5G Enablement through industry standardized APIs

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Problem Statement

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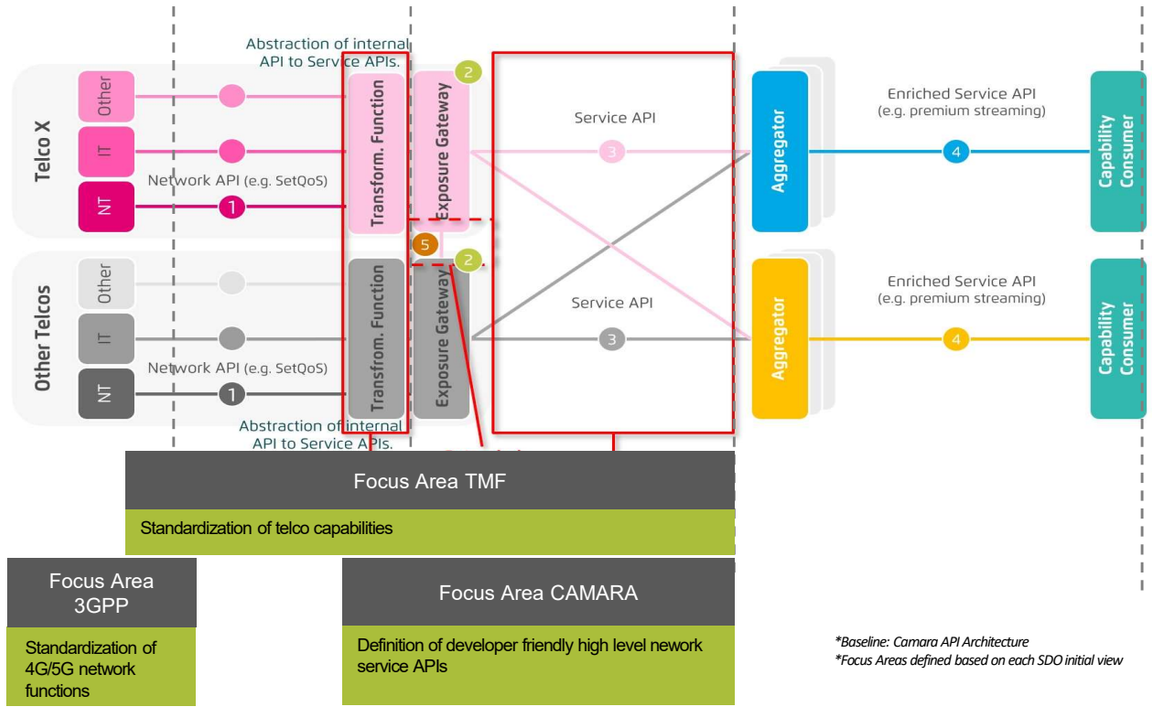
Initial Problem statement

- Adopting Standardized exposure is a key decision for CSPs in their evolution journey and can be a success differentiator in the ecosystem.
- There is an initiative from Linux Foundation under the name of CAMARA to define APIs to expose CSP network capabilities.
- Without clear segregation (between Camara, 3GPP, and TM Forum), exposing APIs to 3PPs, enterprises and developer community becomes a clear challenge.



Solution Overview

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Purpose and Target

- Our purpose is to define a unified API specification set that enable exposure of 5G scenarios. With the delivery of a real-life scenario, an agreed consensus can be reached on a demarcation for APIs areas of coverage, as well as points of enhancement for different initiatives and standardization fora to take forward

- Scenario of choice is operators providing a Quality of Service capability, enabling partner app to boost traffic for its customers based on user policy or via boost button which is presented in the UI. The scenario fulfils the catalyst need as it covers
  - Market Segment : Mobile Broadband.
  - Industry Segment : Multiple.
  - Business Model : B2B2X.

