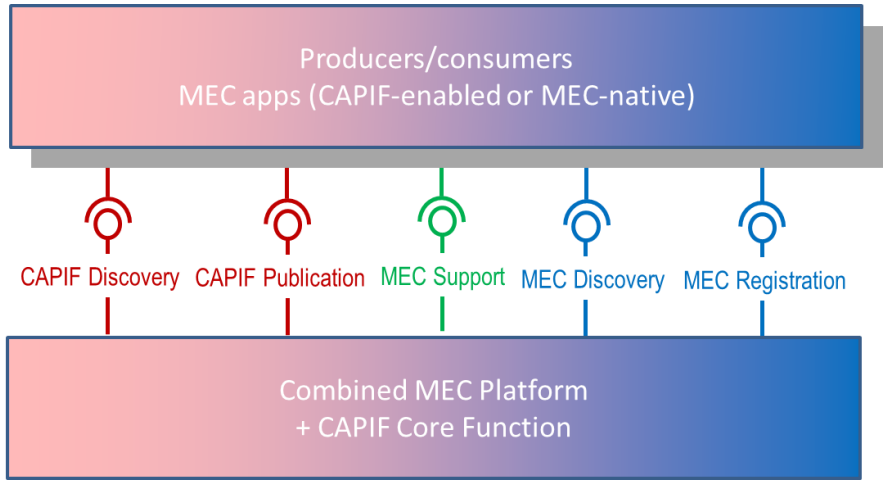
Harmonized deployment examples

Cascaded deployment



Combined deployments



See ETSI GR MEC 031 V 2.1.1 „MEC 5G Integration“

Mapping of the URI structures

CAPIF

{apiRoot}/published-apis/{apiVersion}

- /{apfId}
  - /service-apis
    - /{serviceApiId}

{apiRoot}/service-apis/{apiVersion}

- /allServiceAPIs
- /allServiceAPIs?vend-spec-etsi-mec-ser-instance-id={serviceId}

{apiRoot}/capif-events/{apiVersion}

- /{subscriberId}
  - /subscriptions
    - /{subscriptionId}

MEC

{apiRoot}/mec_service_mgmt/{apiVersion}

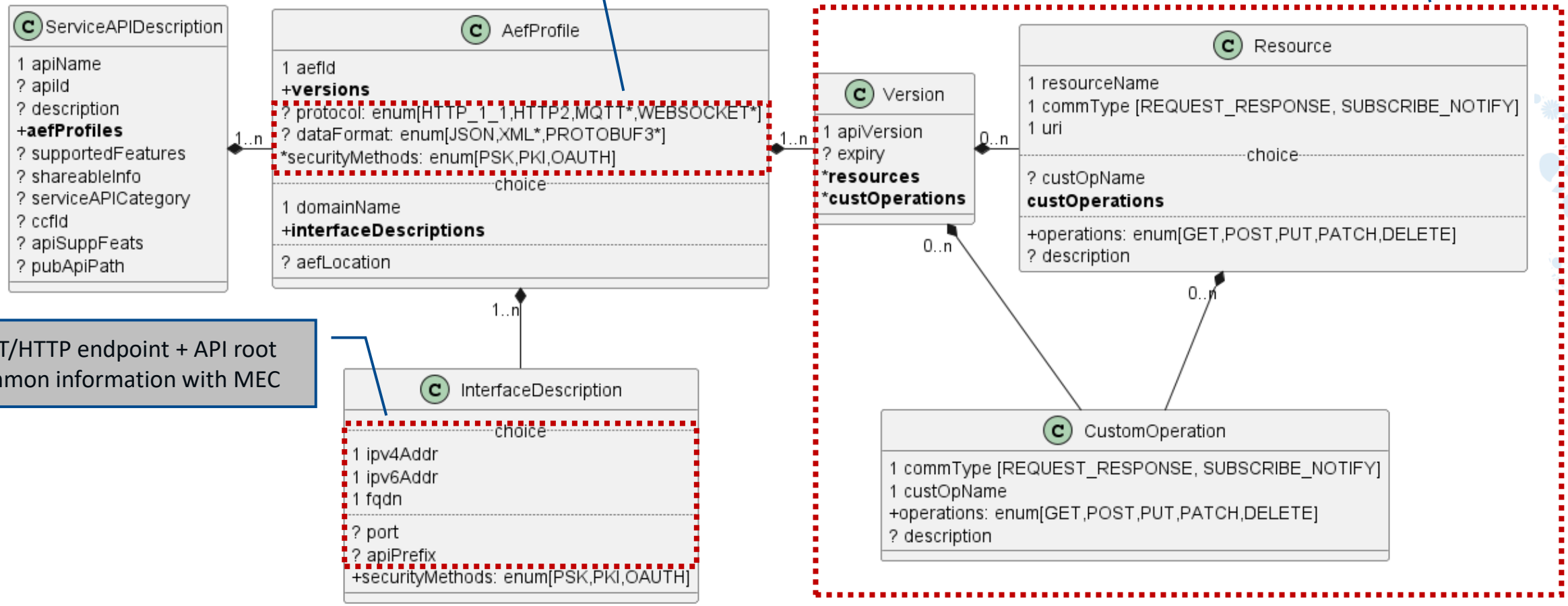
- /applications
  - /{appInstanceId}
    - /services
      - /{serviceId}
    - /subscriptions
      - /{subscriptionId}
- /services
  - /{serviceId}
- /transports

API registration/publication
API discovery
Subscription
App identifiers
Resource not mappable

CAPIF Service API Description data model

- enumerations for 3GPP AEFs
- plus some pre-defined ones for external AEFs
- not used by MEC

- detailed resource model for REST/HTTP only
- not supported in MEC
- but not contradicting MEC either



- REST/HTTP endpoint + API root
- common information with MEC

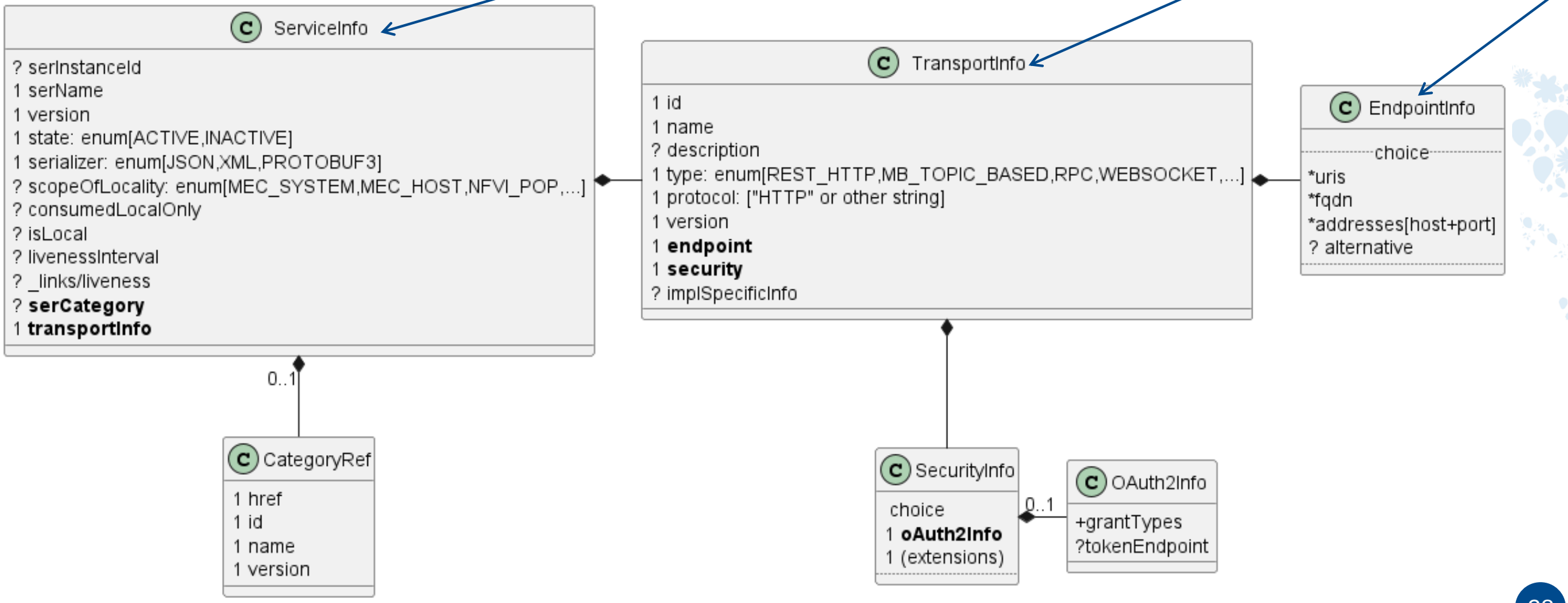
Based on data type definitions in 3GPP TS 29.222 V 18.5.0 "Common API Framework for 3GPP Northbound APIs"

