



CAMARA

THE TELCO GLOBAL API ALLIANCE

Presentation

20.07.2024

Content of the CAMARA presentation



- CAMARA Mission
- CAMARA Motivation – Key problems we try to solve
- CAMARA Scope
- Collaboration with Open Gateway and TM Forum, API Distribution Options
- What is different now in comparison to former API exposure trials?
- History, Logos & Current Figures – Where we started and where we are now
- Current CAMARA APIs, Showcases, Public Launch Status
- 5G network capabilities, Potential Business Use Cases
- Benefit for developers to use CAMARA APIs & Getting Started
- Benefit for developers to work in CAMARA & Joining CAMARA as Developer
- Benefit for operators to implement CAMARA APIs in their networks & Getting Started
- Benefit for operators to work in CAMARA & Getting Started
- Where are we going next, Contacts



APIs enabling seamless access to Telco network capabilities



CAMARA
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Telco network capabilities exposed through APIs provide a large benefit for customers. By simplifying telco network complexity with APIs and making the APIs available across telco networks and countries, CAMARA enables easy and seamless access.



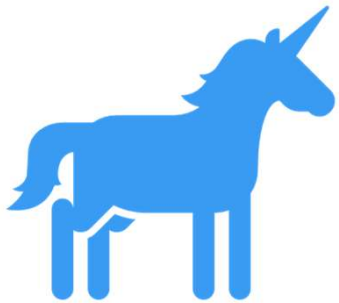
CAMARA mission

What is the CAMARA Project?

Key problems we try to solve



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Scale

Developers dream of being the next unicorn... If apps, products, or services are built on our APIs they want them in all relevant markets and networks globally.



Consistency

Multi-nationals want consistency across all markets they operate in... they do not want APIs that only work in a single network in a single country. They do not want to try and build for the differences of each network.



Simplicity

Telco networks are complex, and every network is different.... Developers want simple, intent-based APIs.



Accessibility

We go to the developers where they are so the project is open sourced in the Linux Foundation. Allowing API users to work directly with CSPs creating the service.



Demand driven

We develop the APIs and design it in the way our customers need it. The demand is collected from organizations like GSMA OPAG but also from customers directly.

Key problems we try to solve

Consistency Benefit



Availability across telco networks and countries is necessary:

- To ensure seamless customer experience
- To accelerate technology development and commercial adoption (minimize implementation effort)
- To accelerate education and promotion
- To support application portability

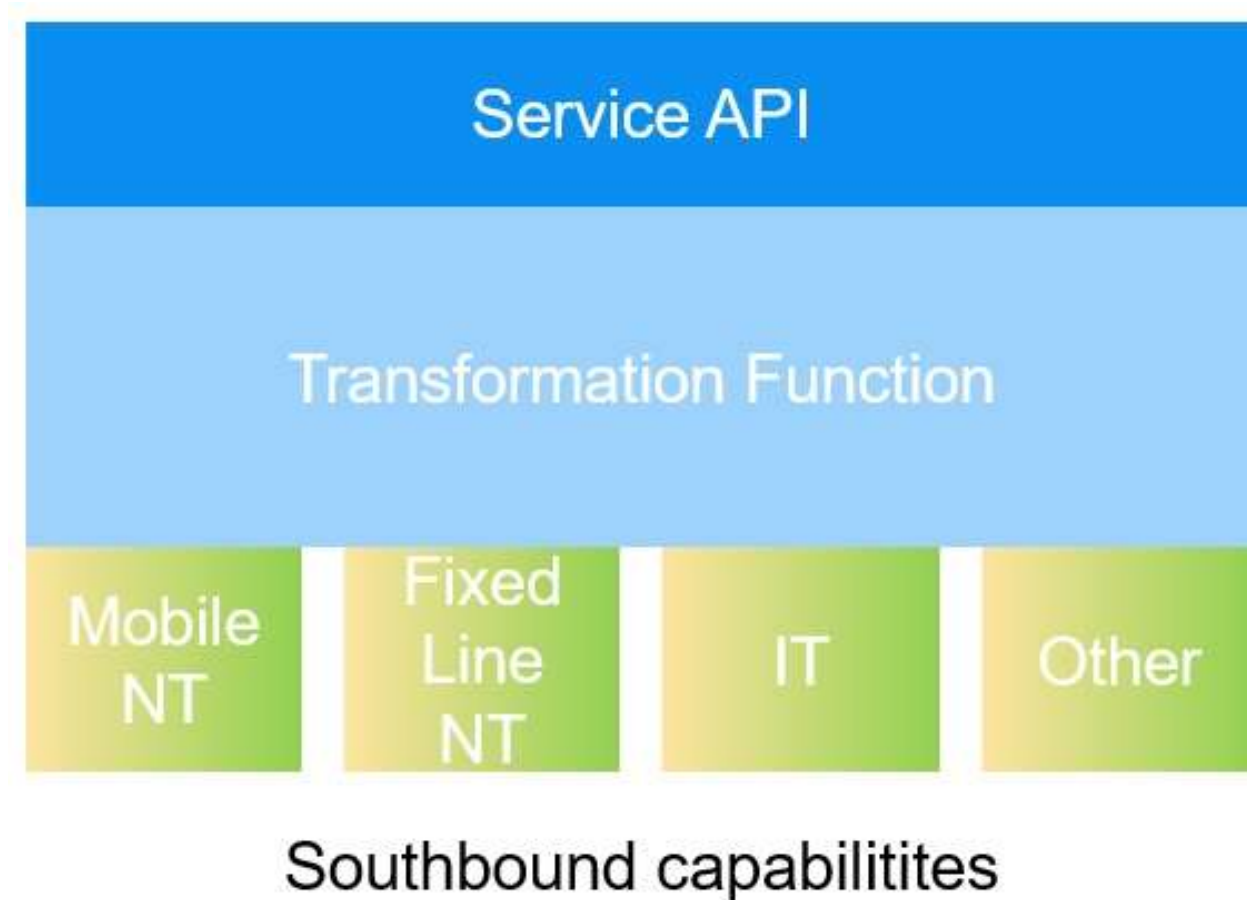
Key problems we try to solve

Simplicity Benefit



Abstraction from Network APIs to Service APIs is necessary:

- To simplify telco complexity making APIs easy to consume for customers with no telco expertise (user-friendly APIs)
- To satisfy data privacy and regulatory requirements
- To facilitate application to network integration



CAMARA Scope



CAMARA is an open source project within Linux Foundation to define, develop and test the APIs. CAMARA works in close collaboration with the GSMA Operator Platform Group to align API requirements and publish API definitions and APIs. Harmonization of APIs is achieved through fast and agile created working code with developer-friendly documentation. API definitions and reference implementations are free to use (Apache2.0 license).