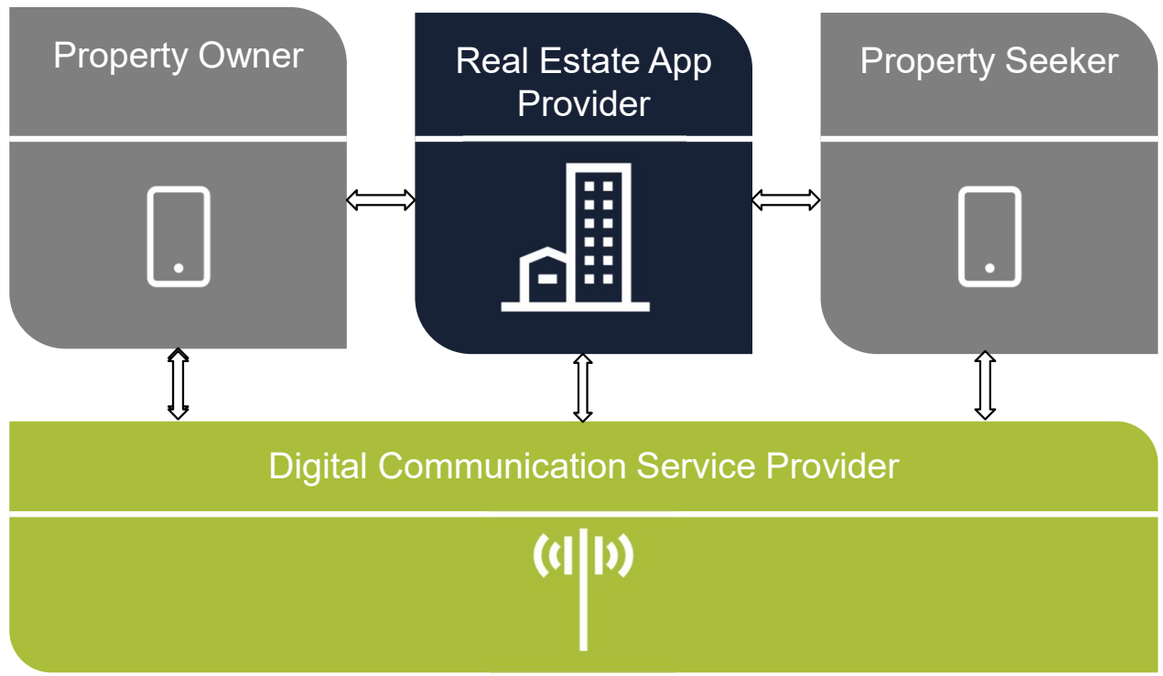
- A more specific variant of the above scenario will be our catalyst proposed innovative real estate digital twin

Real Estate Digital Twin

Overview

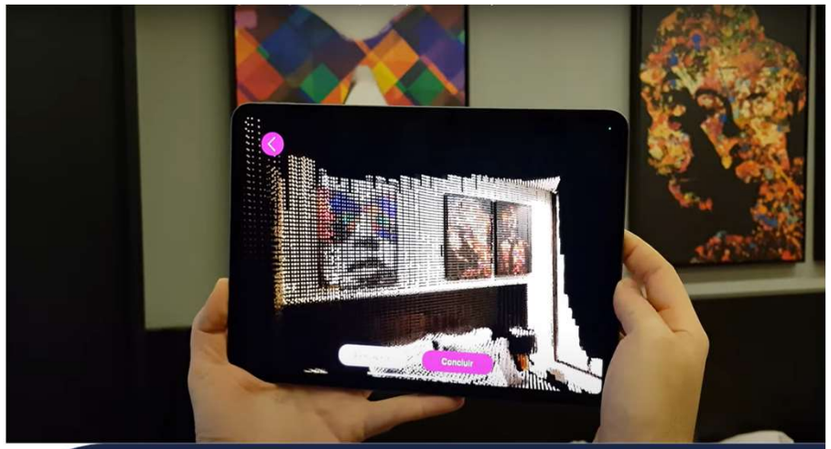
- Our solution proposes relying on latest advancements in end-users devices (LiDAR Sensors) enabling the clients (Property Owners) to capture 3D models of their properties. Such models are uploaded to the real-estate provider application (Application Service Provider), where targeted clients (Property Seekers) can view the 3D created real models of the properties. More elaboration can be found in this video .

- The captured models need to be uploaded in real time with high bandwidth. This would allow the capture of higher quality model which is essential for the optimum customer experience.