Mapping MEC service data model to CAPIF

Maps to CAPIF ServiceAPIDescription
+ vendorSpecific-urn:etsi:mec:capifext:service-info

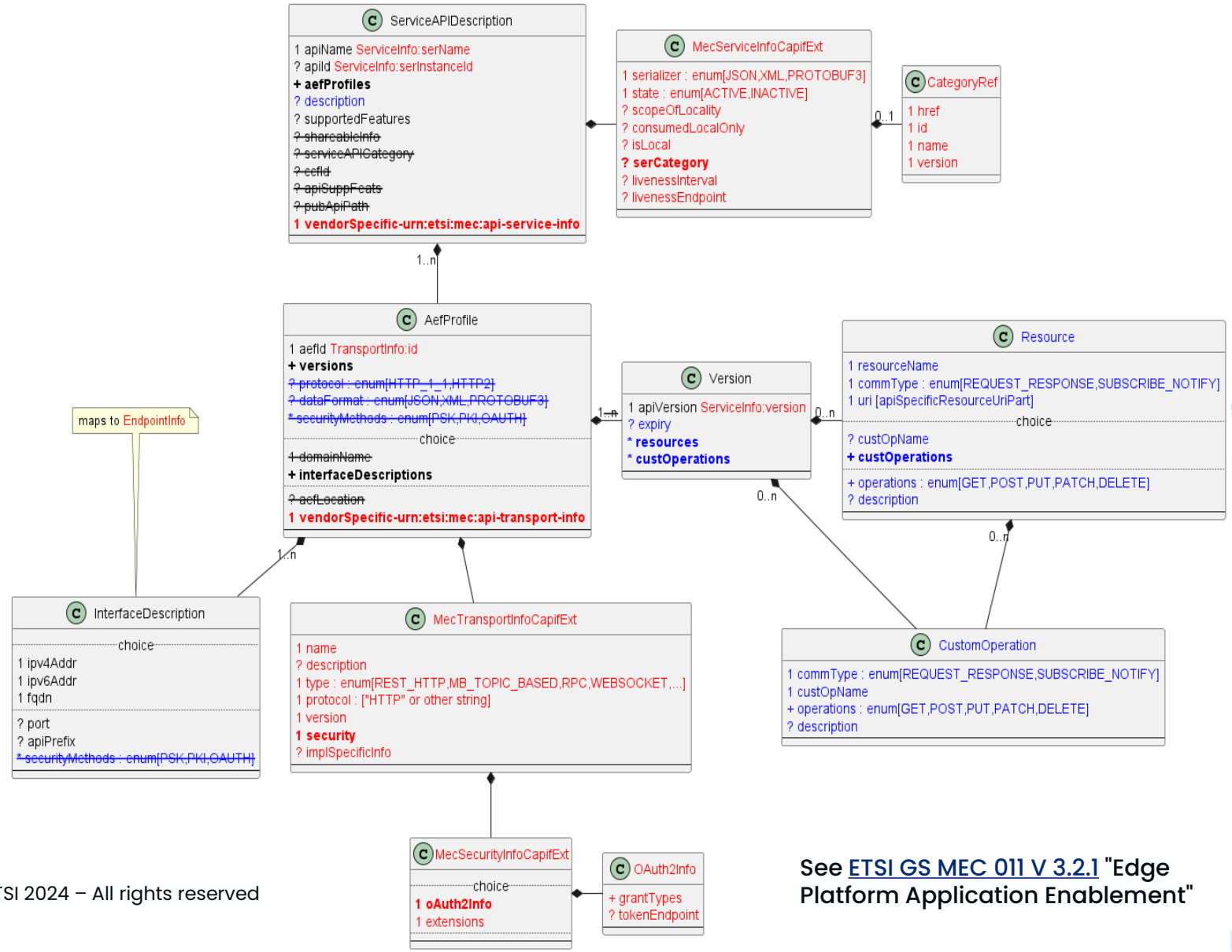
Maps to CAPIF AefProfile
+ vendorSpecific-urn:etsi:mec:capifext:transport-info

Maps to CAPIF InterfaceDescription



Based on data type definitions in ETSI GS MEC 011 V 3.2.1 "Edge Platform Application Enablement"

MEC profile of CAPIF (service data model)



See ETSI GS MEC 011 V 3.2.1 "Edge Platform Application Enablement"

Mapping operations

- Certain CAPIF attributes have the same meaning as certain MEC attributes. We can map these.
  Typography: capifAttr mecAttr
- Some optional CAPIF machinery is not relevant for MEC, not even in hybrid MEC/3GPP deployments – profile this out. Typography: ~~strike out~~
- Some optional CAPIF service description attributes are not relevant for MEC – but it does not harm having them – leave them in. Typography: blue.
- MEC defines alternatives for some CAPIF constructs (protocol, serializer, security). So, native MEC implementations will use the MEC alternatives *only*. The parallel use of the CAPIF definitions In hybrid MEC/ 3GPP deployments is for future work. Typography: ~~blue~~
- Certain MEC attributes are not available in CAPIF. These are included in extension containers. Typography: red
- Some attributes refer to other classes via aggregation.
  Typography: **bold** / **bold** / **bold**

Use of the CAPIF enum and query protocol extension mechanisms in ETSI MEC

Enum extensions

- CAPIF enums for protocol, data format and security method are **not** used by MEC signalling.
- Instead, MEC-specific protocol, data format and security method are signalled in the **MEC extension containers**.