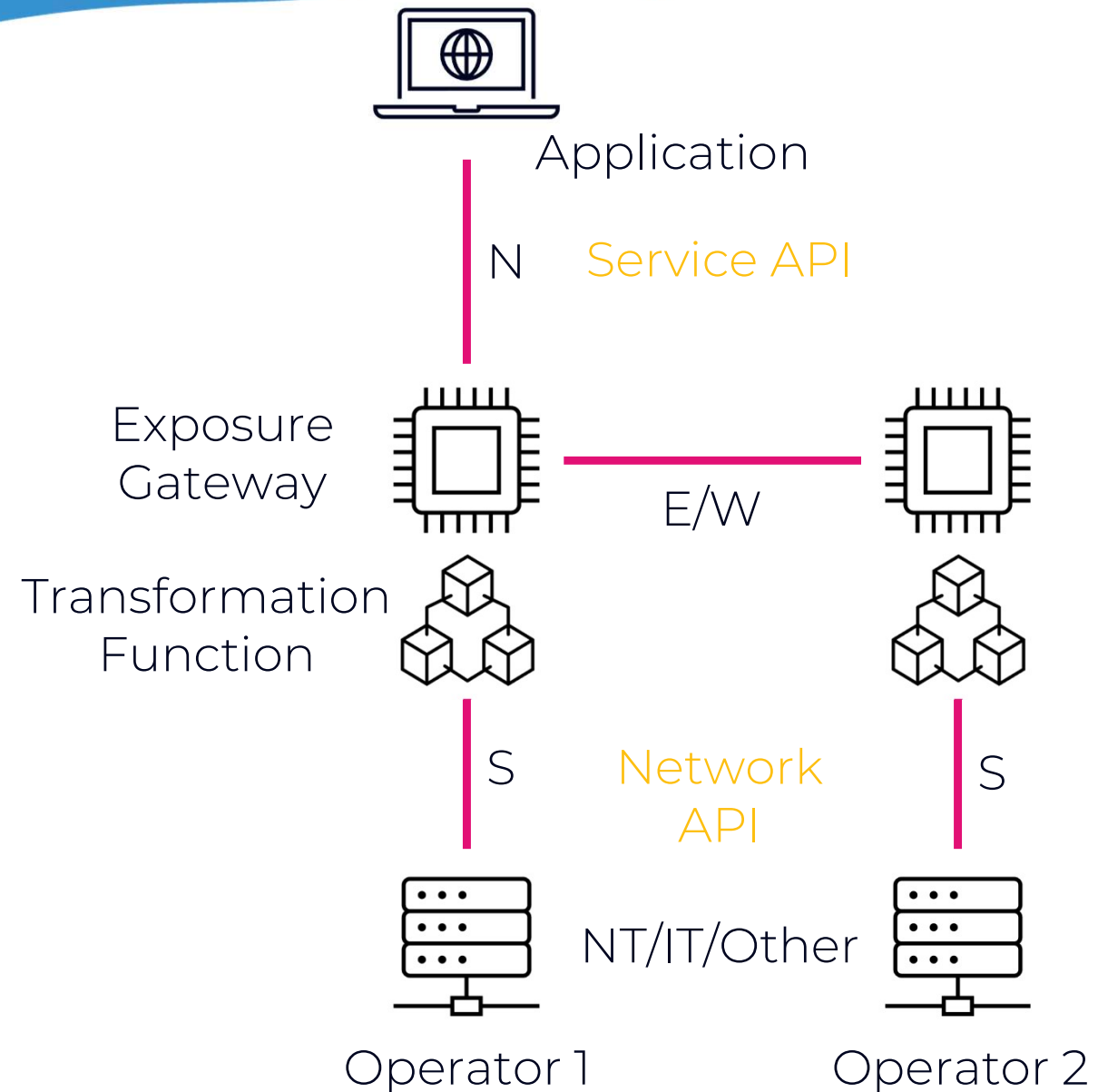


CAMARA Scope



From 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.

Thereby the focus is on the **northbound interface** (between telco operator and aggregator or capability consumer). East-/westbound interface APIs are out of scope for CAMARA.



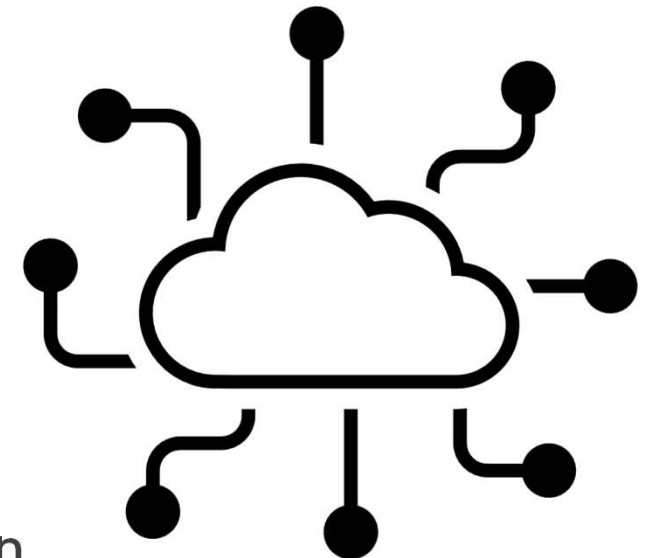
The scope of the CAMARA Project is:

- **Collect API requirements** from GSMA Operator Platform Group and other sources
- **Define Service APIs and Service Management APIs**
- Create test plans / cases / tools from an API consumer perspective
- **Develop and test Service APIs and Service Management APIs**
- Create developer friendly **documentation**

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 and
- Test plans, cases and tools for the APIs all contained in deployment packages.

Project resources can be found in the **GitHub repository**: <https://github.com/camaraproject>.

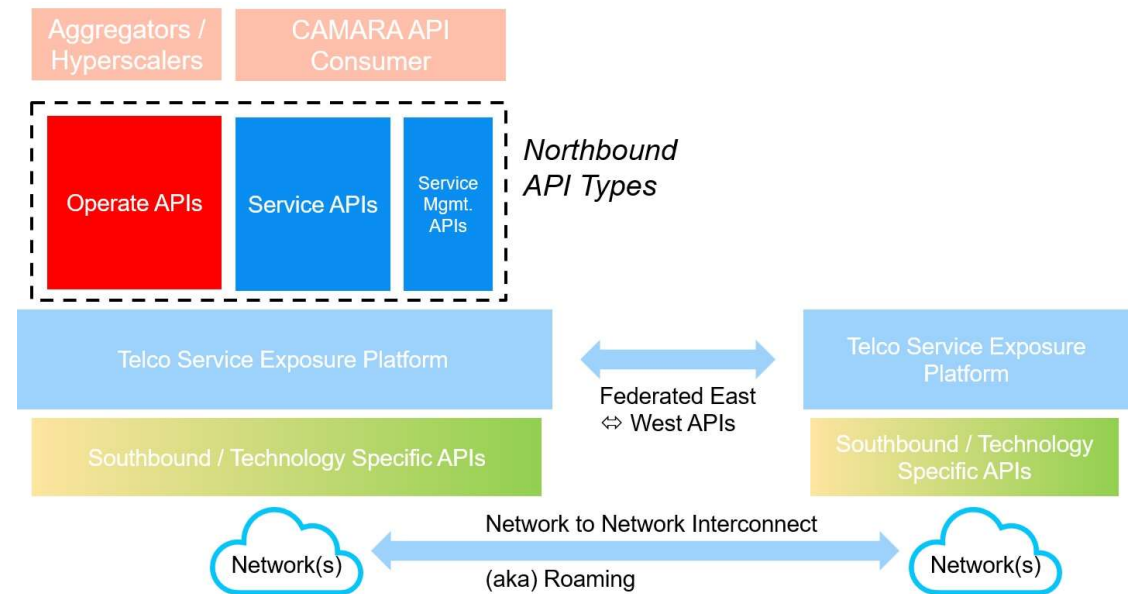


CAMARA Scope



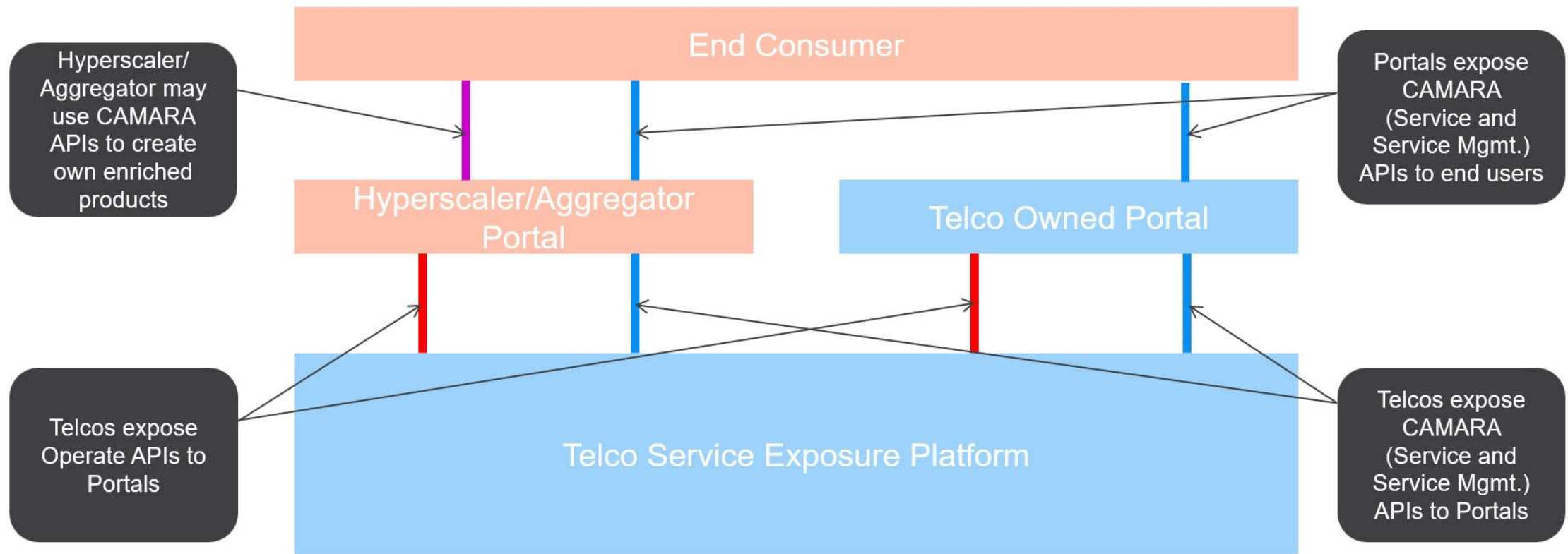
We differentiate between 3 types of Northbound APIs:

- **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.