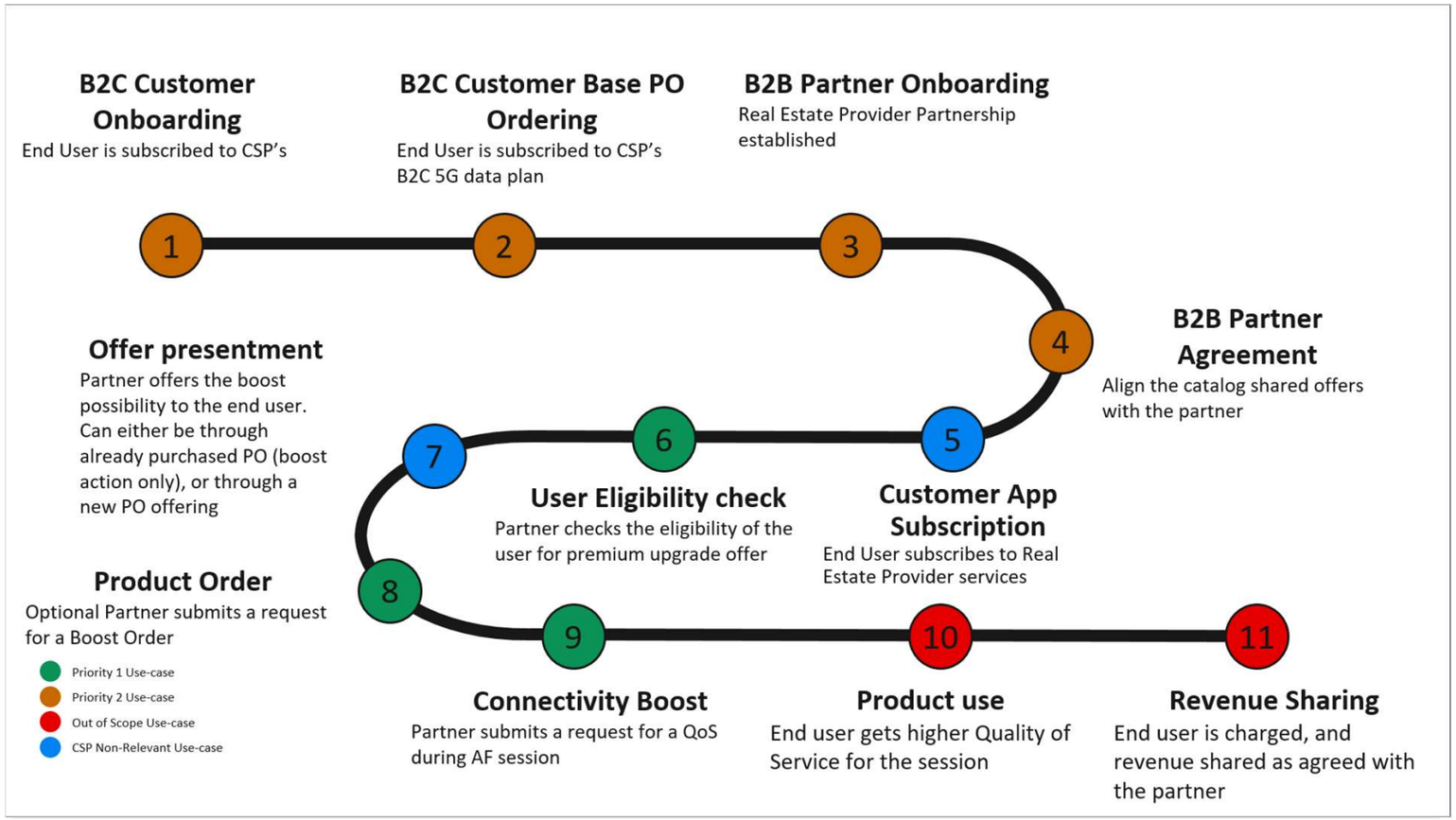
Real Estate Digital Twin

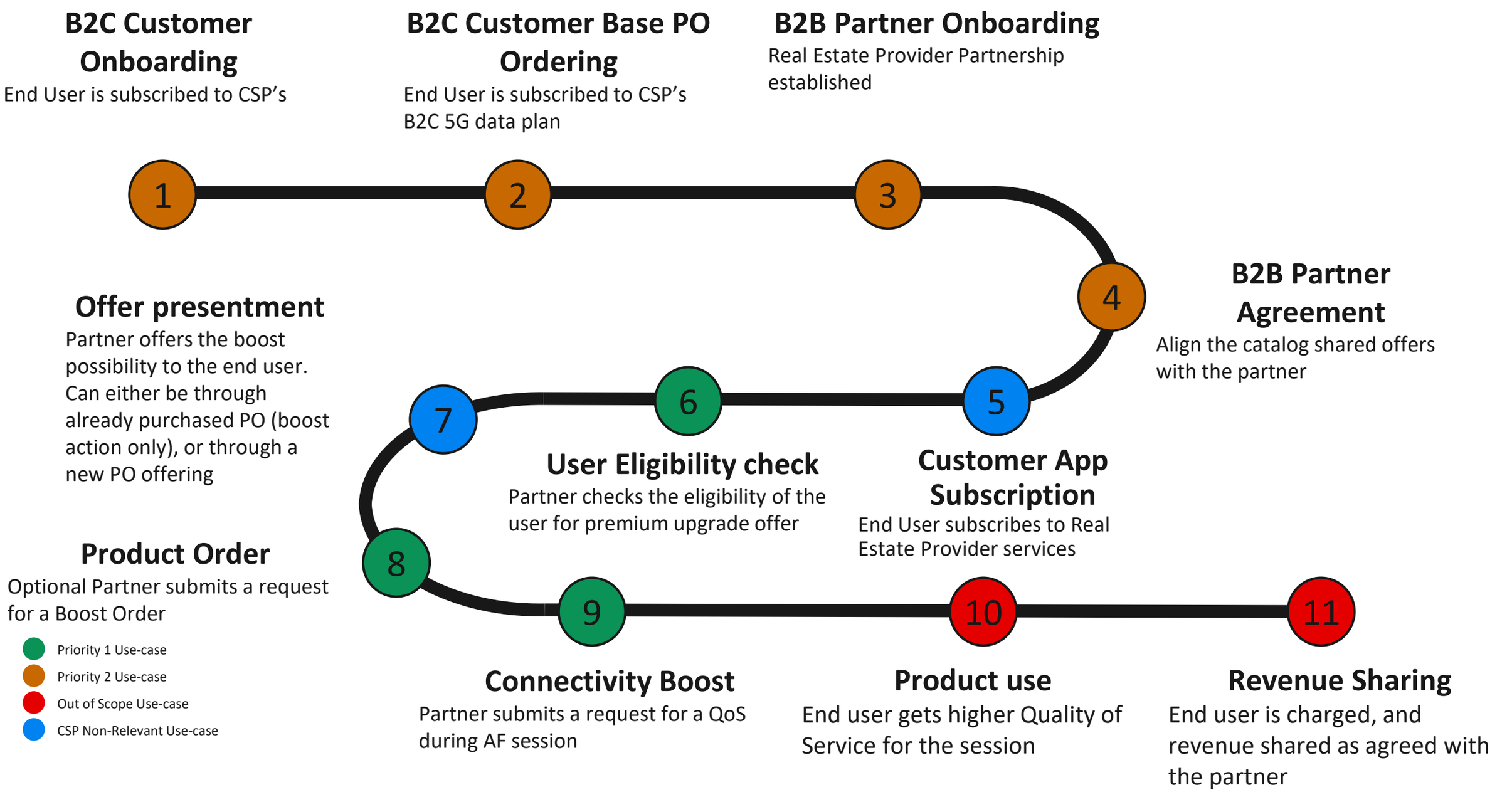
(Property Owner – ASP – CSP) Journey



Scenario:

Operators can provide a QoS capability enabling partner real estate app to boost traffic for its customers for better capture of real Digital twin of the end users' properties




B2C Customer Onboarding
End User is subscribed to CSP's
B2C Customer Base PO Ordering
End User is subscribed to CSP's B2C 5G data plan
B2B Partner Onboarding
Real Estate Provider Partnership established
1
2
3
4
B2B Partner Agreement
Align the catalog shared offers with the partner
Offer presentment
Partner offers the boost possibility to the end user. Can either be through already purchased PO (boost action only), or through a new PO offering
5
6
7
User Eligibility check
Partner checks the eligibility of the user for premium upgrade offer
Customer App Subscription
End User subscribes to Real Estate Provider services
Product Order
Optional Partner submits a request for a Boost Order
8
9
10
11
Priority 1 Use-case
Priority 2 Use-case
Out of Scope Use-case
CSP Non-Relevant Use-case
Connectivity Boost
Partner submits a request for a QoS during AF session
Product use
End user gets higher Quality of Service for the session
Revenue Sharing
End user is charged, and revenue shared as agreed with the partner

