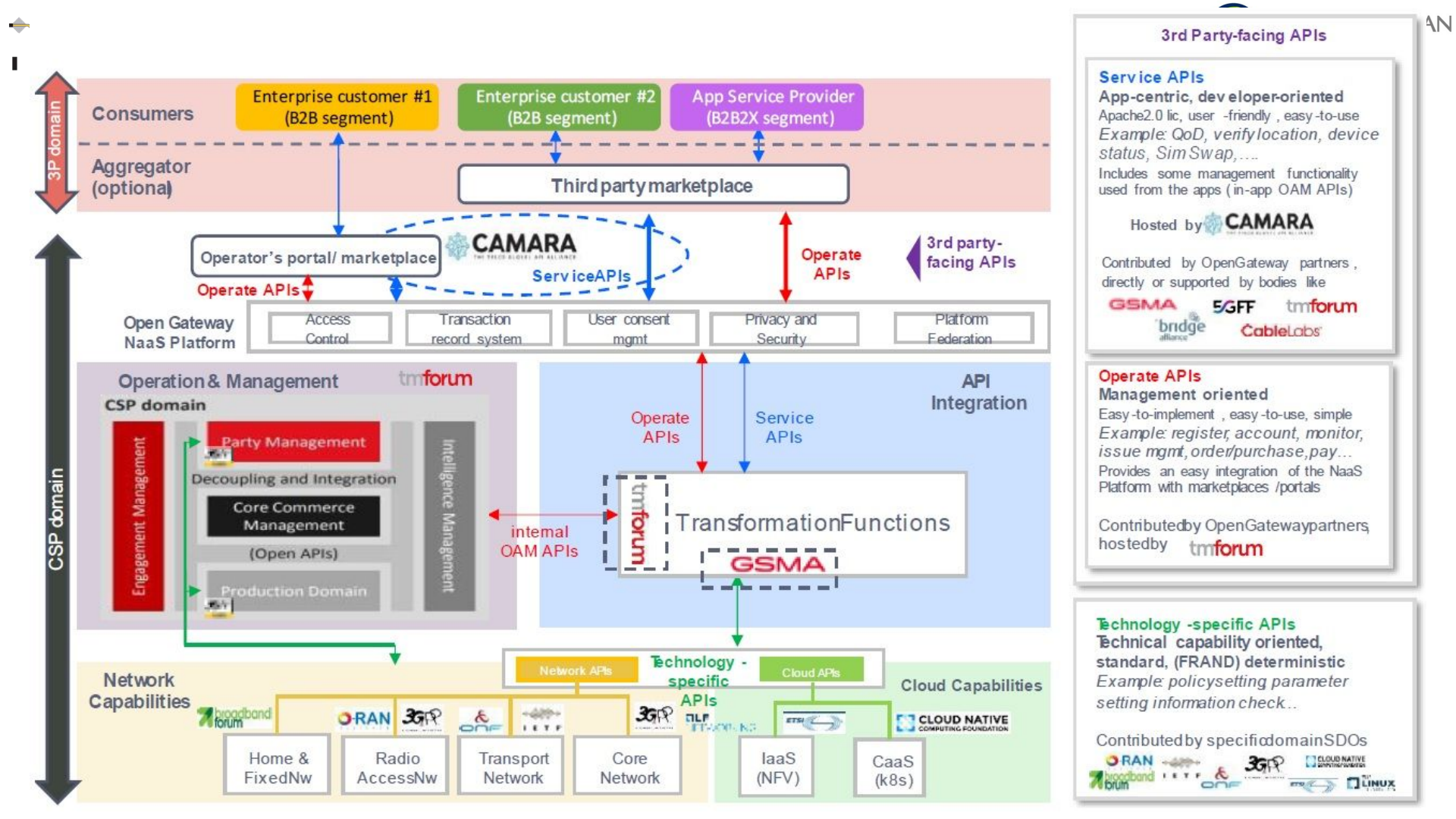
Side Meeting - MONM - IETF119

Open Source Frameworks for IBN-based Management and Automation

Presenter: Yiwen Shen (Chris), Ph.D.
Sungkyunkwan Univ., South Korea



3rd Party-facing APIs

Service APIs

App-centric, developer-oriented

Apache2.0 lic, user -friendly , easy-to-use

Example: QoD, verify location, device status, Sim Swap, ….

Includes some management functionality used from the apps (in-app OAM APIs)

Hosted by CAMARA

Contributed by OpenGateway partners , directly or supported by bodies like

GSMA 5GFF tmforum bridge alliance CableLabs

Operate APIs

Management oriented

Easy-to-implement , easy-to-use, simple

Example: register, account, monitor, issue mgmt, order/purchase, pay…

Provides an easy integration of the NaaS Platform with marketplaces /portals

Contributed by OpenGateway partners, hosted by tmforum

Technology -specific APIs

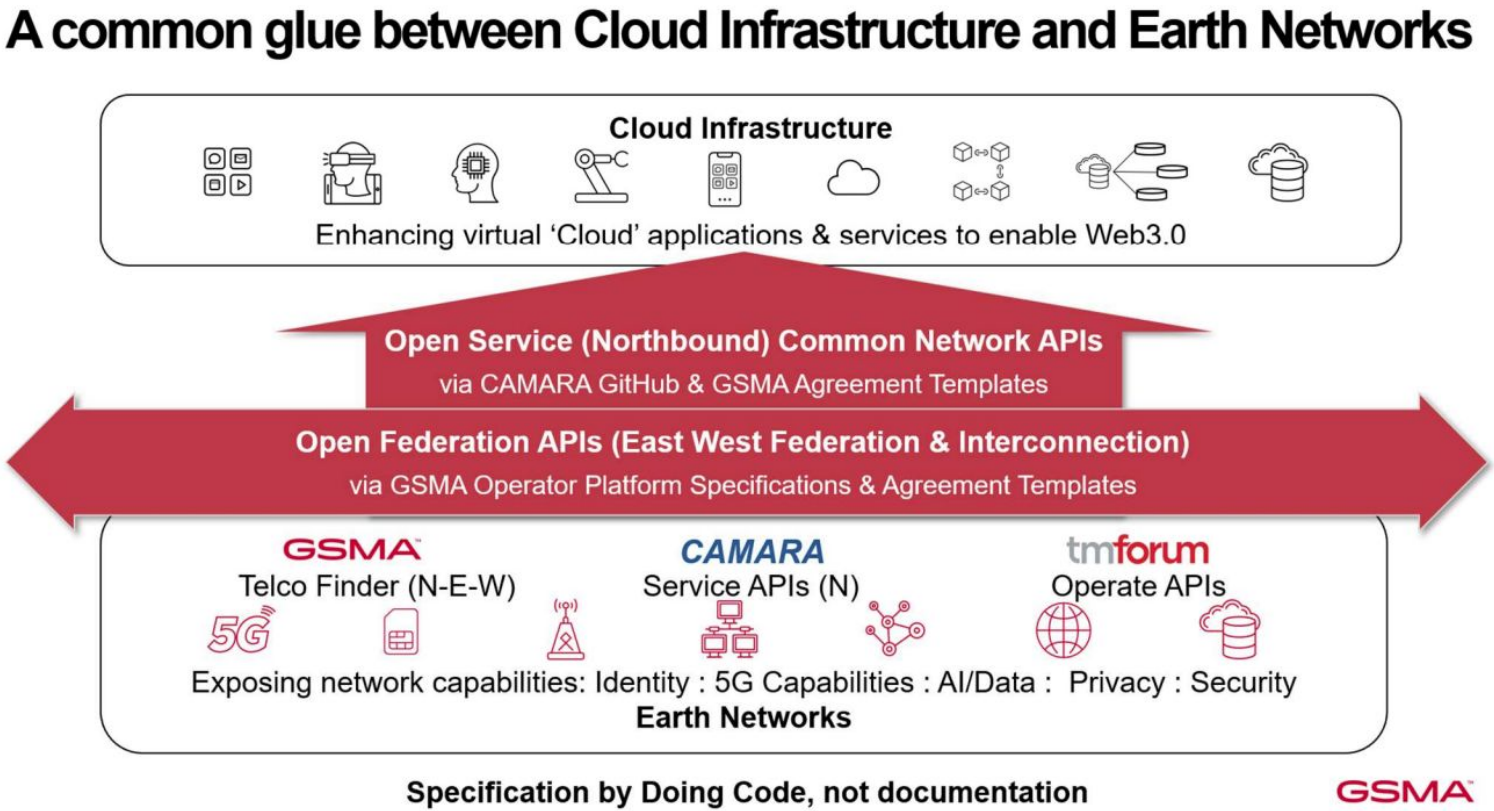
Technical capability oriented, standard, (FRAND) deterministic