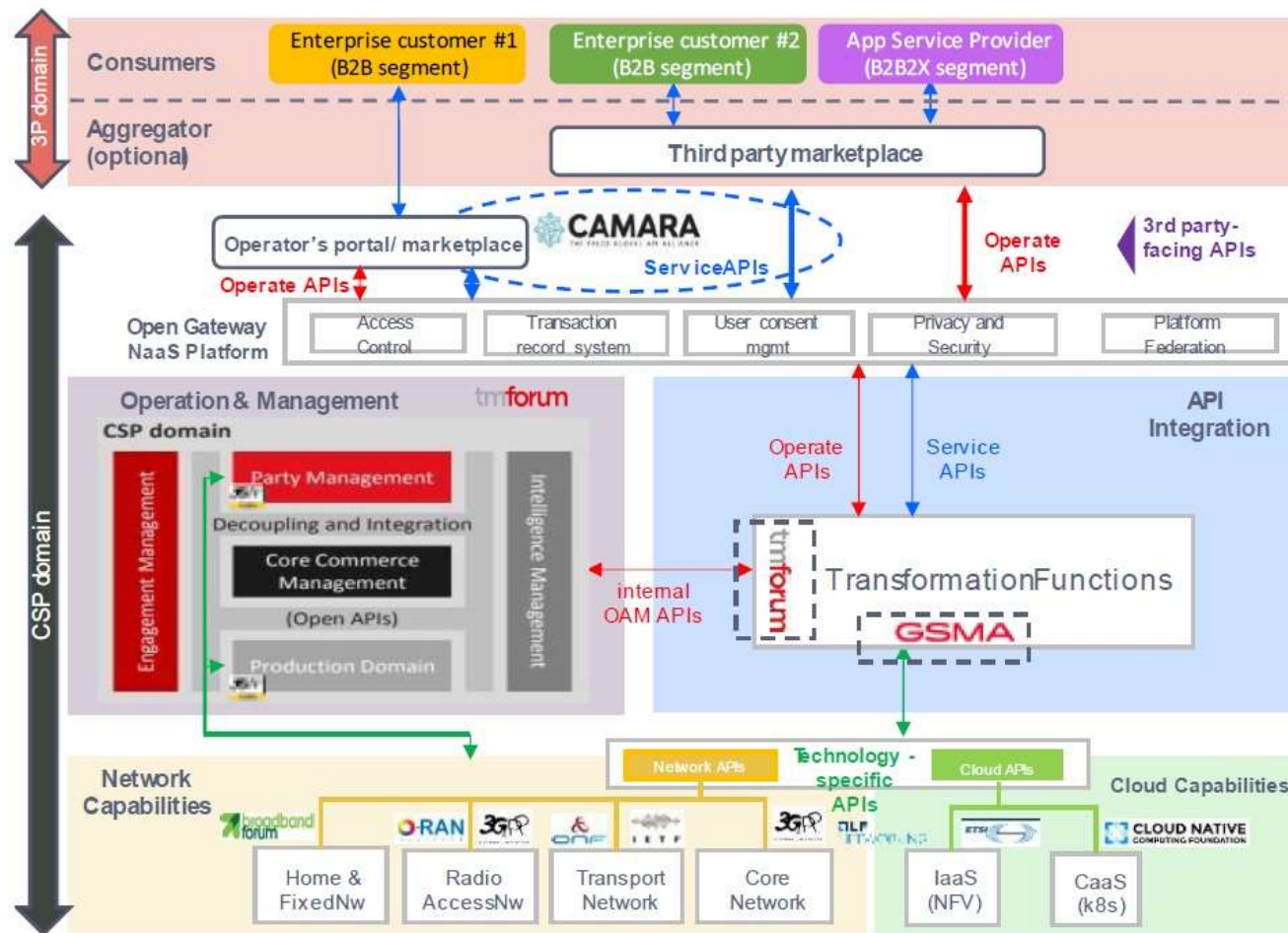
Service APIs and Service Management APIs are in scope of CAMARA. Operate APIs are out of scope of CAMARA (these are already covered by other SDOs = Standards Development Organizations like TM Forum).

CAMARA - Collaboration with Open Gateway and TM Forum



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.

CAMARA - Collaboration with Open Gateway and TM Forum



CAMARA project defines CAMARA APIs.

TMForum develops the Operate APIs.

Several SDOs cover the different technology domains that provide the telco capabilities.

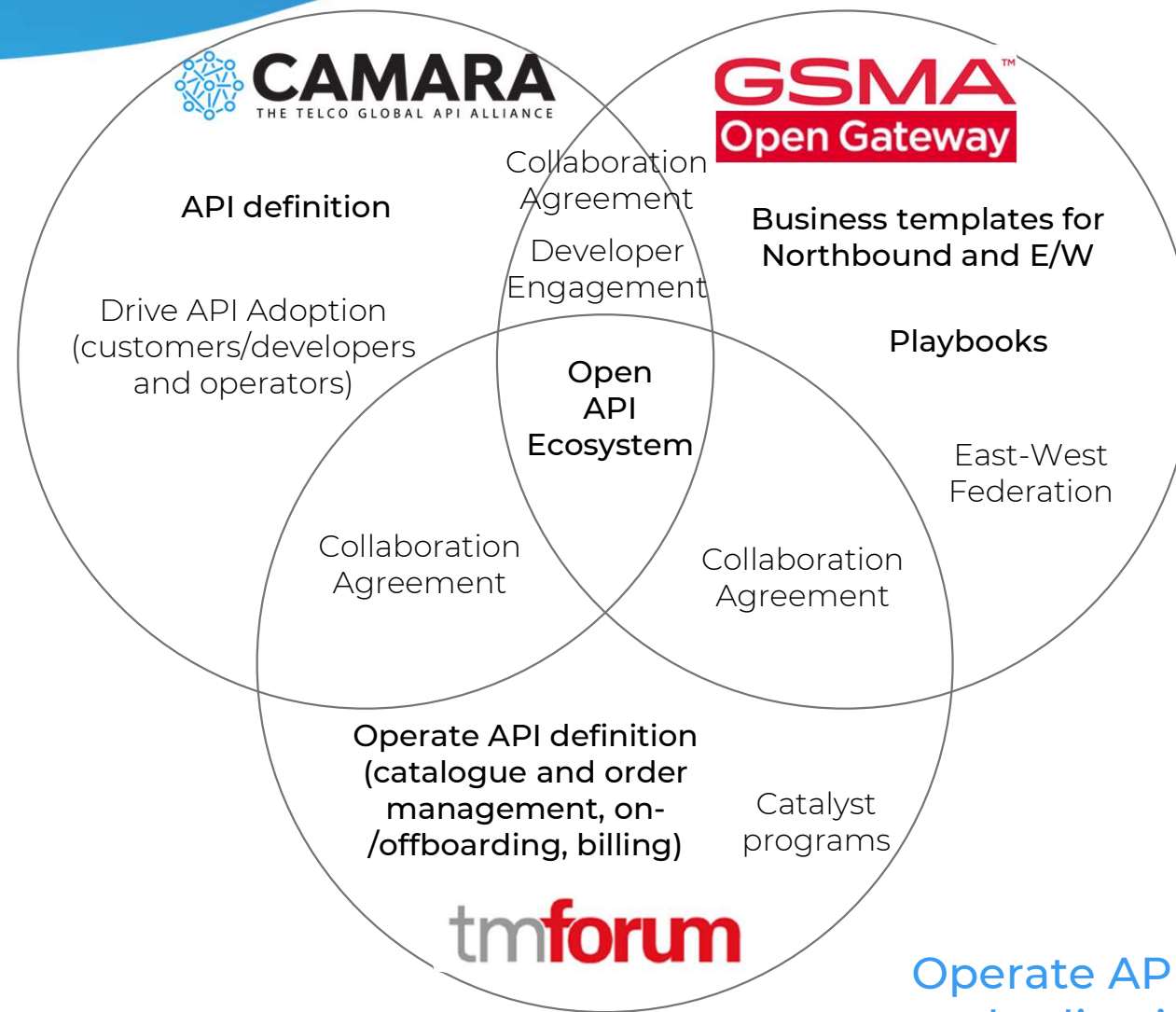
More details can be found in the whitepaper "The Ecosystem for Open Gateway NaaS API Development" (jointly published by GSMA, CAMARA, Linux Foundation and TMForum) available [here](#).