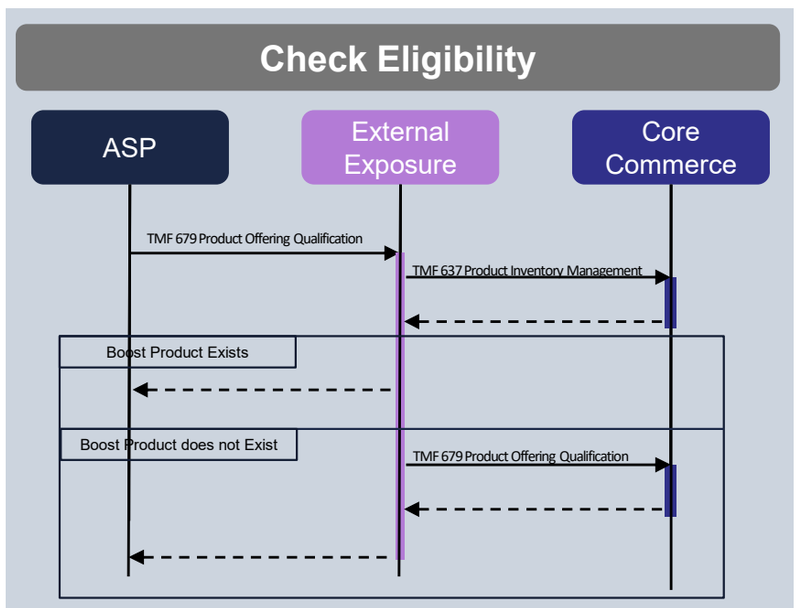
Required API Operations

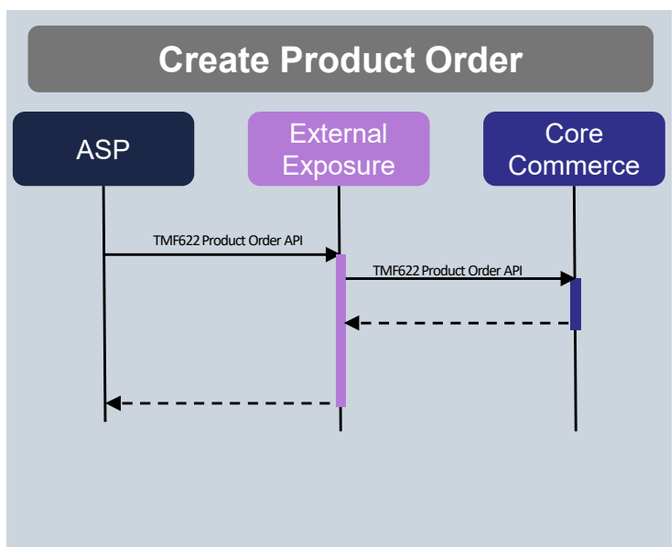
Mapped to current existing Organizations APIs

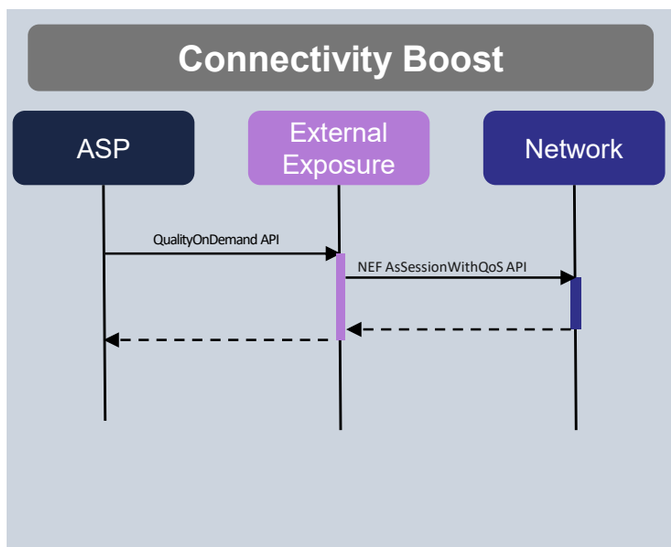
UC	Required Operation	Scope Description	Comment	CAMARA Coverage	TMF Coverage
B2C Customer Onboarding	OnboardCustomer	• Onboard hierarchy of a B2C customer creating the Demographic /contact/billing/Payment information	• Although full hierarchy creation will be probably managed through assisted channels, adding a full individual hierarchy to an existing organization is required for zero touch simplified onboarding	• NA	• TMF 701 **OR** • Orchestration of TMF632 POST /party TMF629 POST /customer TMF666 POST /billingAccount TMF670 POST /paymentMethod
B2C Customer Base PO Ordering	CreateProductOrder	• Validate, fulfil and assure payment for customer connectivity capabilities. Activated offering is basic connectivity at minimum, but can included 5G enabling service.		• NA	• TMF622 POST /productOrder
B2B Partner Onboarding	Onboard Partner	• Onboard hierarchy of Partner creating the Demographic /contact/billing/Payment/Partnership information	• Although Partnership can be established in detail through assisted channels, CSPs planning to interact with -or further more provide- an ecosystem requires API managed zero touch simplified partner onboarding	• NA	• TMF 701 **OR** • Orchestration of TMF632 POST /party TMF669 POST /partyRole TMF666 POST /billingAccount TMF666 POST /settlementAccount
B2B Partner Agreement	Inquire Agreements	• Inquiring preexisting Agreement templates linked to preexisting product offerings	• Although agreements can be tailored in an assisted mood, planning to interact with -or further more provide- an ecosystem requires API managed zero touch Agreement management	• NA	• TMF651 GET /agreement
	Create Agreements	• Creates an agreement between Partner and CSP		• NA	• TMF651 POST /agreement
User Eligibility Check	CheckUserEligibility	• Check if the End-user is elegible to do the boost action. If not eligible then operation should return the applicable offerings required to make enduser eligible for the boost action	• Having a seperate call for the eligibility eliminates presenting the customer a non-eligible choice, hence enhancing customer experince. • Eligibility can be done as an initial part of the boost	• NA	• TMF 701 **OR** • Orchestration of TMF637 GET /product TMF679 POST /productOfferingQualification
Product Order	CreateProductOrder	• Validate, fulfil and assure payment for customer connectivity capabilities enabling Boost Action	• Boost action can be enabled by default on (UC B2B Customer Base PO Ordering) hence this step can be optional	• NA	• TMF701 as elaborated in section 1.4 of Order Capture **OR** • Orchestration of TMF622 POST /productOrder TMF676 POST / payment
Connectivity Boost	BoostConnectivity	• Validate and fulfil boosting of specific end-user session		• QualityOnDemand API : POST /sessions	• TMF 640 PATCH /service