Discovery query extensions

MEC-specific query parameters not supported by CAPIF are realized as query extensions:

- `vend-spec-etsi-mec-ser-instance-id`
- `vend-spec-etsi-mec-ser-category-id`
- `vend-spec-etsi-mec-scope-of-locality`
- `vend-spec-etsi-mec-consumed-local-only`
- `vend-spec-etsi-mec-is-local`

original MEC para-meter names

CAPIF and MEC harmonization
Key takeaways

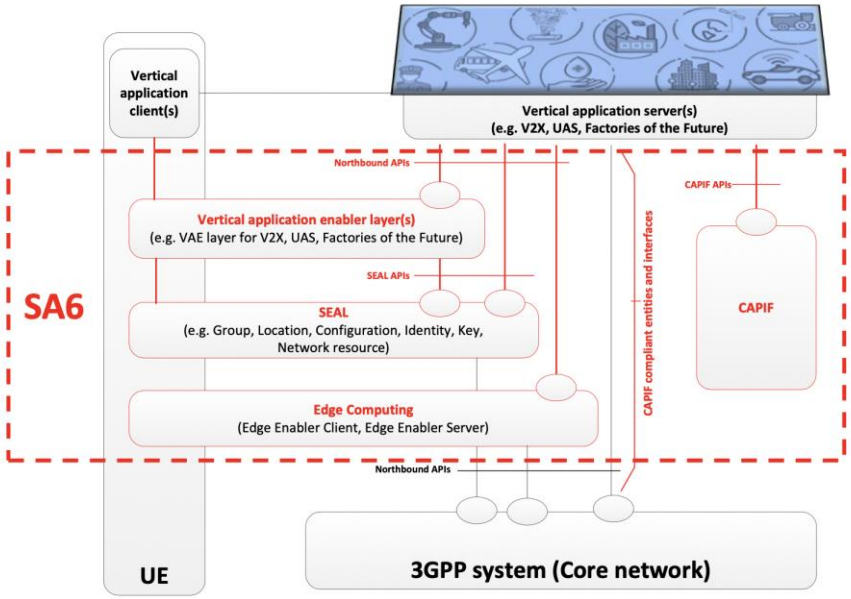
- ETSI ISG MEC has defined the MEC profile of CAPIF as part of its phase 3 work.
- This profile
  - represents a CAPIF-based realization of the MEC service management
  - re-uses the CAPIF services for API publication, API discovery and API events
  - adds MEC specifics to CAPIF using the CAPIF extensibility mechanisms defined by 3GPP in Rel. 18
  - enables consistent API exposure across MEC and 3GPP deployments
  - is defined in clause 9 of ETSI MEC 011 V3.2.1 “Edge Platform Application Enablement”
- Good example of fruitful collaboration across industry fora
  - 3GPP has defined extension mechanisms for third parties in CAPIF Rel. 18, considering MEC requirements
  - ETSI MEC uses these mechanisms to enable synergies between MEC and 3GPP API standards

Presentation from

OpenCAPIF by ETSI

What is OpenCAPIF?

- In 3GPP **Release 15** (Refer to 3GPP TS 23.222, TS 29.222 and TS 33.122) the Common API Framework (**CAPIF**) was introduced to
  - Enable a unified **Northbound API framework** across 3GPP network functions, and
  - Ensure that there is a **single and harmonized approach for API development**
- CAPIF provides a **framework to host network and service APIs** of PLMN and from 3rd party domain.
- CAPIF has been integrated with Northbound APIs such as **SCEF/NEF**
- **OpenCAPIF** is an **open source** implementation of the **CAPIF** framework, as defined in **3GPP,** allowing to expose and invoke APIs in a secure and consistent way



OpenCAPIF website: https://ocf.etsi.org/
OCF code: https://labs.etsi.org/rep/ocf/capif

The ETSI SDG OpenCAPIF (OCF) genesis

ETSI SDGs

Developing software alongside standards can provide the following benefits:

- Earlier validation of standards
- Accelerated standardization process through faster and regular feedback
- Improved quality of standards
- Increased adoption of standards through availability of software and tools

Why OpenCAPIF?

Multiple signs shows that we enter an “API era”

- The Service Based Architecture paradigm
- The microservice programming paradigm
- The Telecom API market
- The API production/certification projects (CAMARA, TM FORUM, GSMA Open Gateway)

Related 3GPP specifications for a Common API Framework (CAPIF) are available (since Rel.15) but till now **there was no open implementation**; So, the CAPIF potential is not fully revealed yet!

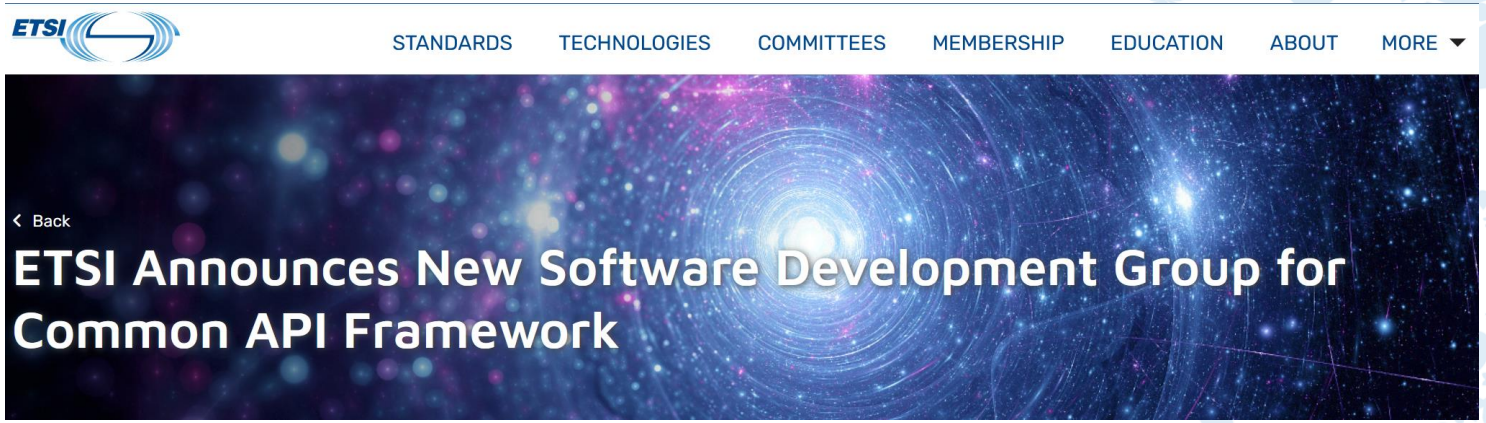
The ETSI SDG OpenCAPIF (OCF) genesis

CAPIF initial implementation efforts

An initial, yet mature, implementation emerged in **https://evolved-5g.eu/** project, by **TELEFONICA** and **FOGUS INNOVATIONS & SERVICES P.C.**

The key milestones

- CAPIF development partners and ETSI engaged in **expression of interest** in March 2023
- SDG Open CAPIF **submission request** in July 2023
- SDG Open CAPIF was discussed at **ETSI Board** and **approved by ETSI D-G** in September 2023
- SDG Open CAPIF was announced in November 2023