CAMARA - Collaboration with Open Gateway and TM Forum



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Service API
“standardization”



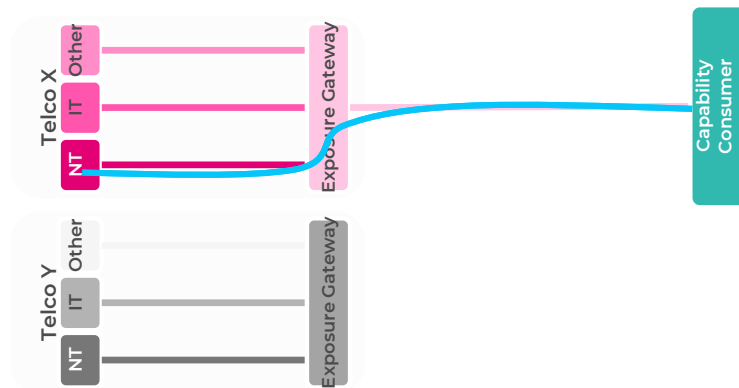
Standardization of
distribution
channels

Operate API
standardization

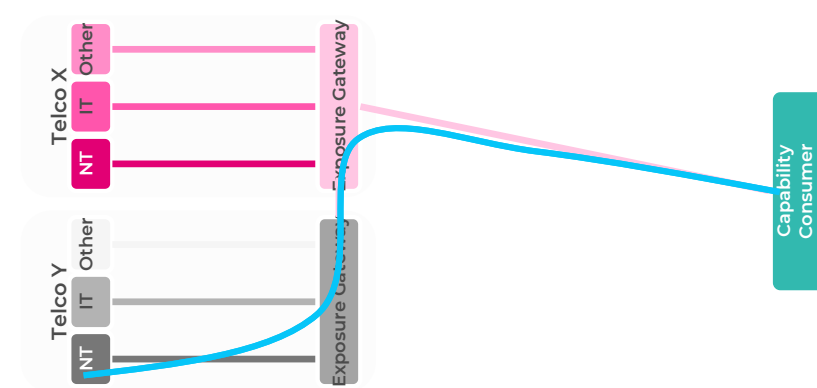
CAMARA API Distribution Options



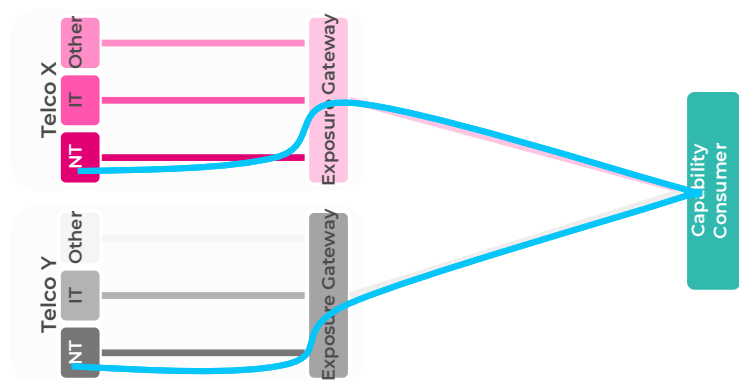
A. Single-Operator Relationship



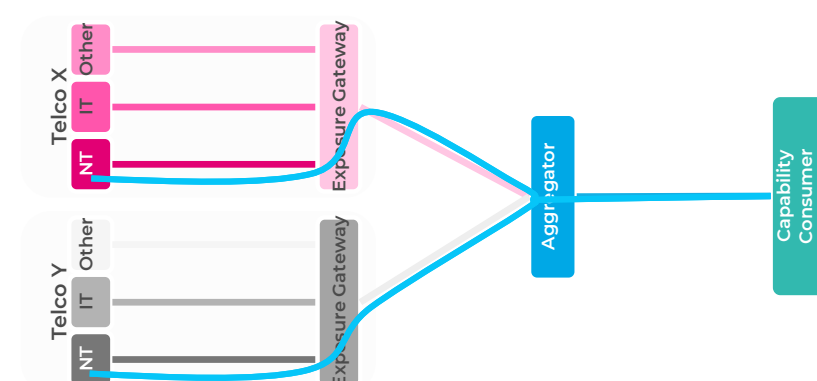
B. Single-Operator "API Roaming"



C. Multi-Operator Relationship



D. Operator Aggregation



What is different now in comparison to former API exposure trials?



- **Simplicity** – Telco complexity is hidden behind simple, easy to use APIs
- **Demand driven** - Listening to customer's voice and demand
- **Availability** – Open APIs with great support of many operators on many platforms
- **Alignment** - With standardization bodies like TM Forum or ETSI-MEC
- **Sustainability** – We have the CEOs behind

CAMARA

Where we started...



Launched at MWC Barcelona 2022

22 Launch Partners

Supported by GSMA and Linux Foundation

Simple idea to “standardize” developer facing APIs



CAMARA

... and where we are now



Members	Premier										General					Associate Membership				
Participating Organizations	Participating Organizations																			

- 111 Named Partners
- 387 (+279*) companies participating in CAMARA
- 27 Active API development Sub Projects and 5 Working Groups
- 1093 (+1540*) people joined CAMARA
- Development "home" for GSMA Open Gateway

* Number in brackets indicates companies and people who are in contact but haven't joined

CAMARA Logos



CAMARA

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Members	Premier										General					Associate Membership				
Participating Organizations	Participating Organizations																			

Status of APIs within CAMARA



CAMARA APIs - launched in at least one market

(<https://www.gsma.com/solutions-and-impact/gsma-open-gateway/open-gateway-public-launch-status/>)



Sim Swap



Number Verification



OTP¹ (SMS) Validation



Device Location Verification



Device Status (Roaming)



Quality on Demand (QoD)



Home Devices QoD



KYC² Match



KYC² Fill-In



Edge Cloud Simple Discovery



Carrier Billing

Further CAMARA APIs in work

(<https://github.com/orgs/camaraproject/repositories>)

Blockchain Public Address

Click to Dial

Device Identifier

Device Swap

Edge Cloud - Traffic Influence

Edge Cloud – Workload Orchestr.

Population Density Data

Short Message Service

WebRTC

Call Forwarding Signal

Connectivity Insights

Device Location – Retrieval

Device Location – Geofencing

Edge Cloud – Resource Mgmt

Network Slice Booking

Region Device Count

Site to Cloud VPN

Approved Backlog – work to be started

(<https://github.com/camaraproject/WorkingGroups/tree/main/APIBacklog>)

KYC² Age Verification

IMEI Fraud

Device Quality Indicator

QoD – Provisioning Mode

Device Visit Location

Most Frequent Location

Home Devices - Network Acces Mgmt

...