Suggested Catalyst Operations - Overview

UC	Required Operation	Exposure Operation	Internal orchestrated Operation s	Scope
User Eligibility Check	**CheckUserEligibility**	• TMF679 POST /productOfferingQualification	• TMF637 GET /product • TMF679 POST /productOfferingQualification	• Checks eligibility for the customer to request the boost action. Requires checking the products/services repository [TMF637], if customer portofolio of products/services don't provide capability for boost then operation needs to check for the qualified proucts to be offered to the customer that cover the boost action [TMF679].
Product Order	**CreateProductOrder**	• TMF622 POST /productOrder	• TMF622 POST /productOrder	• TMF 622 will be used for activation the boost product and fulfilling the boost action.
Connectivity Boost	**BoostConnectivity**	• QualityOnDemand API : POST /sessions	• NEF AsSessionWithQoS API: POST /3gpp-as-session-with-qos/v1/subscriptions	• Scope will not include any inquiry for qualified offerings upon failure to fulfill due to ineligibility







Product Ordering API

Create Product Order suggested operation

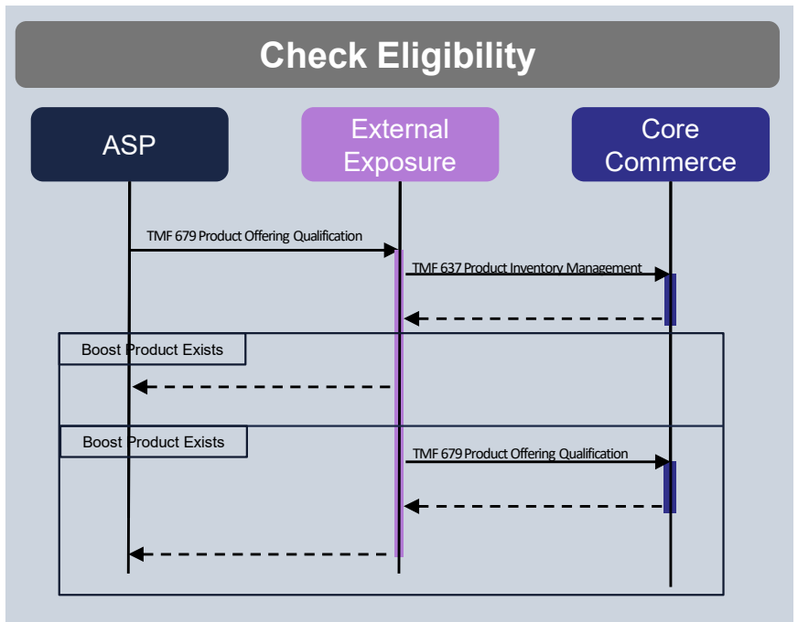
- Product Ordering API suggested to fill the need of fulfilling actions against CSP Offerings
- The API is are expected to
  - Activate Products, services and resources in the CSPs registry
  - Fulfil the payment action
  - Fulfil Network activation and configuration
- Working under the following assumptions
  - Product Offerings can be pre-aligned during partnership agreement creation and maintained by partner Apps, or inquired through a qualification call prior to order submission
  - Limited number of parameters are expected for simple orders


```
{
  "@type": "CamaraProductOrder",
  "ueId": {
    "msisdn": "33123456789"
  },
  "payment": {
    "paymentMethod": {
      "id": "CarrierBilling"
    }
  },
  "productOrderItem": [
    {
      "@type": "CamaraProductOrderItemAdd",
      "id": 1,
      "action": "add",
      "productOffering": {
        "id": "Boost"
      }
    }
  ],
}
```

UC-6 User Eligibility Check

UC	Required Operation	Exposure Operation	Internal orchestrated Operation s	Scope
User Eligibility Check	CheckUserEligibility	• TMF679 POST /productOfferingQualification	• TMF637 GET /product • TMF679 POST /productOfferingQualification	• Checks eligibility for the customer to request the boost action. Requires checking the products/services repository [TMF637], if customer portofolio of products/services don't provide capability for boost then operation needs to check for the qualified proucts to be offered to the customer that cover the boost action [TMF679].