Example: policy setting parameter setting information check..

Contributed by specific domain SDOs

O-RAN broadband forum IETF ONF 3GPP CLOUD NATIVE COMPUTING FOUNDATION ETSI LINUX

CAMARA - Collaboration with GSMA Open Gateway



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CAMARA

THE TELCO GLOBAL API ALLIANCE

CAMARA - User NaaS APIs

Functional and Technical Scope

From a functional perspective the scope is limited to telco APIs, that means APIs in the domain of

- telco mobile networks,
- telco fixed line networks,
- telco edge cloud, etc.
- or supporting these (e.g. for authentication).

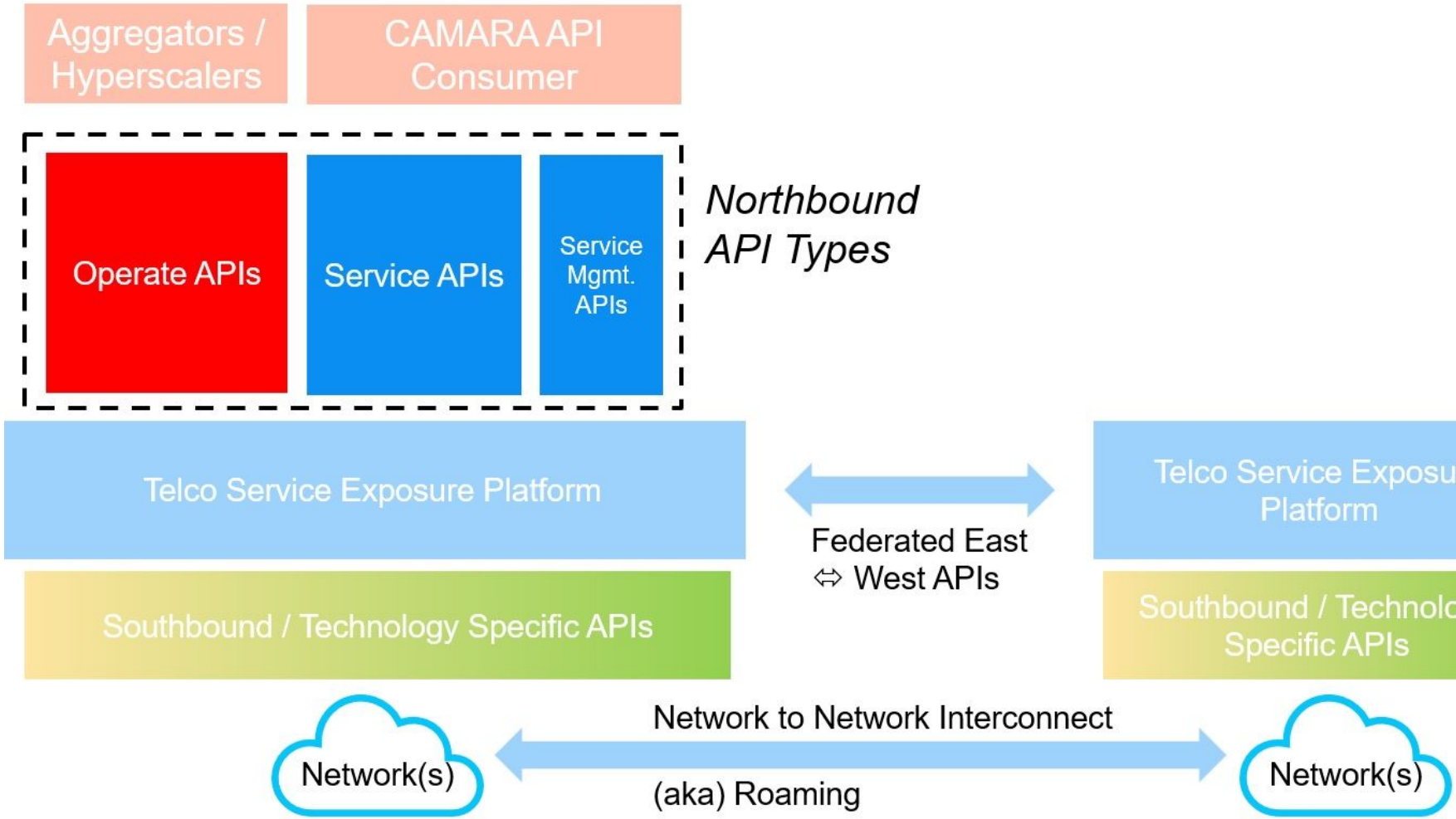
CAMARA only works on **customer-facing northbound APIs**.

East-west federation / roaming APIs are out of scope for CAMARA.

Northbound Scope

We differentiate between 3 types of Northbound APIs:

- **Service APIs**: APIs intended for end consumers and integrated by developers to invoke a certain telco capability.
- **Service Management APIs**: APIs intended for end consumers to manage or get data about offered Service APIs in application runtime, e.g., check service availability or performance information.
- Operate APIs: Operational and maintenance APIs provided by a telco to channel partners for the purpose of service fulfillment and assurance to their [channel partner] customers. This may include service provisioning for a mobile user, technical API performance monitoring, fault ticketing, information exchange such as product catalog, pricing, settlement, etc.