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

Know Your Customer

Allows service providers to validate user information with operators

Location Insights

Give insights to the home area and latest location of a device

Network Access Management

Manage fixed devices that reside at customer premises

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 Device Count

Query the number of active devices in the specified area

Short Message Service

Send SMS to the destination address(es)

SIM Swap

Allows users to get information on SIM pairing changes

Simple Edge Discovery

Discover the closest edge cloud zone to a given device

Site to Cloud VPN

Create and configure site to cloud network service by one click

Tenure

Verify the length of tenure for a mobile user with their mobile operator

Verified Caller

Show certified information on the phone before a call is answered

Web RTC

Add real-time communication capabilities to applications

CAMARA Working Groups

API Backlog

Maintains the API Backlog for CAMARA

Commonalities

Guidelines and assets mandatory for all CAMARA Sub Projects

Identity and Consent Mgmt

Provides solutions to capture, store and manage user consent

Marketing / Outreach

Plans and performs marketing activities for CAMARA

Release Management

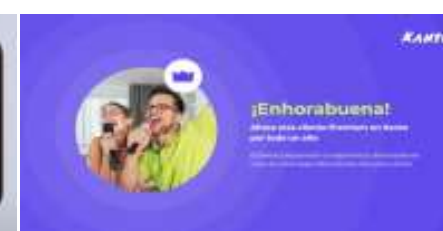
Guidelines and assets for Release Management in CAMARA

CAMARA / Open Gateway API Showcases



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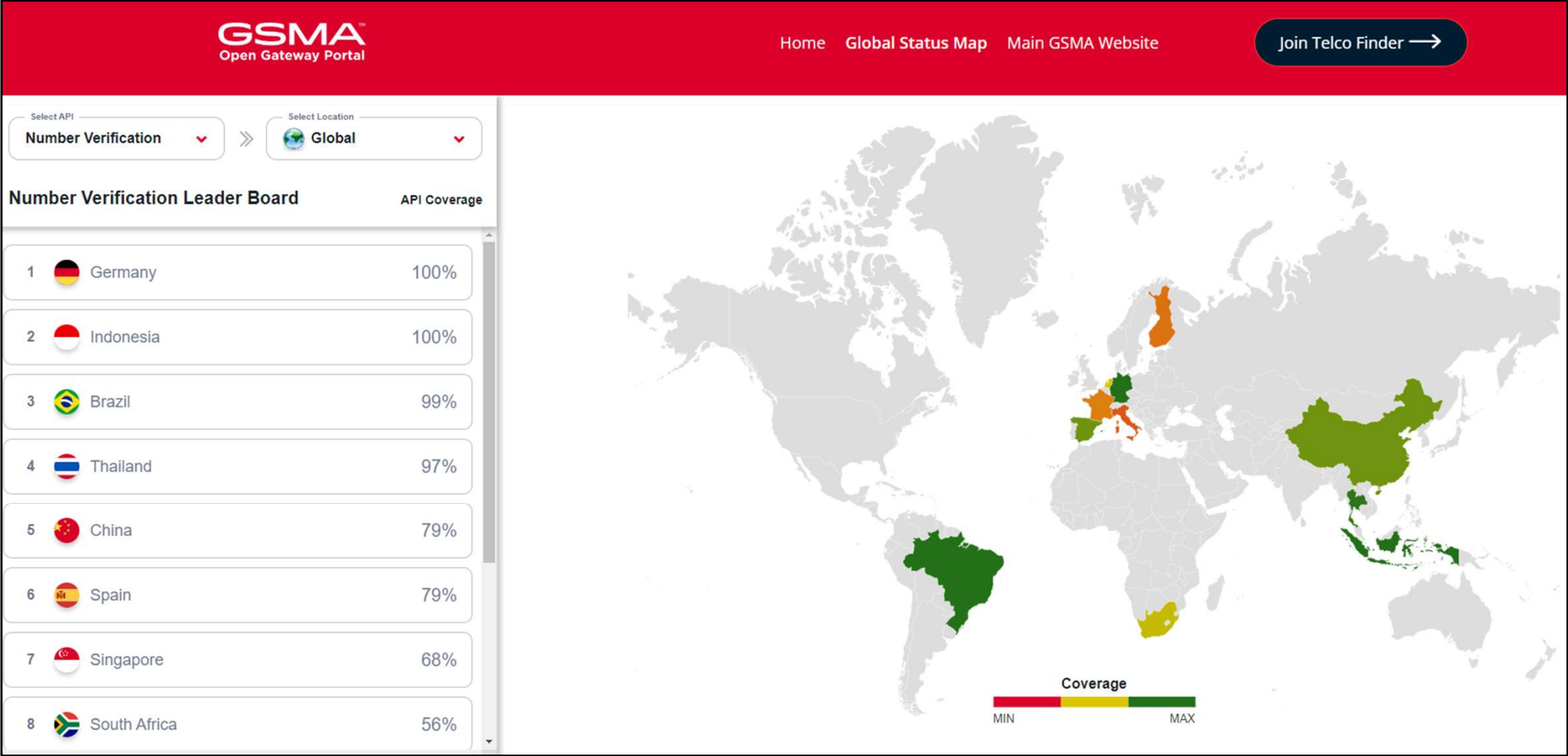
<https://camaraproject.org/resources/>



CAMARA / Open Gateway API public launch status



<https://www.open-gateway.com/operators-map>



CAMARA / Open Gateway API public launch status



Argentina

Australia

Brazil

Greater China

Ethiopia

Finland

France

Germany

Japan

Indonesia

Italy

Netherlands

Saudi Arabia

Singapore

South Korea

South Africa

Spain

Sri Lanka



Thailand

UAE

UK

USA

Uzbekistan

Operator	Developer Portal	Category	APIs	Launched	Certified
	Axiata Developer Portal	Payments	Carrier Billing	✓	
	Axiata Developer Portal	Anti Fraud	One Time Password SMS	✓	
	Axiata Developer Portal	Mobile Connectivity & VAS	Device Location Verification	✓	
	CK Hutchison Developer Portal	Payments	Carrier Billing	✓	
	CK Hutchison Developer Portal	Anti Fraud	One Time Password SMS	✓	
	Bharti Airtel Developer Portal	Anti Fraud	One Time Password SMS	✓	
	SLT Mobitel Developer Portal	Anti Fraud	One Time Password SMS	✓	

<https://www.gsma.com/solutions-and-impact/gsma-open-gateway/open-gateway-public-launch-status/>

5G network capabilities Introduction



Telco network capabilities are functions partly available already in 4G but new and much more powerful in the 5G network. These functions enable to get information out of the network but also to configure the network.

The on-demand, secure and controlled exposure of these capabilities pave the way for transforming operator networks into service enablement platforms, facilitating the application-to-network integration, which will be key to deliver enhanced and service-tailored customer experience in the 5G era.

5G network capabilities

Introduction



Reachability and Location of UEs
Identify (last known) location of drone



of UEs in geographic region
Traffic jam or Corona warning



of UEs in slice, network congestion
Adapt resolution for video transmission



Quality on Demand / Traffic influence
Enable augmented reality



Wake up UEs
Support low energy IoT devices



Block UEs in geographic region
Crisis management



Potential Business Use Cases



Fraud



Secure Auth

Fraud Prevention

Number Verify,
Sim Swap, etc.

Location



Location Verification
Location Retrieval
Location Geofencing

Location APIs

Enhanced communication



Safeguarding of Transactions
Remote Control
AR/VR/XR
Gaming

Quality on Demand

Video Production



Live Video Production
Video Production
Video Broadcasting

Slicing APIs



Network APIs offer the opportunity

- For customers to optimize their use cases and applications
- For operators to monetize their invest in 5G infrastructure

It's a win-win!

Benefit for developers to use CAMARA APIs



- 1 Reduces friction for developers to access network information across telcos globally.
- 2 Increases usage and value of telco networks by providing easy access to network capabilities.
- 3 Enables developers to create new applications or improve existing ones with access to these capabilities.

Additional
revenue on
existing assets,
leveraging SDN
and NFV
capabilities

Developers Getting Started with CAMARA APIs



A screenshot of the CAMARA website. At the top, there's a black bar with "THE LINUX FOUNDATION PROJECTS" in white. Below that is the CAMARA logo and a navigation menu with links: Home, About, Sub Projects A-H, Sub Projects I-Z, Working Groups, Events, Resources, and Contact. A red arrow points down to the "Sub Projects A-H" link, which has a dropdown menu open. The dropdown menu lists the following sub-projects: Blockchain Public Address, Call Forwarding Signal, Carrier Billing Check Out, ClickToDial, Connectivity Insights, Device Identifier, Device Location, Device Status, Device Swap, Edge Cloud, and Home Devices QoD. The main content area features a large blue background with the text "APIs enable seamless access to Telco network capabilities" and a "Read More" link.

Developers Getting Started with CAMARA APIs



CAMARA
THE TELCO GLOBAL API ALLIANCE

Quality on Demand

Scope

- Service APIs for "Quality on Demand" (see APIBacklog.md)
- It provides the customer with the ability to:
 - set quality for access network connections (e.g. mobile device connection or fixed access between a home gateway and the service providers gateway router)
 - get notification if network cannot fulfill
- Describe, develop, document and test the APIs (with 1-2 Service Providers)
- Started: October 2021
- Location: virtually

Meetings

- Meetings are held virtually: [Meeting registration / Join](#)
- Schedule: bi-weekly, Friday, 2 PM CET/CEST (13:00 UTC, 12:00 UTC during European DST). For date/time of next meeting see previous [meeting minutes](#).