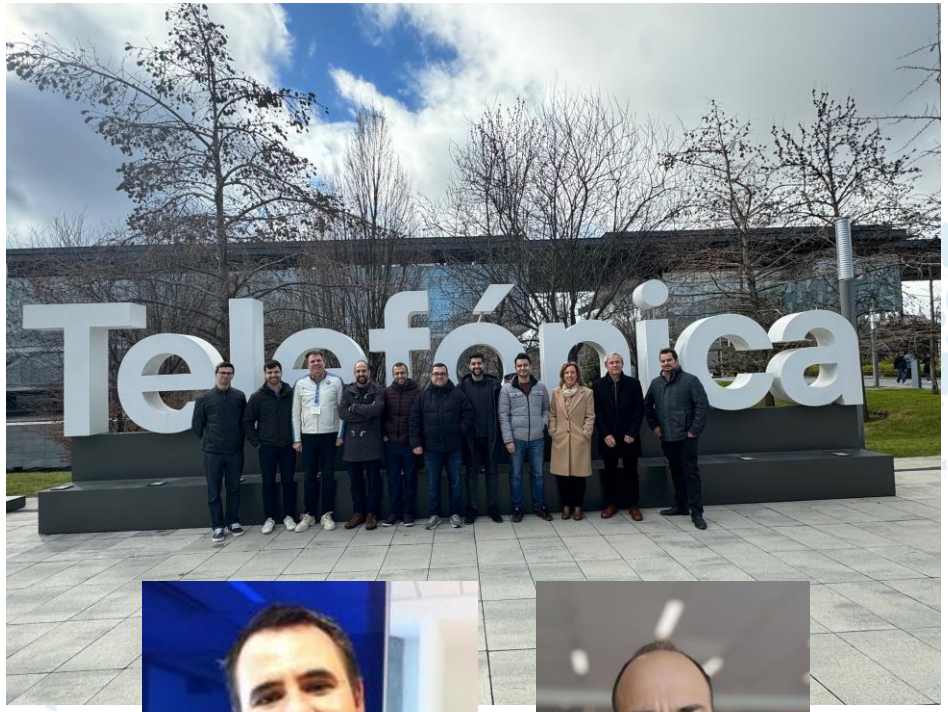


The ETSI SDG OpenCAPIF (OCF) genesis

- **OpenCAPIF Kick-off** meeting took place at Telefónica HQ in Spain in Jan 2024.
- **First Release of the code (0.0)** published during Kick-Off meeting
- Next Release targeted by **June 2024**

Conf Calls for **OpenCAPIF**:

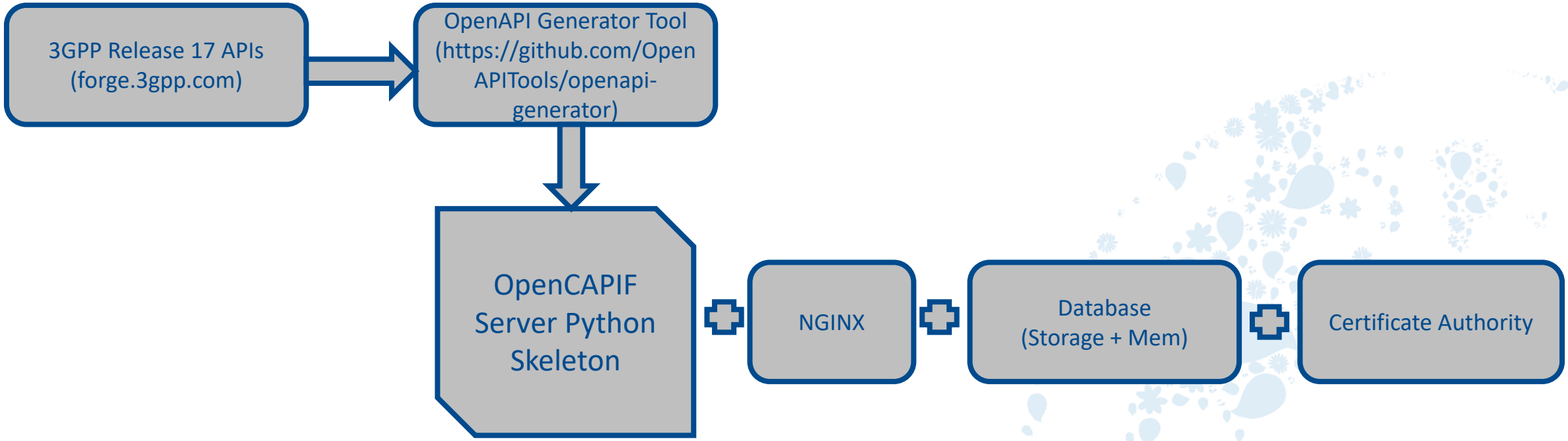
Conf-Call	Group	Recurrence	Day	Time
OCF TECH	TECH	Bi-weekly	Friday	11-12 CET



OCF Chair
David Artuñedo
(TEF)

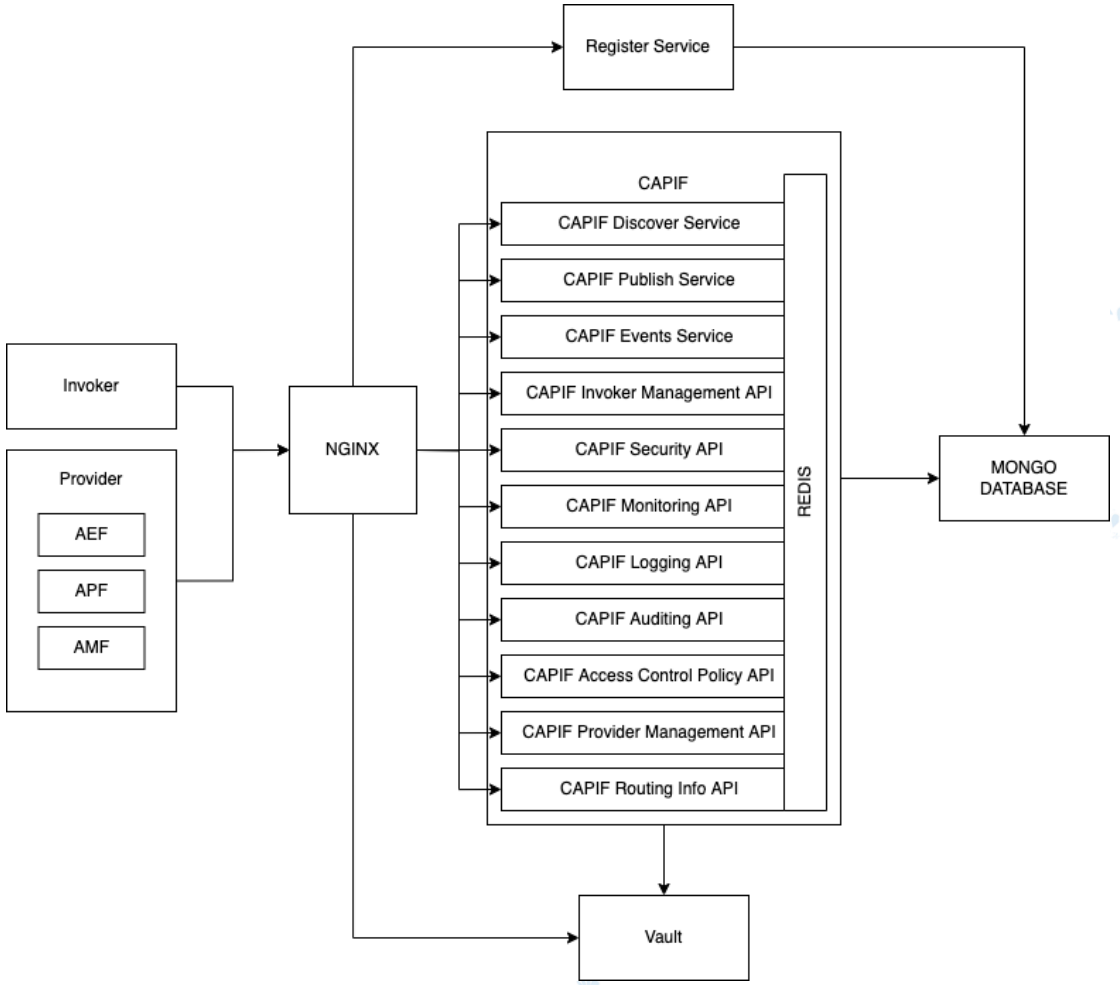
OCF Vice Chair
Dimitris Tsolkas
(FOGUS)