Aggregators / Hyperscalers
CAMARA API Consumer
Operate APIs
Service APIs
Service Mgmt. APIs
Northbound API Types
Telco Service Exposure Platform
Federated East ⇔ West APIs
Telco Service Exposure Platform
Southbound / Technology Specific APIs
Southbound / Technology Specific APIs
Network(s)
Network to Network Interconnect
(aka) Roaming
Network(s)

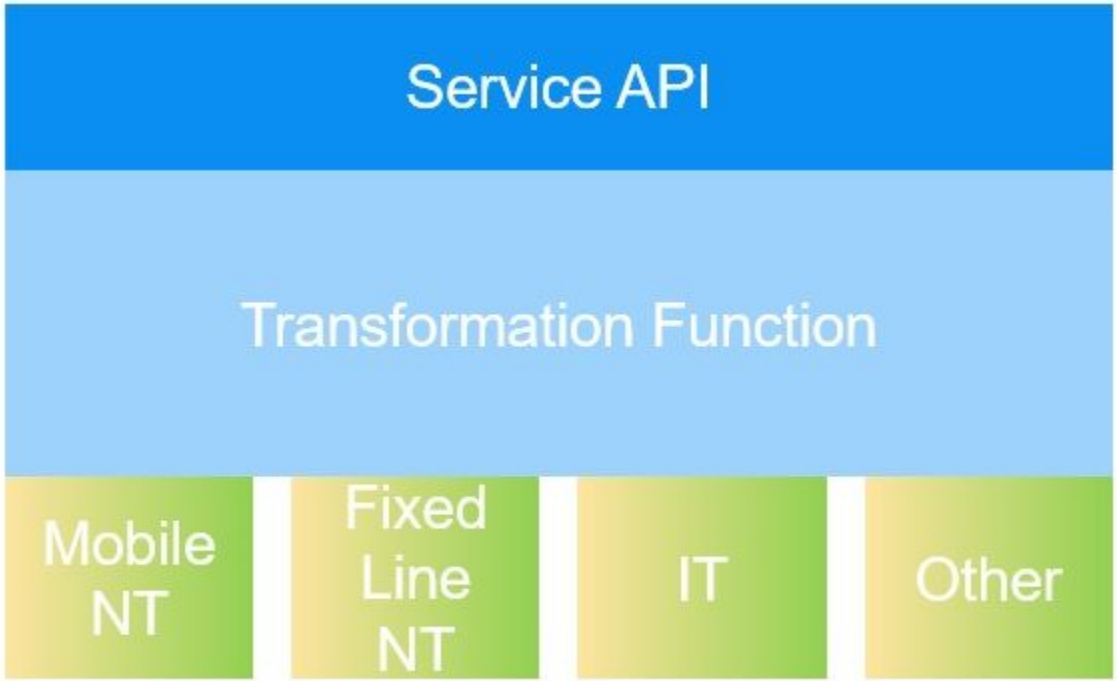
Transformation Functions

Service APIs and Service Management APIs mean an abstraction / aggregation of e.g. 3GPP APIs, Broadband Forum APIs or ETSI MEC APIs to hide telco complexity, keep control at the operator side and fulfill regulatory and data privacy constraints.

The definition and documentation of CAMARA APIs (including the mapping tables for the attributes to the southbound APIs if useful) is in scope of the Project and in scope of the harmonization.

The **transformations functions** (business logic that calls the southbound APIs, transforms the data and provides the function for the CAMARA APIs) are in scope of the Project as example or reference implementations, but not in scope of the harmonization.

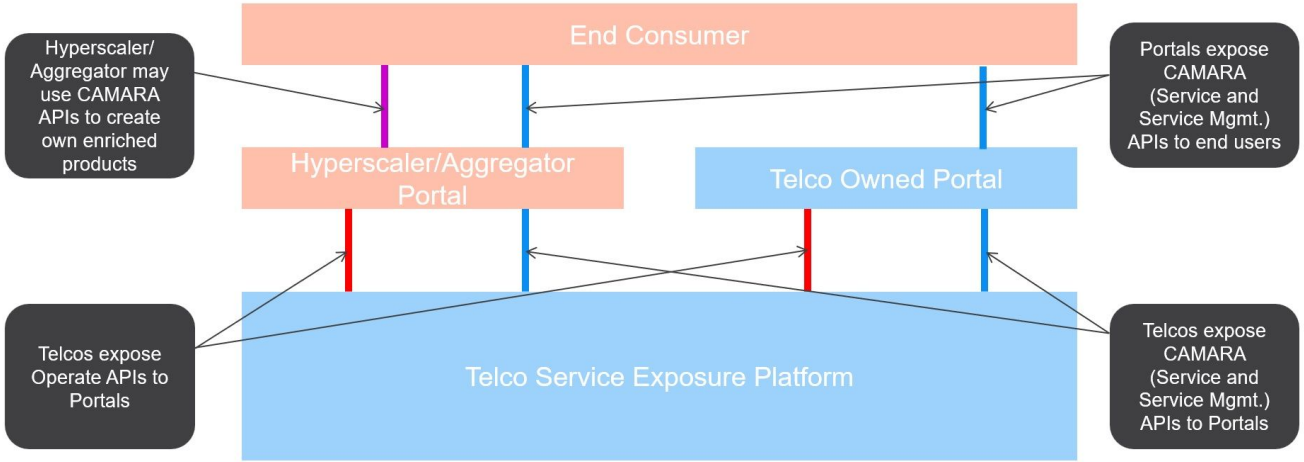
So each telco operator can implement the transformation functions in the best manner considering network topology and vendors, and can use the reference implementation as an orientation and starting point.



Southbound capabilitites

API Consumption

- The way how the different API types shall be consumed is shown in the figure below.
- Hyperscalers and aggregators have the possibility to create own enriched products based on the CAMARA APIs and expose that in addition to the CAMARA APIs.



Alignment with other SDOs

- **CAMARA** project defines **CAMARA (Service) APIs**, with a contribution-driven approach and in collaboration with the developer community.
- **TMForum** develops the **Operate APIs**, working jointly with aggregator and developer platform owners, to facilitate their integration with the operator's NaaS Platforms.
- Several SDOs cover the different technology domains that provide **the telco capabilities**, through **Technology-specific APIs**, that are exposed by CAMARA, like
  - Broadband Forum (Home and fixed access networks),
  - O-RAN (Radio access network),
  - IETF and ONF (Transport networks),
  - 3GPP (Radio access and core networks),
  - ETSI (network function virtualization),
  - Cloud Native Computing Foundation (container management), etc.
- These **SDOs provide exposure functions** to be able to interact with the network systems from external platforms.

https://github.com/camaraproject/Governance/blob/main/documentation/The-Ecosystem-for-Open-Gateway-NaaS-API-development.pdf

Service Scope

The service scope of the CAMARA Project is limited to the following activities:

- Collect API requirements from GSMA OPG (Operator Platform Group, a GSMA group that defines the reference architecture and requirements of the platform the operators use to expose their capabilities to Customers via APIs) and other sources. That can be a (prioritized) list of API families seen as useful for the customers, a functional description of the APIs (attributes, function, result), and also non-functional requirements for the APIs (response time, scalability, performance, etc.). All APIs developed within GSMA/OPG and contributed to the CAMARA Project will be developed under Apache-2.0.
- Define Service APIs and Service Management APIs (e.g. by Swagger) and create test plan / cases and tools from a business and API consumer perspective
- Develop Service APIs and Service Management APIs (and reference implementation for transformation functions)
- Create test cases and perform verifications and tests from developer perspective (to show that the Service APIs, the and Service Management APIs and the transformation functions have been developed correctly)
- Create developer friendly documentation for Service APIs and Service Management APIs
- Test Service APIs and Service Management APIs from business and customer perspective (validation) in telco network(s)
- Create deployment packages for Service APIs and Service Management APIs
- Create a reference architecture for Service APIs and Service Management APIs (if possible preferred solution is to refer to an existing architecture)
- Define a standard API lifecycle, development and test process including tools for the project

Deliverables

The following deliverables are provided by the CAMARA Project:

- **Service API and Service Management API** definitions and documentation
- Optionally Service API and Service Management API code (reference implementation for transformation functions) and
- Test plans, cases and tools

both contained in deployment packages. In addition a

- Reference architecture for Service APIs and Service Management APIs
- Description of the standard API lifecycle, development and test process

is created.