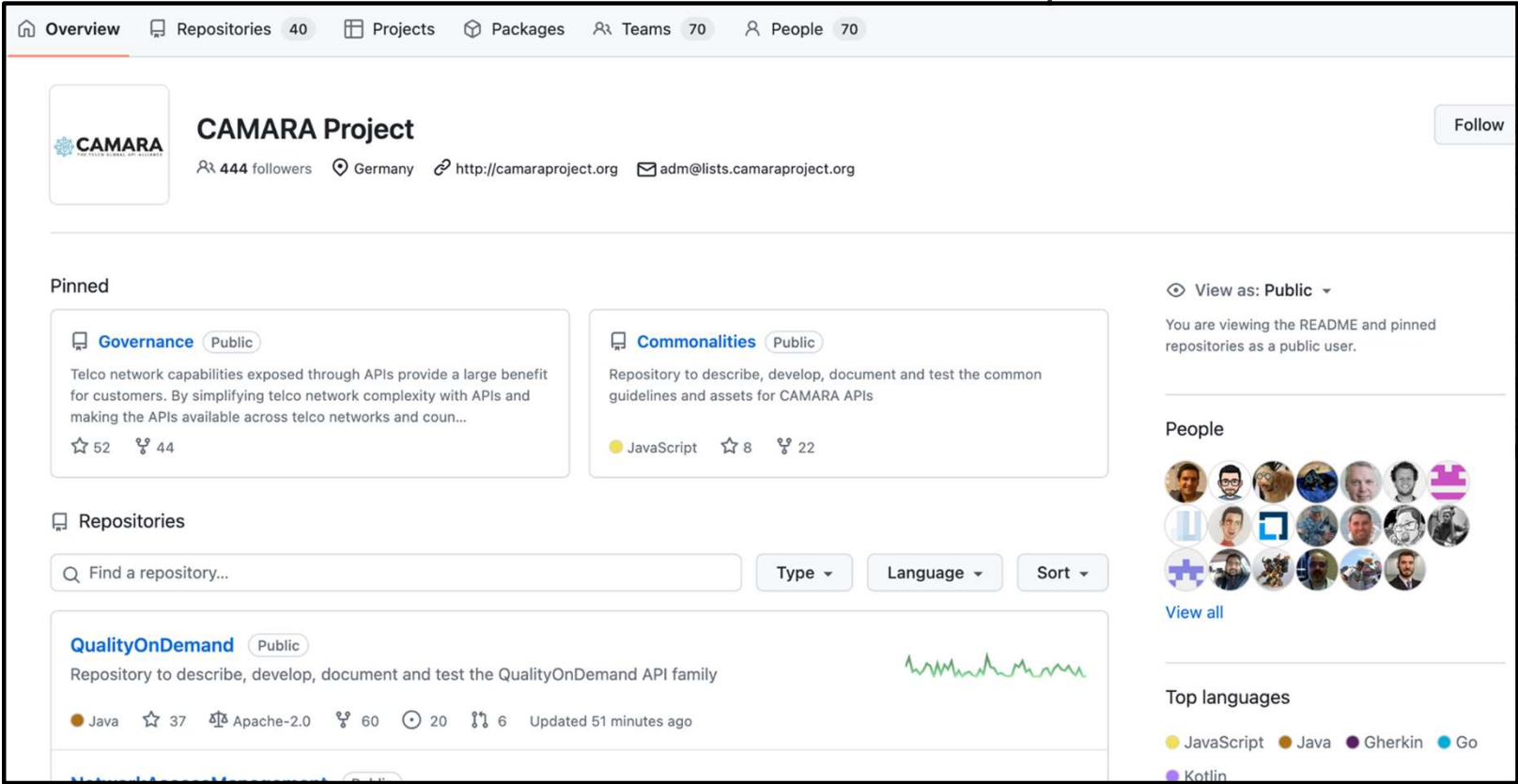
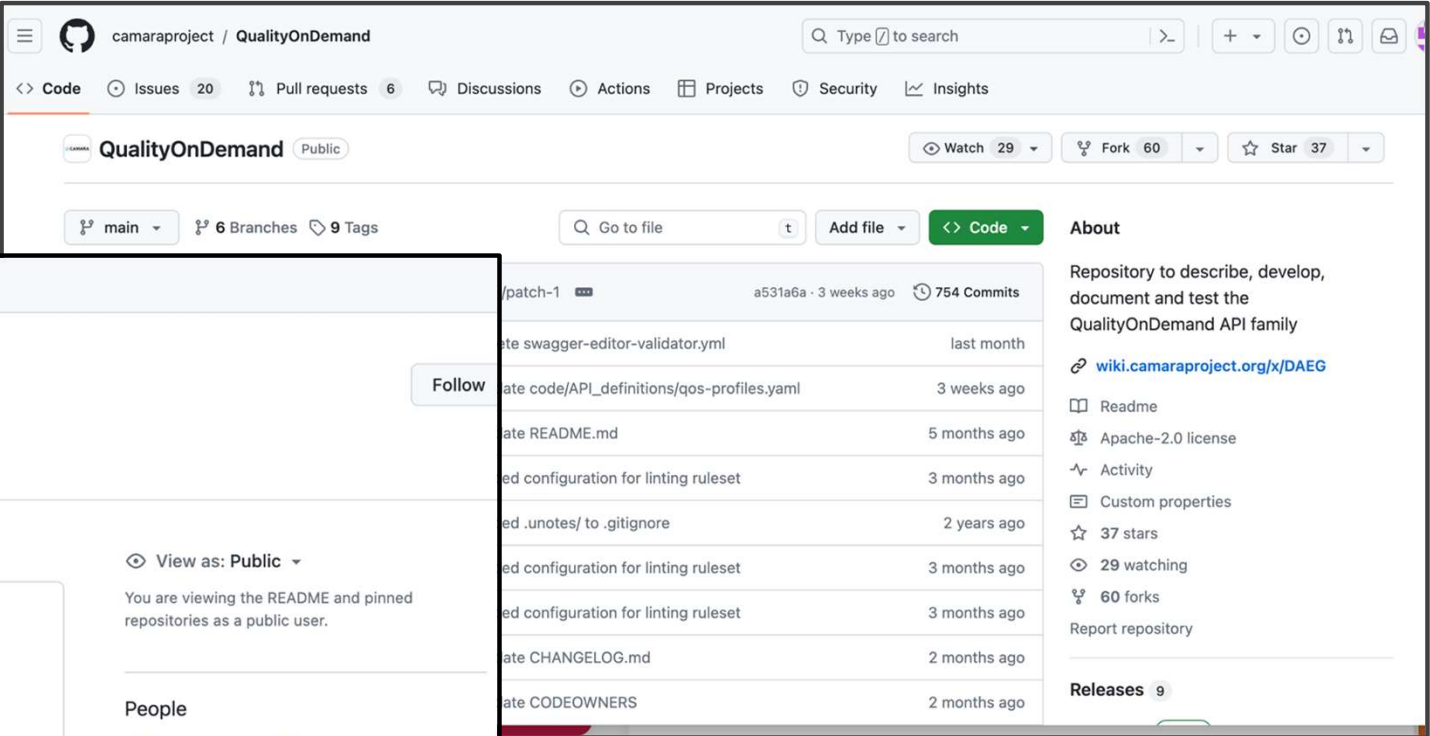
Results and Status

- Note: Please be aware that the project will have frequent updates to the main branch. There are no compatibility guarantees associated with code in any branch, including main, until a new release is created. For example, changes may be reverted before a release is created. **For best results, use the latest available release.**
- The latest available and released version 0.10.0 is available within the [release-0.10.0 branch](#)
 - API definition v0.10.0 with inline documentation:
 - [View it on ReDoc](#)
 - [View it on Swagger Editor](#)
 - [OpenAPI YAML spec file](#)
- The previous released version v0.9.0 is available within the [release-0.9.0 branch](#)
- For changes between v0.10.0 and v0.9.0 see the [CHANGELOG.md](#)
- Provider implementations (PI) are available within separate repositories (partly for previous releases):
 - [QualityOnDemand_PI1](#) by Deutsche Telekom
 - [QualityOnDemand_PI2](#) by Orange
 - [QualityOnDemand_PI3](#) by Spry Fox Networks

Contributorship and mailing list

- To subscribe / unsubscribe to the mailing list of this Sub Project and join or resign as a Contributor, please visit <https://lists.camaraproject.org/g/sp-qod>.
- A message to all Contributors of this Sub Project can be sent using sp-qod@lists.camaraproject.org.