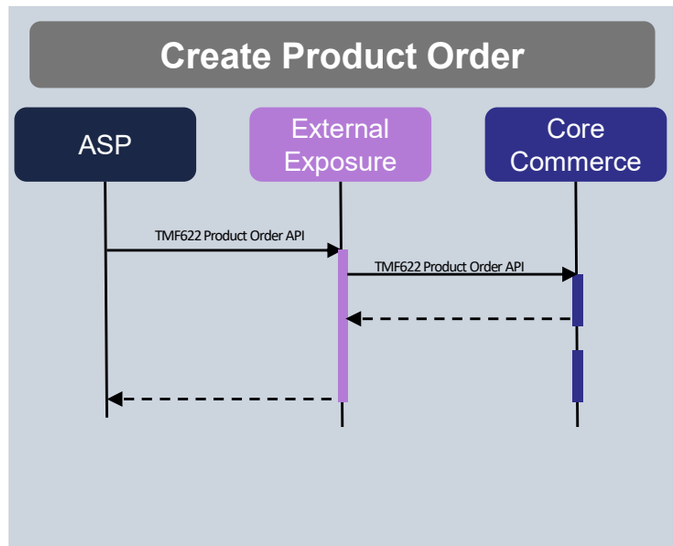
- API to check the eligibility of the end user for the boost, result could be
  - Green: User is already enjoying a product offering allowing him to boost freely
  - Yellow: User doesn't have a free boost PO,but is eligibly for add-on boost product offerings.
  - Red: User doesn't have a free boost PO, Nor eligible for add-on boost offerings
- Domain Context Specialization used to abstract API signature for only required parameters by ASPs
- Challenges
  - TMF API signature required extension to meet requested scope, introducing Green/Yellow/Red Concept
  - TMF API Operation behaviour returning existing products without qualification (Green Scenario) is architecturally questionable



UC-8 Product Order

UC	Required Operation	Exposure Operation	Internal orchestrated Operation s	Scope
Product Order	CreateProductOrder	• TMF622 POST /productOrder	• TMF622 POST /productOrder • TMF676 POST / payment	• TMF 622 will be used for activation the boost product and fulfilling the boost action. TMF 676 will be used for reflecting the payment for that order

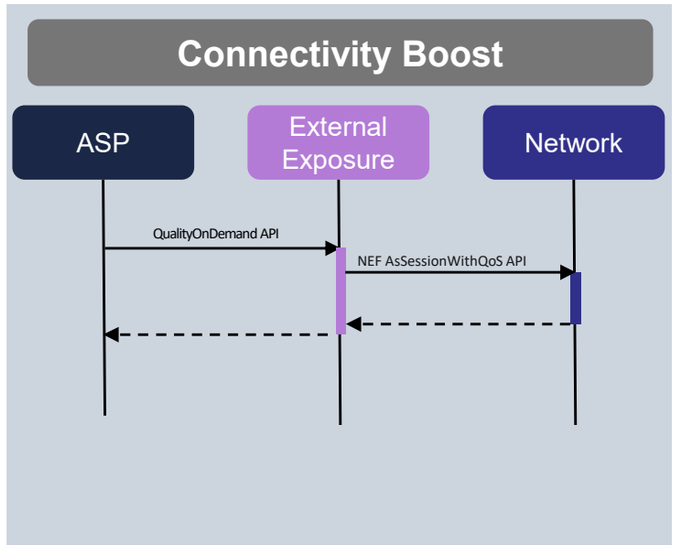
- API submit the add-on Boost Order and fulfil the boost action against the network
- Domain Context Specialization used to abstract API signature for only required parameters by ASPs



UC-9 Connectivity Boost

UC	Required Operation	Exposure Operation	Internal orchestrated Operation s	Scope
Connectivity Boost	**BoostConnectivity**	• QualityOnDemand API : POST /sessions	• NEF AsSessionWithQoS API: POST /3gpp-as-session-with-qos/v1/subscriptions	• Scope will not include any inquiry for qualified offerings upon failure to fulfill due to ineligibility

- API submit the add-on Boost Order and fulfil the boost action against the network
- Domain Context Specialization used to abstract API signature for only required parameters by ASPs