Current CAMARA API Families (1)

Blockchain Public Address
Manage a blockchain public address associated to a phone number

Call Forwarding Signal
Determine if a "call forwarding" service is enabled

Carrier Billing CheckOut
Purchase, pay, and follow up on fulfilment of products

Click to Dial
Establish web-based communication by clicking an object

Connectivity Insights
Alerts the consumers if and when the QoS threshold has breached

Device Identifier
Check the identity of the subscribers' device

Device Location
Check the location of a device

Device Status
Check the network connection and roaming status of a device

Device Swap
Check if the MSISDN has had a change of device in the last 30 days

Edge Cloud
Provide and manage network and compute resources for an application

Home Devices QoD
Request prioritization of traffic on a specific device on the home network

Identity and Consent Mgmt
Provides solutions to capture, store and manage user consent

Know Your Customer
Allows service providers to validate user information with operators

Network Slice Booking
Reserve, dynamically provision, query, dynamically delete a slice

Number Verification
Allows users to verify the phone number of the connected device

OTP Validation
To offer secure user authentication to service providers

Population Density Data
Get dynamic population density data in a specific area for a future date & time

Current CAMARA API Families (2)

Quality on Demand
Allows users to set mobile connection quality and get notifications

Region User Count
Query the number of active users in the specified area

Short Message Service
Send SMS to the destination address(es)

Site to Cloud VPN
Create and configure site to cloud network service by one click

SIM Swap
Allows users to get information on SIM pairing changes

Web RTC
Add real-time communication capabilities to applications

CAMARA Working Groups:

API Backlog
Maintains the API Backlog for CAMARA

Common-alities
Guidelines and assets mandatory for all CAMARA Sub Projects

Marketing / Outreach
Plans and performs marketing activities for CAMARA

Release Management
Guidelines and assets for Release Management in CAMARA

GSMA Open Gateway

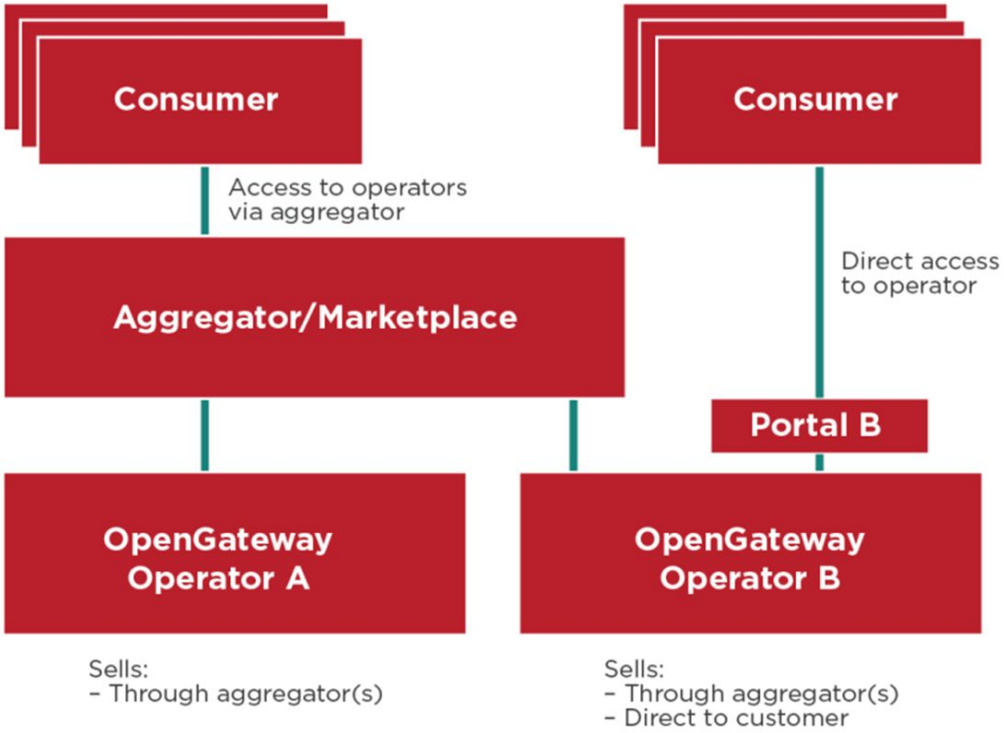
Objectives of GSMA Open Gateway

- GSMA Open Gateway is **a framework of common network APIs** designed to provide universal access to operator networks for developers.

- GSMA Open Gateway helps developers and cloud providers **enhance and deploy services more quickly** across operator networks via single points of access to the world's largest connectivity platform.

- GSMA Open Gateway is **achieved via, northbound service APIs supported by the CAMARA Project**.

Different Relationship Models for Open Gateway.



- In the aggregator model, the marketplace acts as a one-stop shop for tenant applications to access services from multiple CSPs without needing separate contracts.
- It can enhance CAMARA APIs and simplify them for third-party use.
- Federation and aggregation models enable quick access to third parties like app service providers and enterprises familiar with marketplaces for easy development.

Scope of Transformation Function

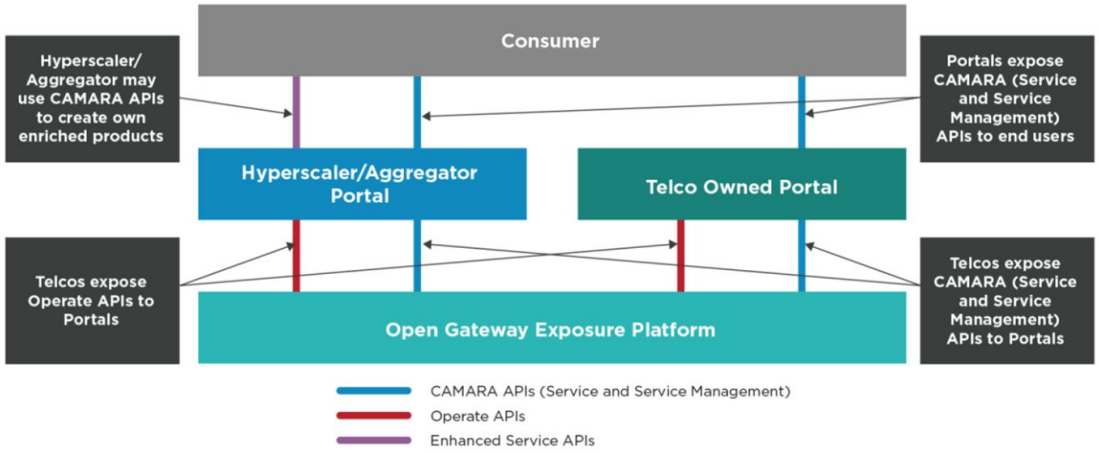
- **Transformation Function**: Function that translates CAMARA API calls into calls to technology specific APIs, executing the workflows.
- GSMA OPAG (Operator Platform API Group) provides advice on **the mapping of CAMARA Service APIs to internal APIs**, mainly technology-specific ones, while TM Forum plays the same role for the CAMARA Service Management APIs, **mapping mainly to internal OAM APIs**.
- This intend to facilitate APIs to achieve scale in terms of market reach once the API is consolidated in CAMARA.
- Operator Federation and Interconnection: APIs for transparent federation between operators let developers deploy CAMARA API-based apps across wide regions without operator to establish relationships with multiple operators.