OpenCAPIF Implementation



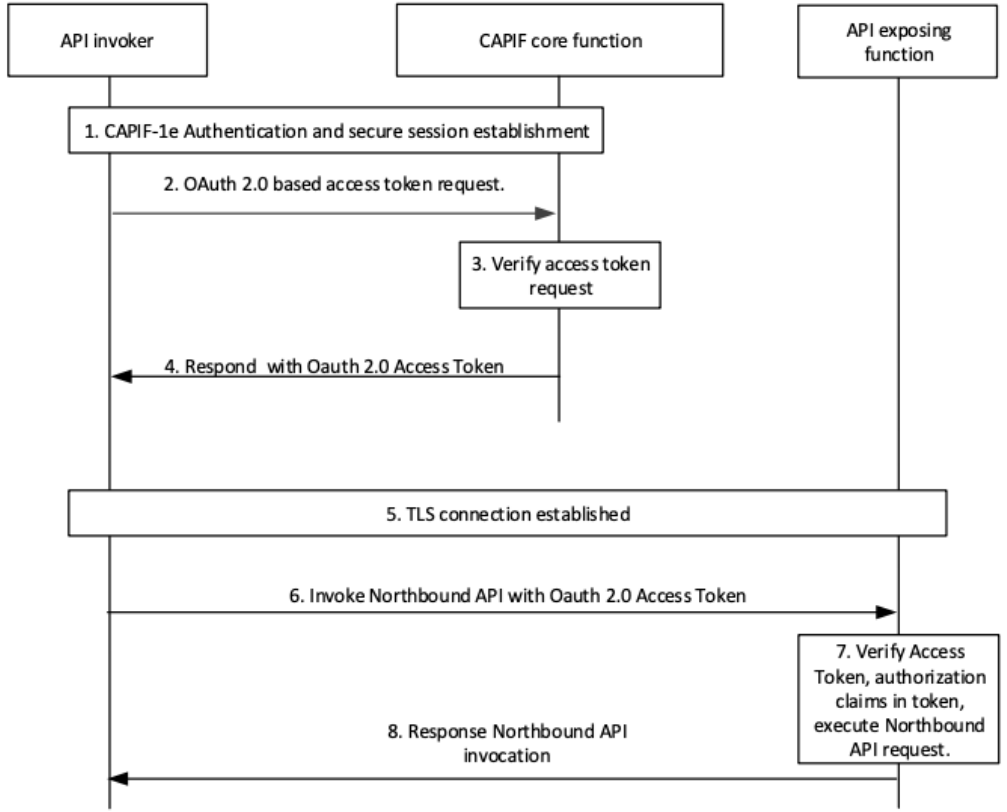
OpenCAPIF Implementation aspects

- **NGINX** exposes CAPIF Core Function Services with **mutual TLS** authentication
- We use **VAULT** as the Certificate Authority to expedite Certificates
- All data is stored in **MongoDB**
- **REDIS** manages CAPIF **Events** Generation and Notifications
- Each CAPIF service is a separate **Container**
- CAPIF Core Function deploys in **Kubernetes**
- **Testing** implemented in **RobotFramework**