Developers Getting Started with CAMARA APIs



Benefit for developers to work in CAMARA



As a typical Open Source Project **CAMARA is driven by contribution!**

People who contribute define priorities and drive the direction.

Working in CAMARA on API definitions, API documentations and API code (transformation functions) enables to

- **Bring in own demand** and contribute a solution
- **Influence the definition** of new APIs and API versions
- Ensure that own requirements are considered
- **Provide code which can be used globally**
- **Learn** about CAMARA, Open Gateway and the Network API ecosystem
- **Get deep knowledge about the APIs**
- **Become maintainer and TSC member** to influence technical decisions in CAMARA

Joining CAMARA as Developer



To join the CAMARA mailing list send an (empty) email to all+subscribe@lists.camaraproject.org.

The screenshot shows the CAMARA web interface. The top navigation bar is blue with the CAMARA logo and 'Your Groups' dropdown. The left sidebar contains links for Home (Owner), Subscription, Admin, Pending, Members (selected), and Activity. The main content area shows a breadcrumb trail: All / Members / markus / markus.kuemmerle@telekom.de (Mod). Below this is a 'Membership' dropdown menu. The 'User Details' section is highlighted, showing the 'Email Address' field with the value 'markus.kuemmerle@telekom.de'. A note below the field states: 'Note: Changing this email address changes the email address for this person's account, affecting all of their other subscriptions.'

The CAMARA GitHub <https://github.com/camaraproject> can be accessed without any prerequisite. To create issues and start contributing to CAMARA you need a free GitHub account.

Joining CAMARA as Developer



Each API family / working group in CAMARA is organized as a separate Sub Project with (example QoD):

- A dedicated lead repository (containing API definition and API documentation)
- 0...n provider implementation repositories (containing API code)
- A dedicated mailing list

QualityOnDemand Public
Repository to describe, develop, document and test the QualityOnDemand API family
Java 37 Apache-2.0 60 19 5 Updated 3 days ago

QualityOnDemand_PI1 Public
Provider Implementation of QualityOnDemand by Deutsche Telekom
Java 5 Apache-2.0 8 0 0 Updated 2 hours ago

QualityOnDemand_PI2 Public
Provider Implementation of QualityOnDemand by Orange
Kotlin 0 Apache-2.0 1 1 0 Updated on Nov 9, 2023

QualityOnDemand_PI3 Public
Provider Implementation of QualityOnDemand by Spry Fox Networks
Go 0 Apache-2.0 2 0 0 Updated on Apr 24, 2023

sp-qod@lists.camaraproject.org

Sub Project "Quality on Demand"

Group Information

95 Members

27 Topics , Last Post: May 17

Started on 07/05/22

[RSS Feed](#)

Group Email Addresses

Post: sp-qod@lists.camaraproject.org

Subscribe: sp-qod+subscribe@lists.camaraproject.org

Unsubscribe: sp-qod+unsubscribe@lists.camaraproject.org

Group Owner: sp-qod+owner@lists.camaraproject.org

Help: sp-qod+help@lists.camaraproject.org

Joining a Sub Project as Developer



To join a Sub Project please have a look into its Readme.md (example Quality on Demand):

last commit **may** issues **20 open** pull requests **5 open** contributors **27** repo size **11.4 MB** License **Apache 2.0**

QualityOnDemand

Repository to describe, develop, document and test the QualityOnDemand API family

Scope

- Service APIs for "Quality on Demand" (see APIBacklog.md)
- It provides the customer with the ability to:
 - set quality for a flow within an access network connections (e.g. mobile device connection or fixed access between a home gateway and the service providers gateway router)
 - Session mode, for a specific duration
 - Provision mode, indefinitely for each time the device connects to the same access network
 - get notification if network cannot fulfill
- Describe, develop, document and test the APIs (with 1-2 Service Providers)
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Status and released versions

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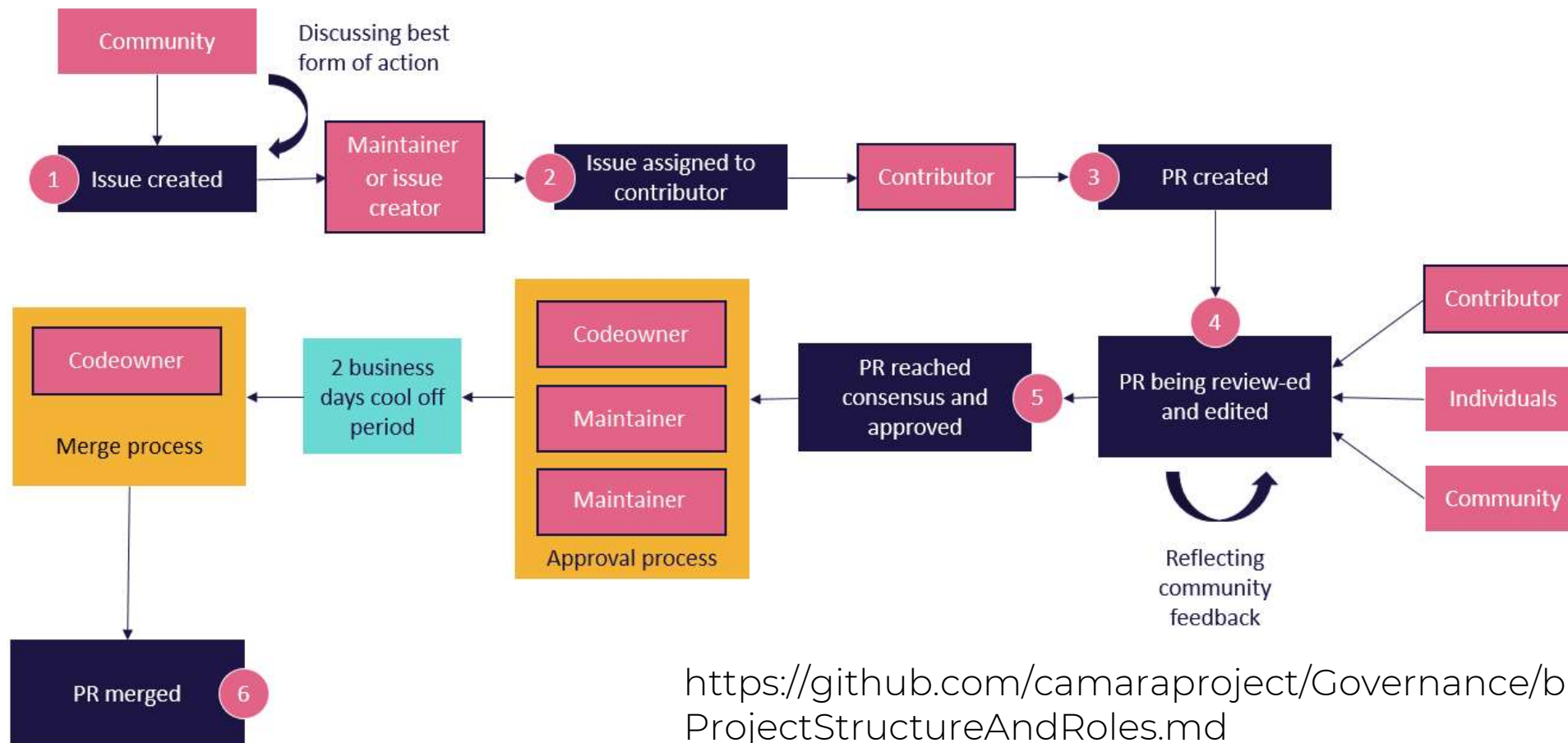
Contributorship and mailing list

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- A message to all Contributors of this Sub Project can be sent using sp-god@lists.camara-project.org.