Transformation Function APIs

- **CAMARA APIs**: APIs that directly exposed to customers that provides validated and purpose-specific capability to third parties via Service APIs. It also allows application developer to run certain management functions via Service Management APIs.
- **Operate APIs**: APIs that facilitates integration of Open Gateway NaaS platform by providing programmable access to operations, administration and management; providing transversal/non-service specific functionality that is required to make a commercial product out of the Service APIs.
- **Technology-specific APIs**: APIs that offers programmable access to telco infrastructure and network, service and IT capabilities. These APIs are typically defined in standardization bodies (e.g., 3GPP, IETF, ETSI, TM Forum) and cloud communities (CNCF).

API Consumption

- The way how the different API types shall be consumed is shown in the figure below.
- Hyperscalers and aggregators have the possibility to create own enriched products based on the CAMARA APIs and expose that in addition to the CAMARA APIs.



Open Gateway API Portfolio

Open Gateway API Portfolio Overview

API Portfolio	Anti-Fraud	Mobile Connectivity / Value-Added Services		Fixed Connectivity	Cloud & Edge	Payments
API Product Family	Subscriber Identity	Location	Network Quality/ Optimisation	Network Quality/ Optimisation	MEC	Payments and Charging
CAMARA API	Device Status	Device Location Verification	Connectivity Insights	Home Devices QoD	Simple Edge Discovery	Carrier Billing
	IMEI Fraud	Geofencing	Mobile Quality on Demand		Traffic Influence	
	KYC Fill-in	Location Retrieval				
	KYC Match					
	Number Verification					
	SIM Swap					
	SIM Swap Subscription Notification					
	One Time Password SMS					

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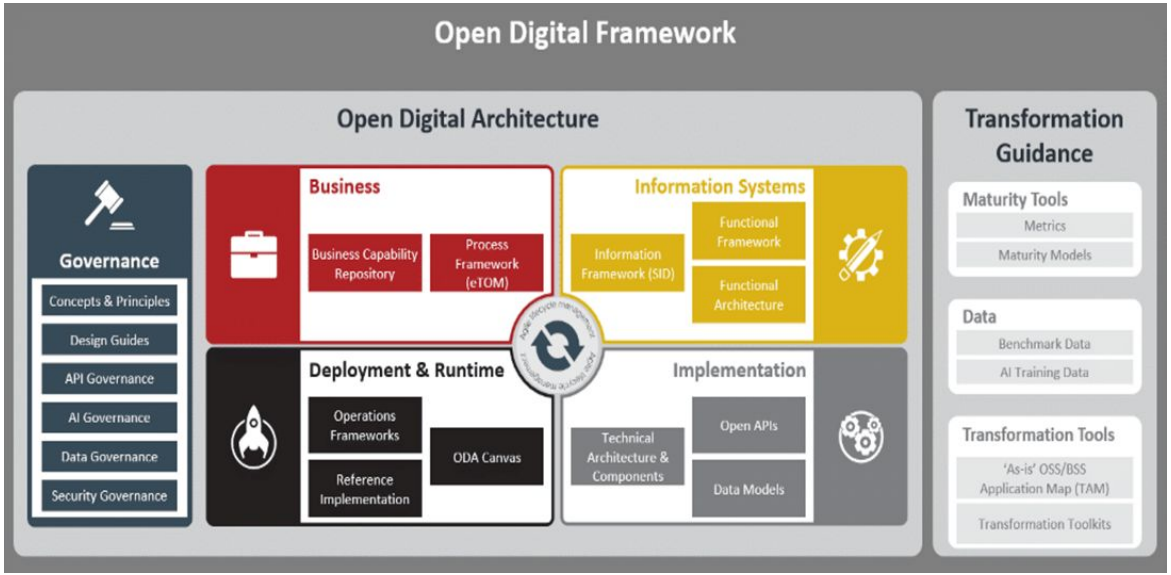
Tm Forum:
Open Digital Services (ODS) Framework

TM Forum

- TM Forum stands for “**TeleManagement Forum**” and it is a global industry association that focuses on collaboration and innovation within the telecommunications and digital services industry.
- The **Open Digital Services** initiative aims to enable the creation, delivery, and monetization of digital services in a more agile and efficient manner by leveraging standardized APIs, data models, and architecture frameworks.
- ODS is essentially a framework for digital service providers to create and deliver services more rapidly and efficiently in today's dynamic digital ecosystem.