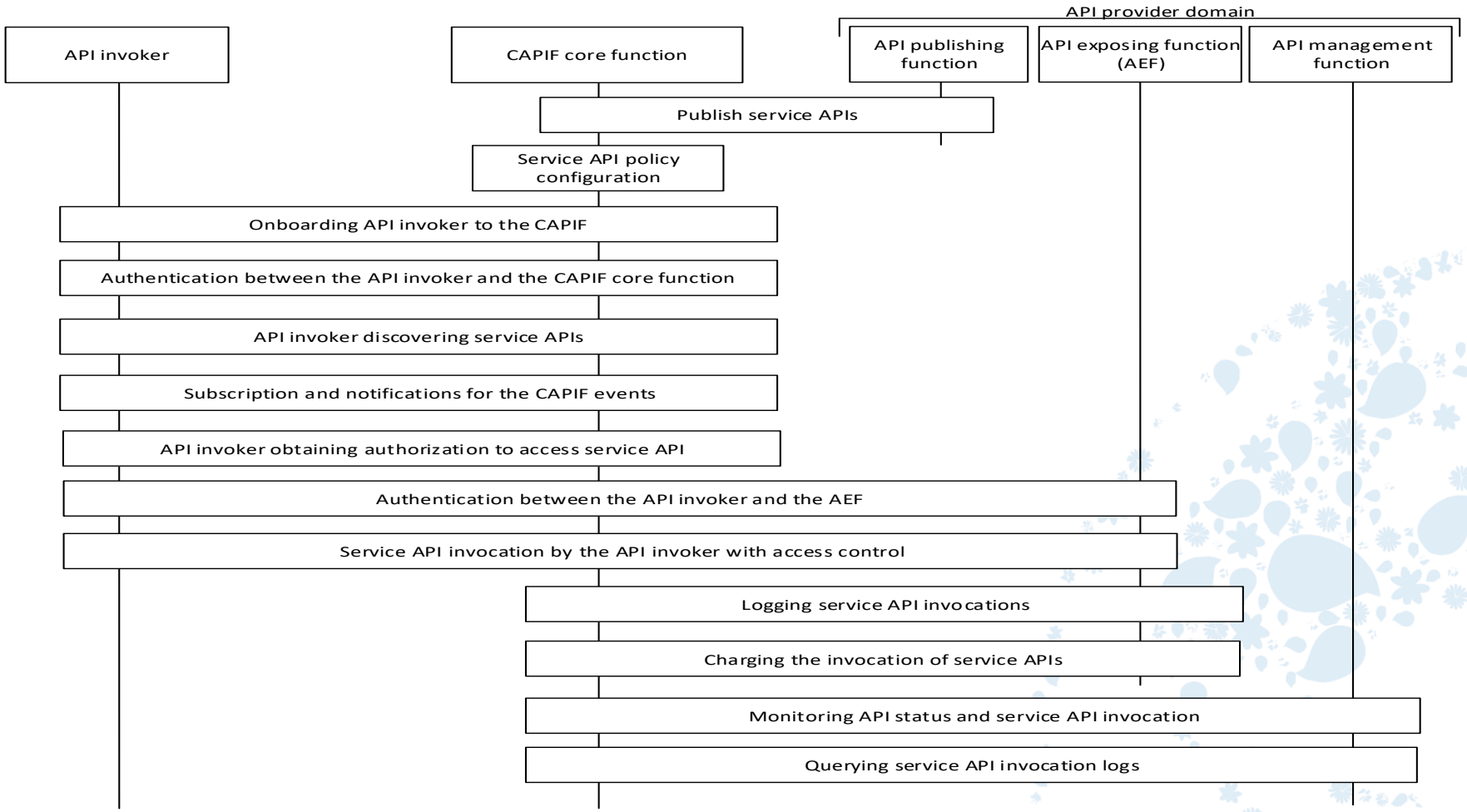


OpenCAPIF Security

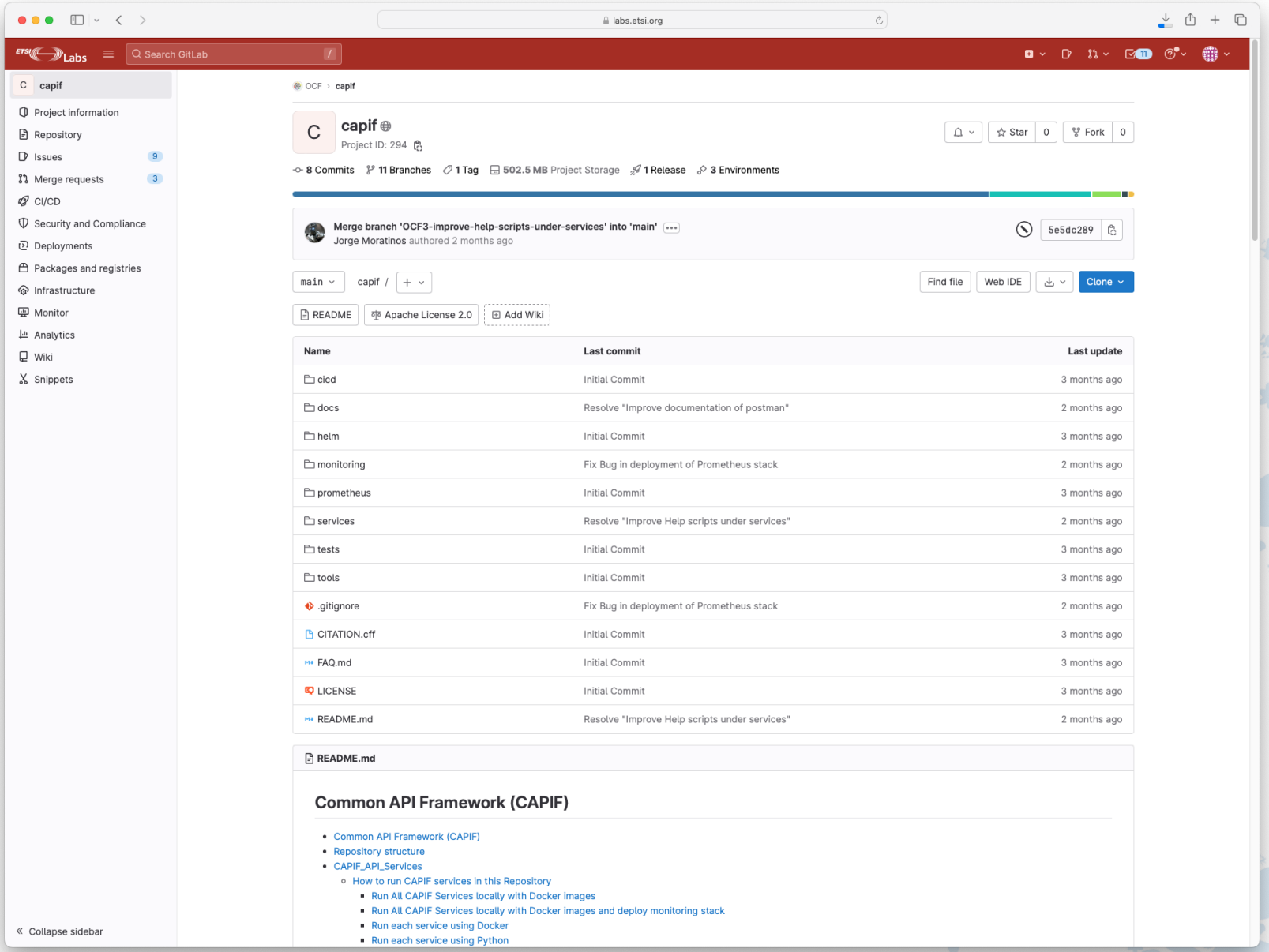
- **CAPIF Core Function** communication with API Invokers and API Providers is based in **TLS mutual authentication**
- CAPIF Core Function developed includes a **Certificate Authority** to expedite Certificates for API Invokers and API Providers
- **API Consumption** between API Invokers and API Providers supports **three security** mechanisms:
  1. Pre-Shared Key
  2. Certificates
  3. OAuth 2.0 Tokens