Contributing to CAMARA



In the Project the “Fork and pull model” is used. Changes and contributions to CAMARA shall follow this process:



<https://github.com/camaraproject/Governance/blob/main/ProjectStructureAndRoles.md>

Benefit for operators to implement CAMARA APIs in their networks



Operators have made high investments in

- Spectrum licences
- Infrastructure (cell towers, fibre)

Operators haven't been successful in

- Increasing customer prices for connectivity contracts

CAMARA APIs open a possibility

- To monetize the high investments
- To improve customer experience
- For market positioning



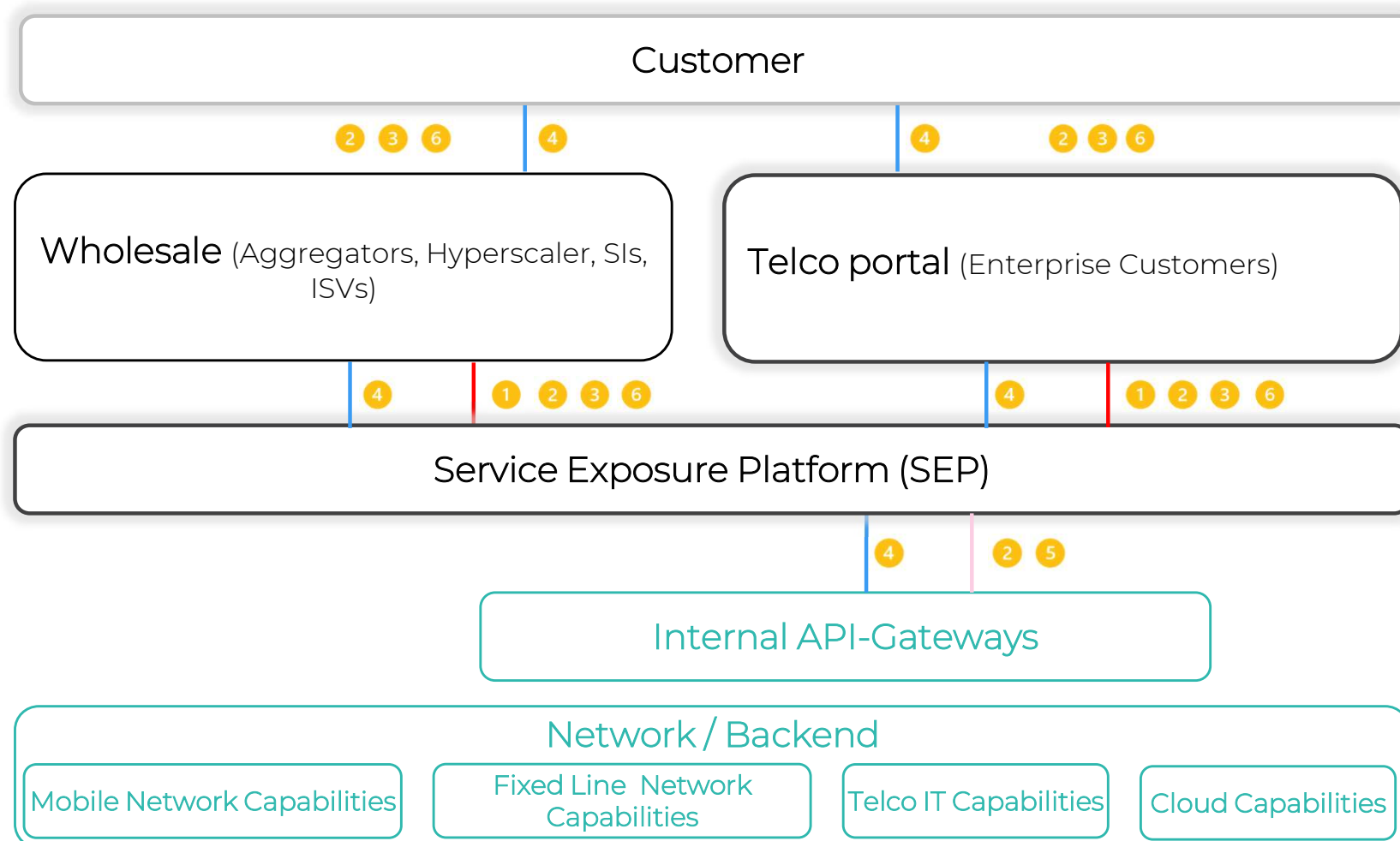
What have operators to do to implement Network APIs?



- Develop APIs and products based on the network capabilities
- Implement an exposure infrastructure
- Define commercial products
- Sell it



What have operators to do to implement Network APIs?



Possible API workflows

1. Catalog published from SEP to portals
2. Customer onboarding to SEP
3. Customer orders API, SEP sends credentials to access API
4. If necessary SEP requests user consent for API. Capacity management is done. Customer uses API. SEP performs metering (wholesale) / metering and rating (retail).
5. SEP initiates billing for wholesale and retail
6. Customer offboarding

Service API

IT API

Operate API

Benefit for operators to work in CAMARA



Collaborative Innovation

- Industry Collaboration
- Standardization: contribute to development of industry standards, ensuring interoperability and consistency across networks and services
- Bring in your requirements!

Networking and Partnerships

- Access to a growing global network of industry leaders
- Technological Advancements
- Knowledge Exchange

Shared Resources

- Collaborative projects often lead to cost savings through shared resources and reduced duplication of efforts
- Benefit from the collective research efforts

Benefit for operators to work in CAMARA



Why Join CAMARA as a sponsor /member?

Seat on the Governing Board to influence CAMARA strategy

Elevate your Brand

Signal Support & Commitment to open API development

Discounts on Linux Foundation events & programs

Help ensure the Project continues to provide needed governance & infrastructure

Platform to showcase thought leadership

Operators Getting Started with CAMARA



Individuals and organizations from API customers (e.g. enterprises and startups), aggregators, cloud operators, telco operators, network equipment vendors, system integrators, and software vendors are welcome to join CAMARA.

For organizations:

- If you are interested to show your logo on the CAMARA website as **“Participating Organization”** send a .SVG version of it to adm@lists.camaraproject.org. Participation is free, without any fees or obligations.
- If you would like to become a **CAMARA sponsor** please don't hesitate to use the [enrollment link](#). The cost is depending on the kind of membership and the number of employees.
- Associate Members of The Linux Foundation can also join as **"Associating organization"** for free, without any fees or obligations.

CAMARA

Where are we going next...



1

Additional APIs and roadmap sync across CSPs, Aggregators and Hyperscalers

2

API lifecycle management consistency, Documentation of API versioning and availability globally

3

Drive API Adoption (customers/developers and operators)

CAMARA Contacts



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THE TELCO GLOBAL API ALLIANCE

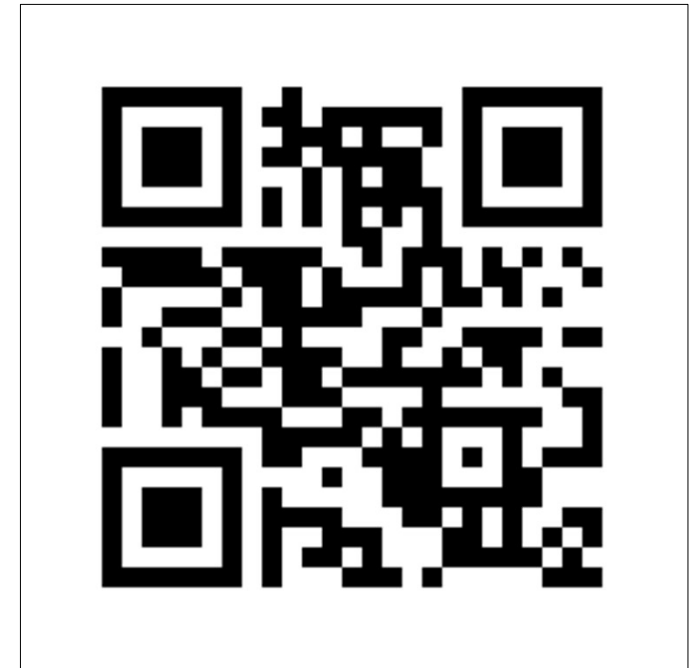
Individuals and organizations from API customers (e.g. enterprises and startups), aggregators, cloud operators, telco operators, network equipment vendors, system integrators, and software vendors are welcome to join CAMARA.

To access CAMARA technical resources like API definitions, API specifications or API code just visit the [CAMARA GitHub](#). All resources are reachable without any prerequisite. To create issues and start contributing to CAMARA you need a free GitHub account without any further prerequisite. This participation is free, without any fees or obligation to work.

If you are interested to be included in the CAMARA communication, please subscribe to all+subscribe@lists.camaraproject.org. You may unsubscribe from CAMARA and these communications at any time. Participation is free.

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