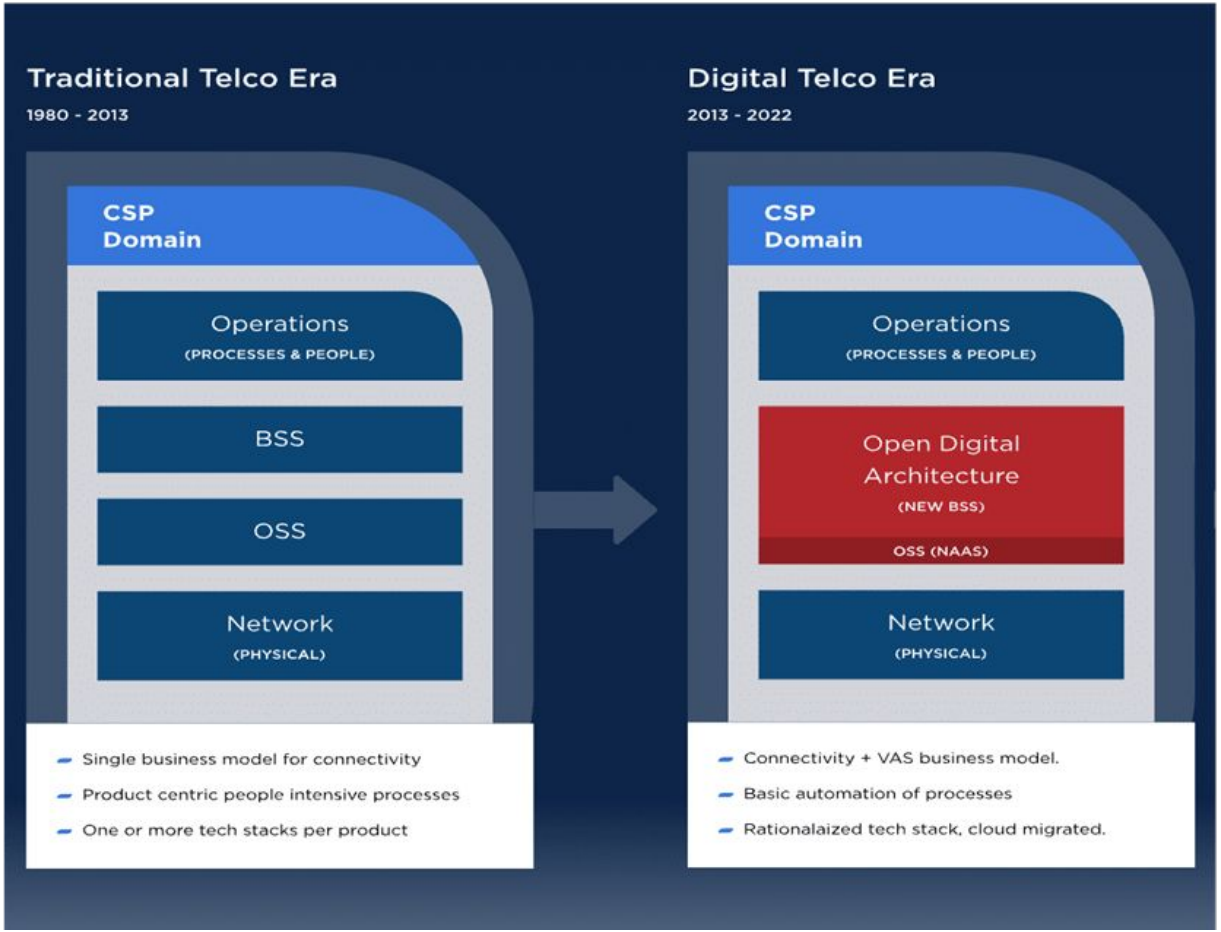
Open Digital Framework

In the context of TM Forum's Open Digital Services (ODS) framework, both ODF (Open Digital Framework) and ODA (Open Digital Architecture) are key components that complement and support the ODS initiative.

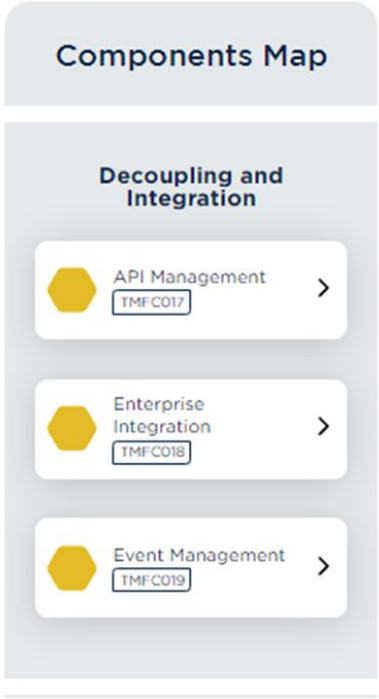


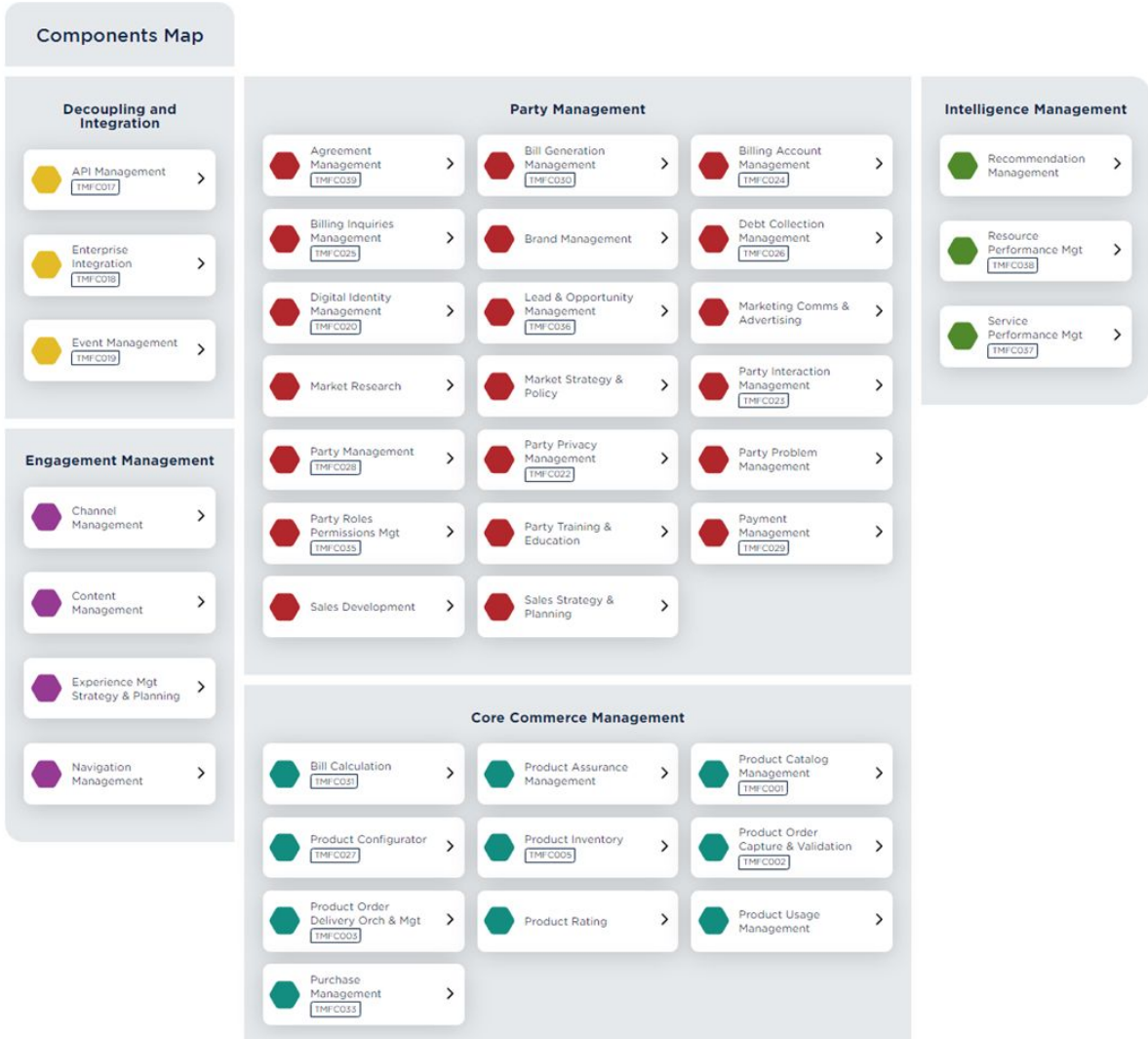
Open Digital Architecture

Open Digital Architecture (ODA) replaces traditional operations and business support systems Operation Support System(OSS) and Business Support Systems(BSS) with a new approach that will simplify your design, modernize your build and automate your operation.