OpenCAPIF Flows

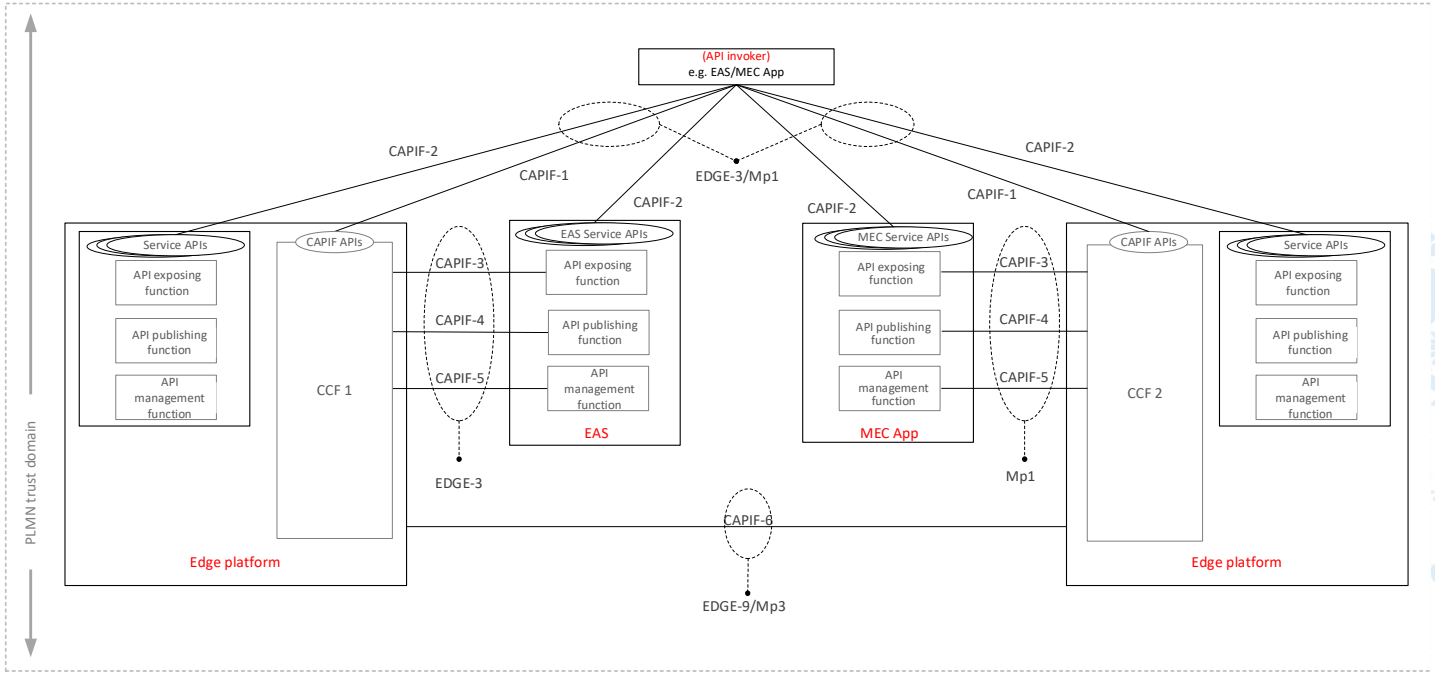


OpenCAPIF Code <https://labs.etsi.org/rep/ocf/capif>

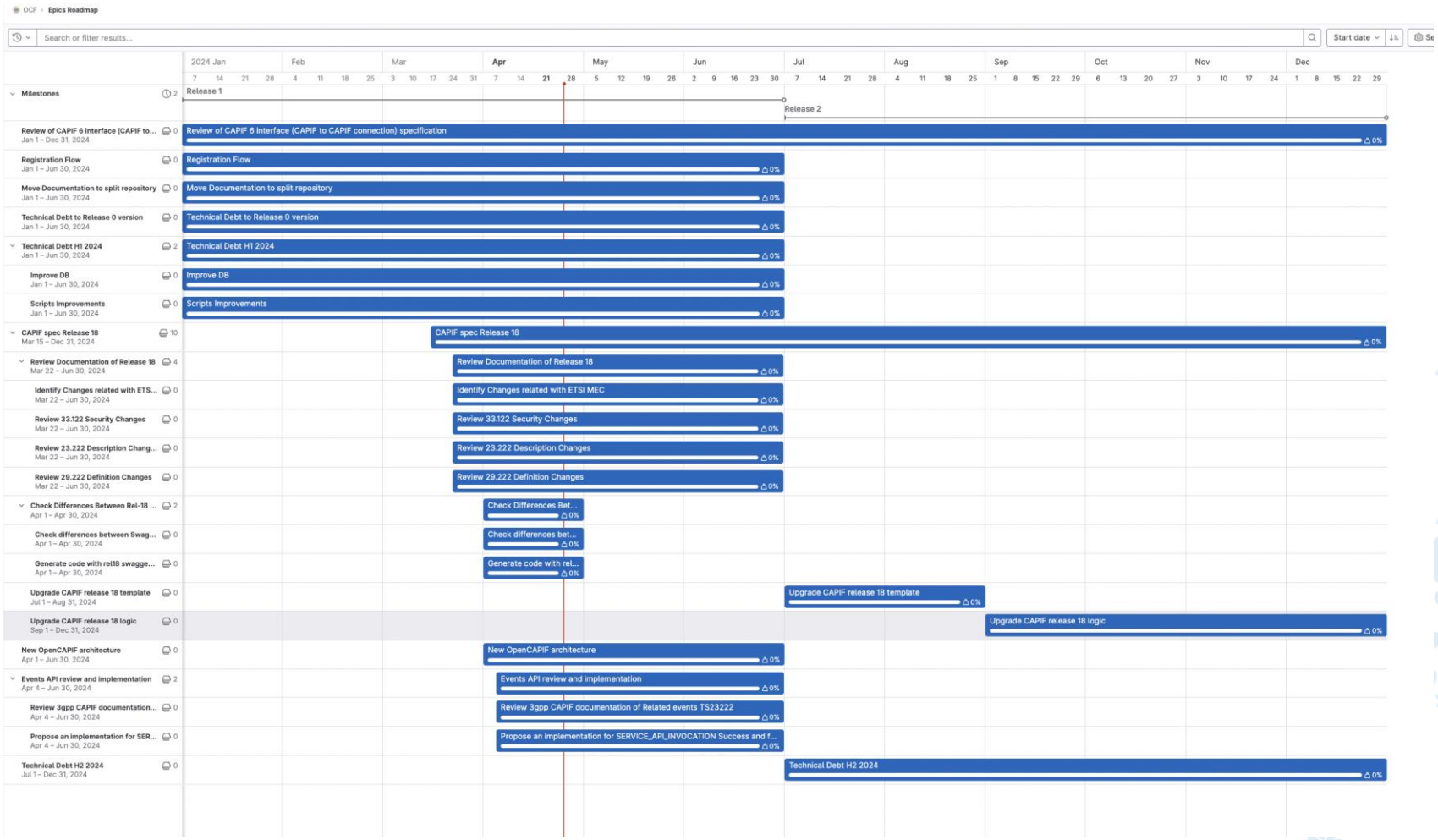


OpenCAPIF & ETSI MEC

- **CAPIF** framework is aligned between 3GPP **EDGEAPP** and **ETSI MEC** architectures (TS 23.958 Rel-18).
- An **Edge application** acting as a CAPIF **API invoker** can discover and invoke Edge platform services from 3GPP **EDGEAPP**, and **ETSI MEC**.
- **EAS-EES/MEC Platform** defined as **API Provider**
- **CCF to CCF** communication on **CAPIF-6** reference point



OpenCAPIF Roadmap 2024



TWO Releases are planned for 2024:

- **CAPIF-6 reference point (add config to discover other CCFs)**
- **Upgrade to 3GPP Release 18 APIs (new Events APIs)**
- **Resource Owner-aware northbound API Access (RNAA) model (CAPIF-8 is not specified in Rel-18)**
- **Collaborate with ETSI MEC on CAPIF Extensibility**

OpenCAPIF & 3GPP

3GPP TR 23.946 V0.3.0 (2024-03)

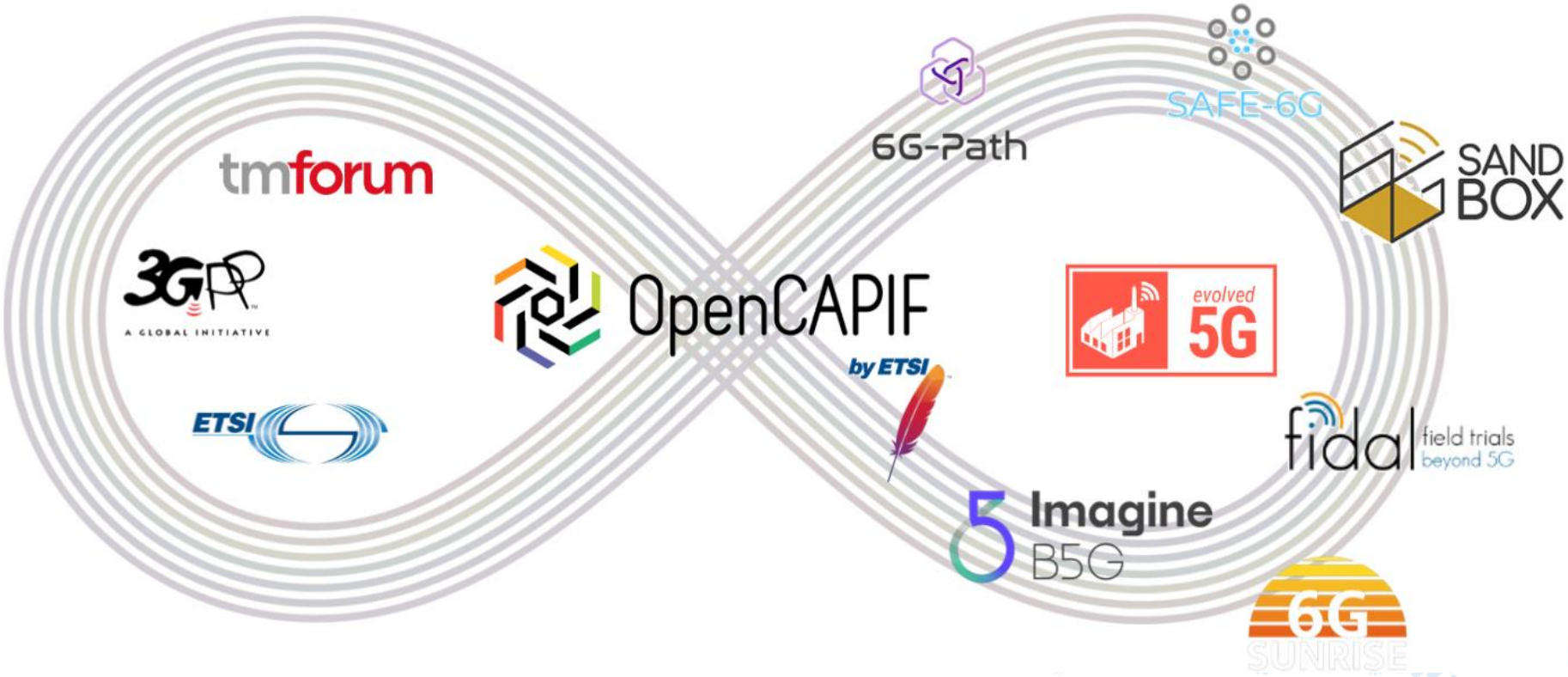
Technical Report

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Guidelines for CAPIF Usage;
(Release 19)