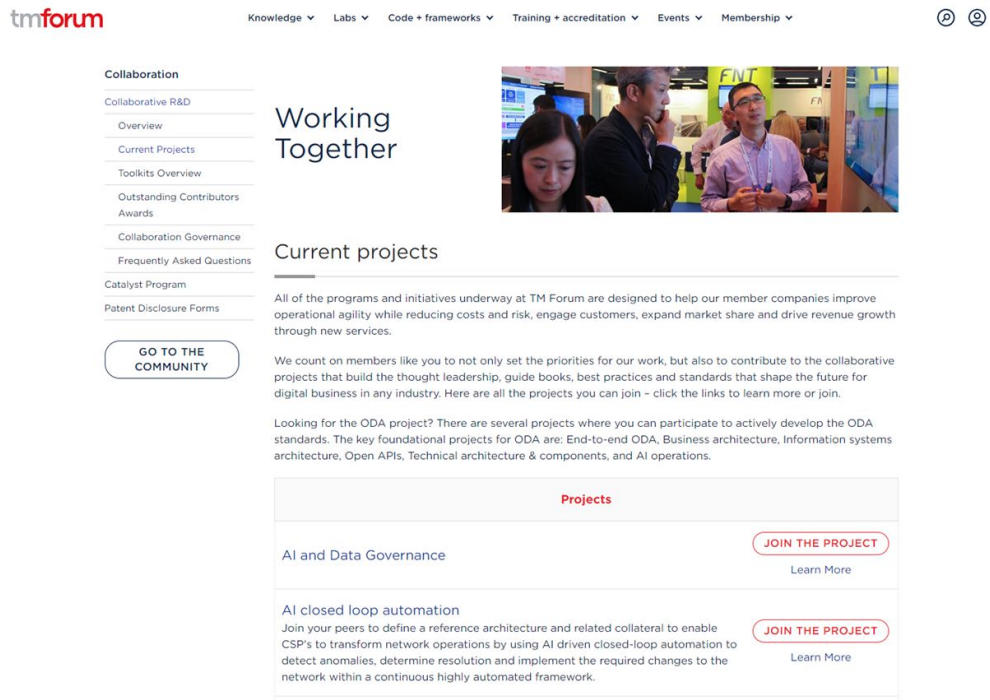
Components Map



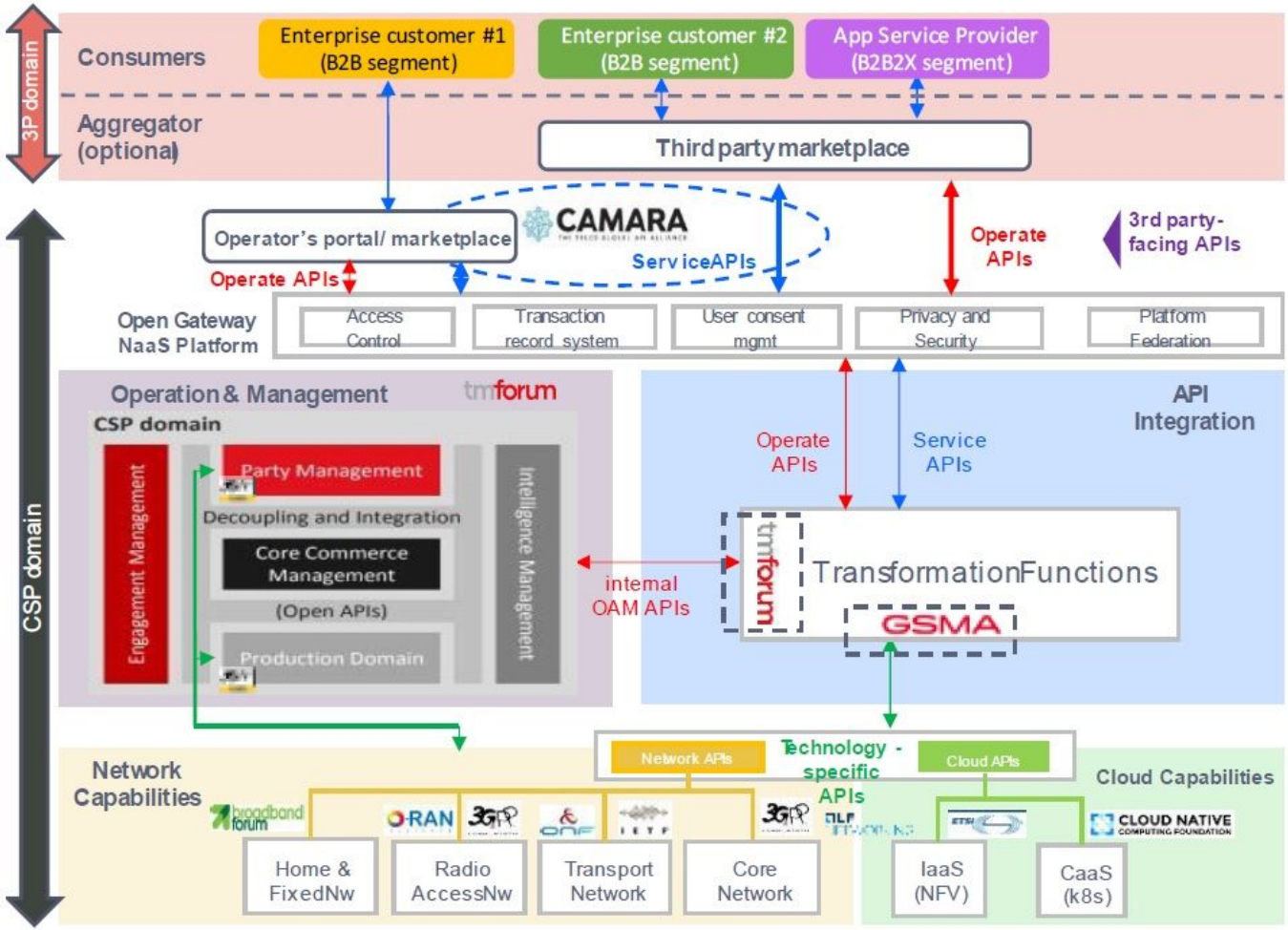


Current Projects in Tm Forum

- AI and Data Governance
- AI closed loop automation
- AI operations
- Autonomous networks
- Business architecture
- Components and canvas
- Digital ecosystem management
- Information systems architecture