6 Exemplary Use Cases and Adoption 10
6.1 ETSI MEC deployment based on CAPIF 10
6.2 Open-source implementation of CAPIF 10
6.3 NEF Publishes an API 11
7 Summary 14
Annex A (informative): Change history 15

Rapporteur: Junpei Uoshima (NTT DOCOMO)

OpenCAPIF Research Ecosystem



https://ocf.etsi.org/research/

Engage with OpenCAPIF

Participation is free for ETSI members, SMEs, Universities, Public Research Bodies and User and Trade Associations.

Join us by signing the SDG OCF Agreement

https://portal.etsi.org/ocf

https://ocf.etsi.org

https://labs.etsi.org/rep/ocf

@OpenCAPIF

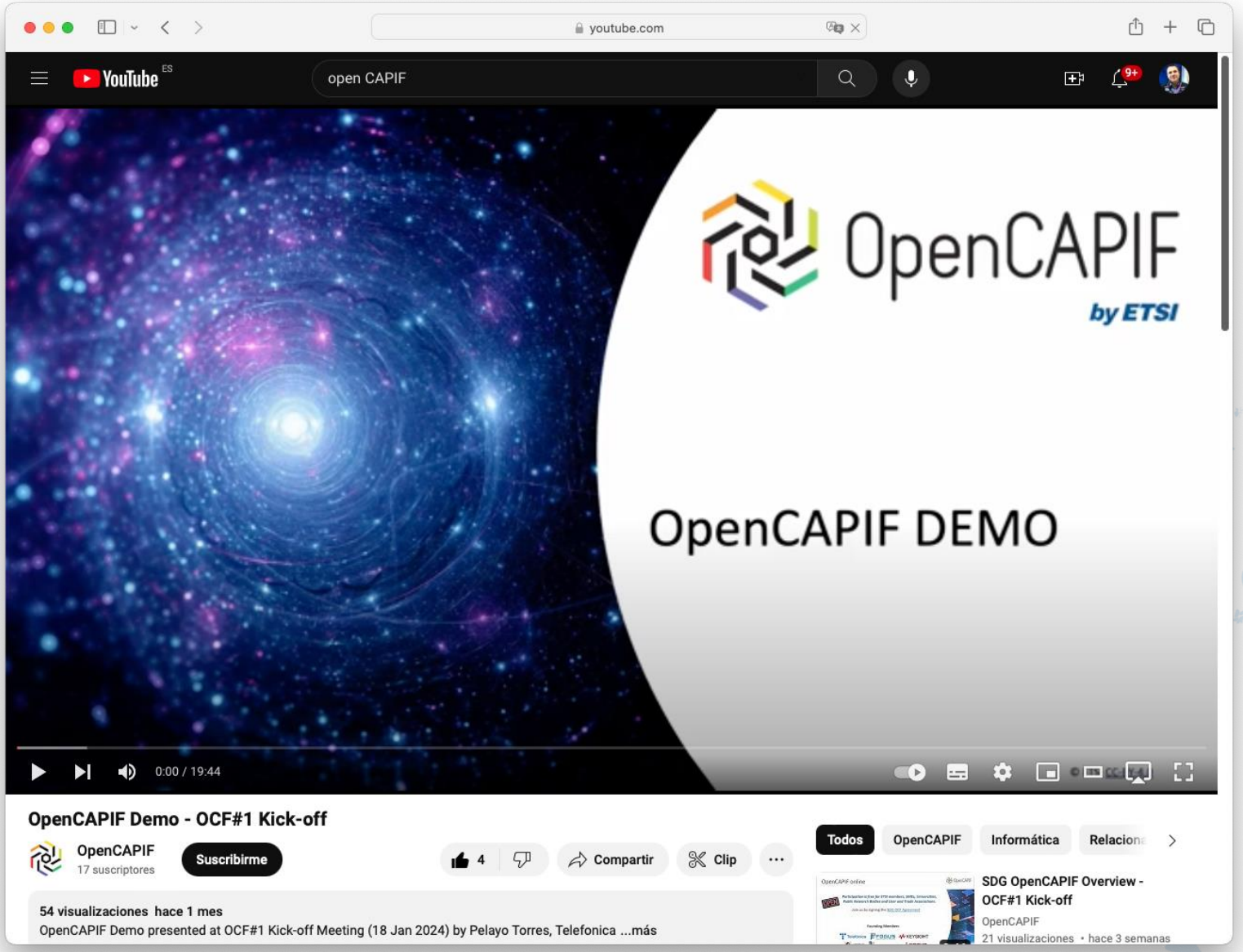
@OpenCAPIF

@OpenCAPIF

https://OpenCAPIF.slack.com (invite)

OCF_INFO@list.etsi.org

OpenCAPIF Demo in YouTube



https://www.youtube.com/watch?v=pXTAjzhAVwg

Q&A live session

Dario Sabella, ETSI ISG MEC Chair, Intel
Abdessamad El Moatamid, 3GPP CT3 Delegate, Huawei
Uwe Rauschenbach, ETSI ISG MEC Vice Chair, Nokia
David Artunedo, ETSI SDG OpenCAPIF Chair, Telefonica
Dimitris Tsolkas, ETSI SDG OpenCAPIF Vice Chair, FOGUS

Conclusion and way forward

Final Remarks

- Multiple signs shows that we enter an "*API era*"
  - The Service Based Architecture paradigm
  - The microservice programming paradigm
  - The Telecom API market
  - The API production/certification projects (CAMARA, TM FORUM, GSMA Open Gateway)
- ETSI MEC standards in the area of API exposure made great progresses in Phase 3 (2021-2023)
  - ETSI ISG MEC is producing open standards allowing multiple implementations and ensuring interwork
  - When it comes to "MEC in 5G", ETSI MEC phase 3 aligned with 3GPP Rel. 18 to facilitate adoption and interoperability
- The Common API Framework (CAPIF) defined in 3GPP is an essential and open tool to enable exposure and consumption of Northbound and Application Layer " APIs.
  - Not only ETSI MEC invokers can use CAPIF, but also other external fora.
  - Also APIs defined by other organizations can be consumed by MEC or 3GPP invokers.
  - This open mechanism makes CAPIF an ideal reference for API gateway in other fora, e.g. CAMARA project.
- ETSI MEC Phase 3 and 3GPP Rel.18 provide coherent specifications to support the usage of CAPIF for API exposure, also when the API invoker is outside the PLMN trust domain or the ECSP trust domain.
- Finally, the OpenCAPIF initiative provides an open implementation of CAPIF that helps further and wider adoption from the ecosystem.

Thank you for your attention

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