Integration All



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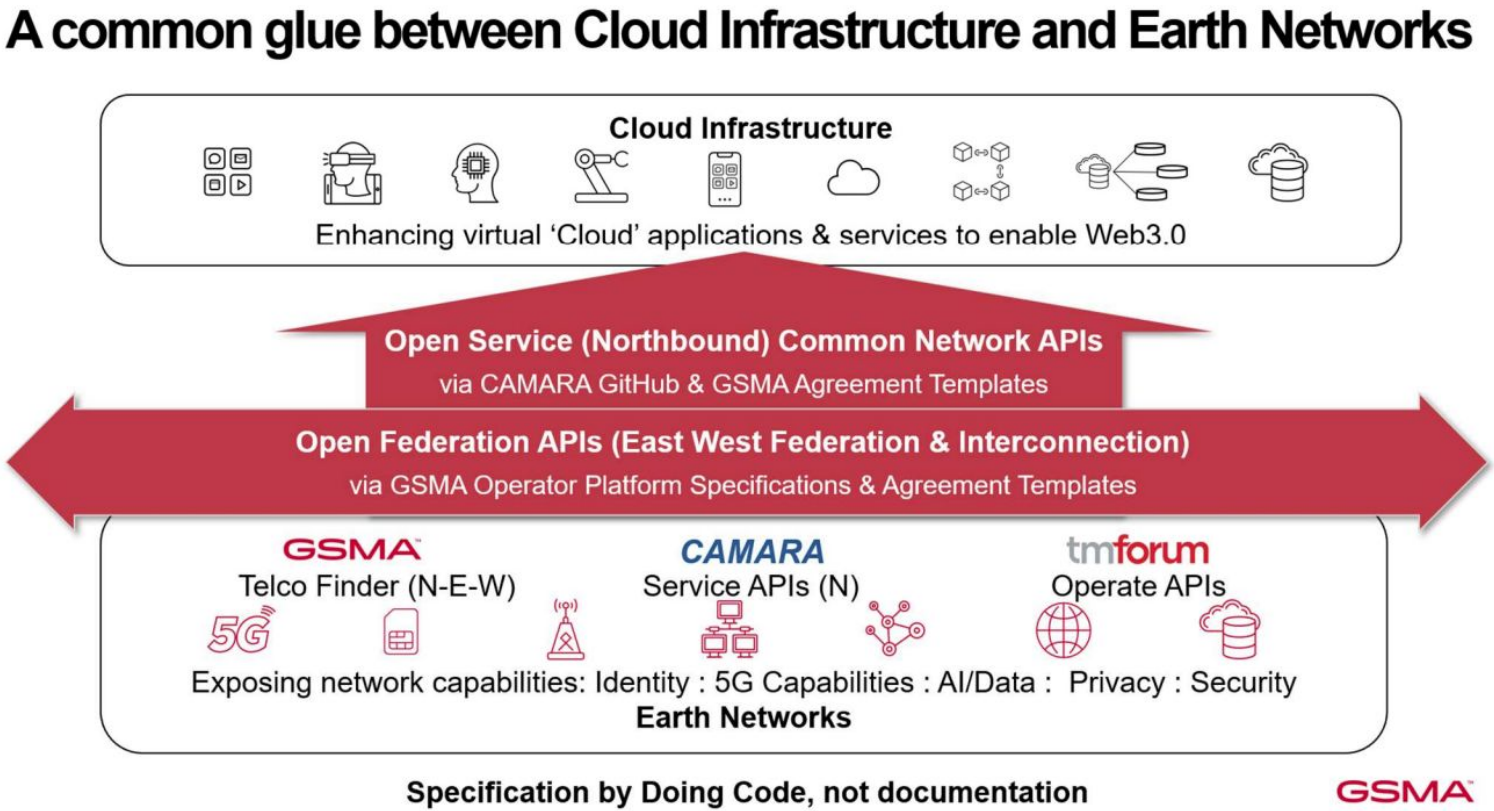
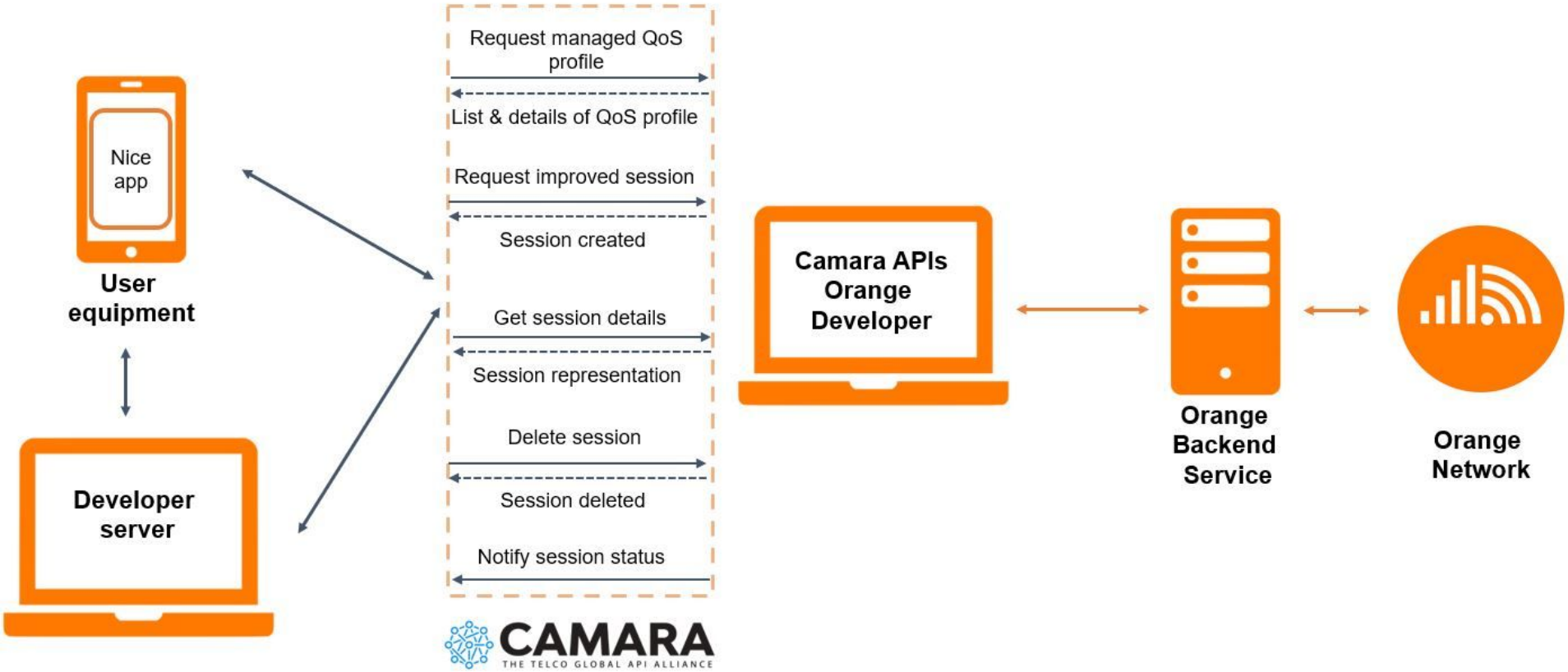


Use Case

- **Orange Telco**:
- **Quality on demand API:** You may offer to mobile users an improved connection (bandwidth, latency) in order to get a top-notch experience for gaming, holographic, virtual reality sessions. And this without the necessity to have in-depth knowledge of the 4G/5G networks or the overall complexity of the Telecom Systems.
  - https://developer.orange.com/apis/camara-quality-on-demand
- Secure your application against fraud;
- Trigger payment for in-app purchase
- Interact with networks to get device connectivity and location information;

CAMARA - Quality on Demand



Use case of operation	URL method
I want to get all QoS profiles managed by the Orange Qos server	GET "https://api.orange.com/camara/quality-on-demand/orange-lab/v0/qos-profiles
I want to get all information for one QoS profile	GET "https://api.orange.com/camara/quality-on-demand/orange-lab/v0/qos-profiles/{name}
I want to get an improved QoS session between an user equipment and an application server	POST "https://api.orange.com/camara/quality-on-demand/orange-lab/v0/sessions
I want to retrieve QoS session information	GET "https://api.orange.com/camara/quality-on-demand/orange-lab/v0/sessions/{sessionId}
I want to terminate a QoS session information (before planned end)	DELETE "https://api.orange.com/camara/quality-on-demand/orange-lab/v0/sessions/{sessionId}

https://developer.orange.com/apis/camara-quality-on-demand/getting-started

Thank You
Q/A?

References

CAMARA project website: https://camaraproject.org/

Github: https://github.com/camaraproject

CAMARA Project Home: https://wiki.camaraproject.org/

Use cases:

- Orange: https://developer.orange.com/apis/camara

References

GSMA Open Gateway API Descriptions:
https://www.gsma.com/solutions-and-impact/gsma-open-gateway/gsma-open-gateway-api-descriptions/

The Ecosystem for Open Gateway NaaS API Development:
https://www.gsma.com/solutions-and-impact/gsma-open-gateway/gsma_resources/naas-ecosystem-whitepaper/

Github: https://github.com/camaraproject