Adopted Architecture & Principles

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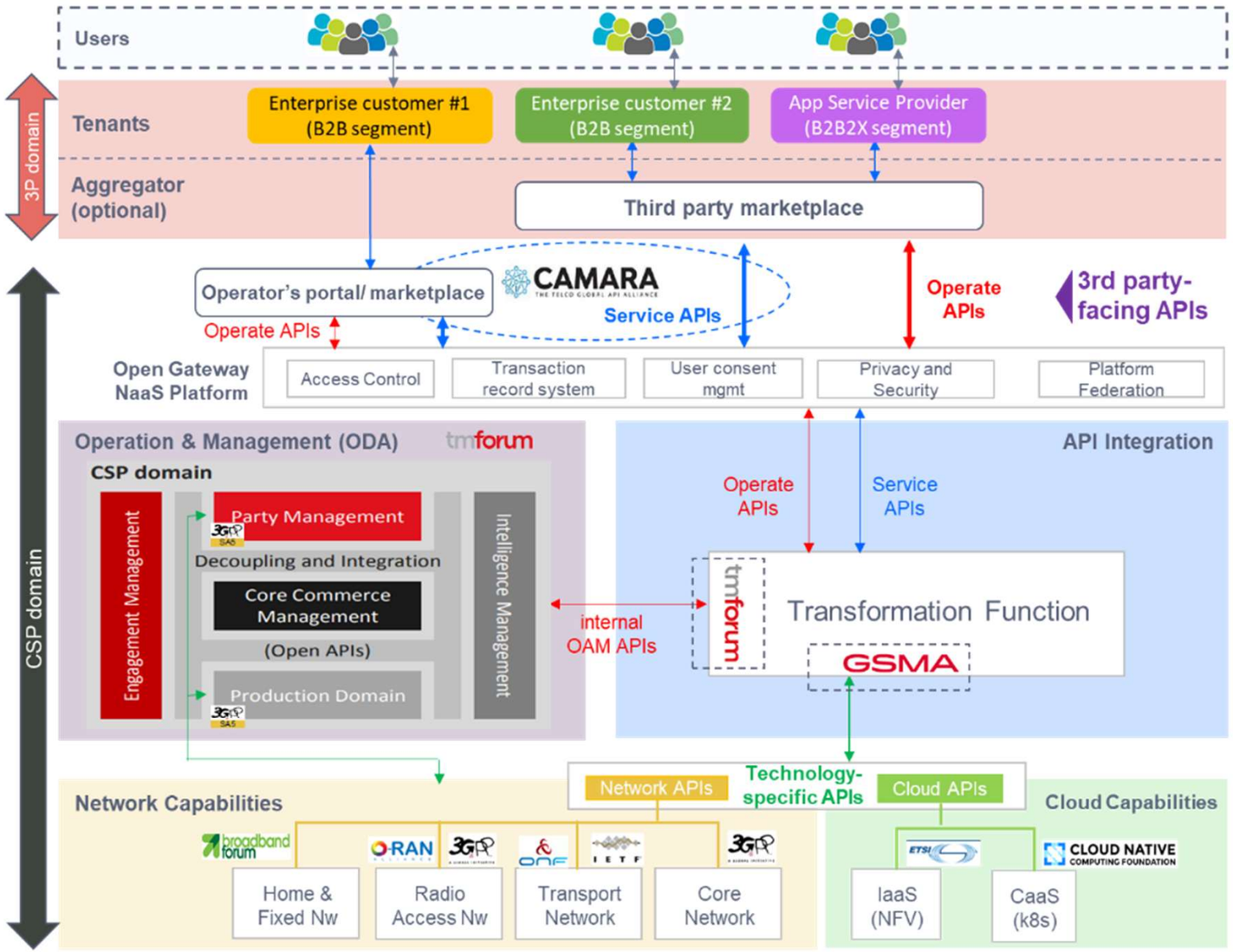
Architecture for API Exposure



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

Architectural Principles for API Exposure

- A new layer of composite APIs are required to fulfil the below
  - Expose holistic APIs orchestrating granular TMF/3GPP/etc APIs to fulfil common business scenarios
  - Abstract the Standards (TMF/3GPP/etc) operations data model, exposing slim simplified set of parameters which are understandable to the developer community.
  - Provide reusable set of capabilities fulfilling essential scope and realizing multiple use-cases. We should refrain from standardizing specialized limited scope operations to maintain a controlled set of API repository
- The composite APIs are expected to
  - Rely on TMF data model as base -as well as other standards depending on area of coverage-, since it is market proven mature model.
  - Suggested as CAMARA APIs and Reverted to TMF for possible inclusion within the standard

Challenges, Gaps & Way Forward

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Architecture Challenges

- Challenges for using CAMARA APIs for Life Cycle Management
  - CAMARA APIs don't currently cover OAM capabilities, full coverage of capabilities is not expected soon as they are not yet planned in the CAMARA backlog
  - If created with no reliance on existing market standards, APIs are expected to follow normal path of market assessment and rectification till they reach a stable mature structure

- TMF provides a mature stable set of APIs fulfilling customer OAM capabilities, but face the following challenges fulfilling foreseen ASPs interactions
  - API operations require abstraction of operations payload, catalyst proved ability to simplify payload utilizing TMF patterns (Domain context specialization)
  - ASPs interactions would require orchestrating multiple TMF operations, which call for creation of abstracted composite layer (Experience Layer).

- Exposing multiple APIs with different standards complicates API consumption, as caller systems would require to understand multiple naming conventions and follow different models for security, error handling, etc.

Alignments & Challenges

As an outcome of the Catalyst Project

Aligned On

- TM Forum assets will be utilized for CAMARA Operation, Administration & Management APIs
- TMF guidelines can be used for abstraction and simplification of APIs to meet CAMARA targets best serving application developers
- TMF APIs -in some cases- can be granular and would require an added layer of composite APIs to orchestrate multiple APIs defined by TMF
- Exposure of CSPs external APIs is better served and governed by a unified layer following same exposure guidelines

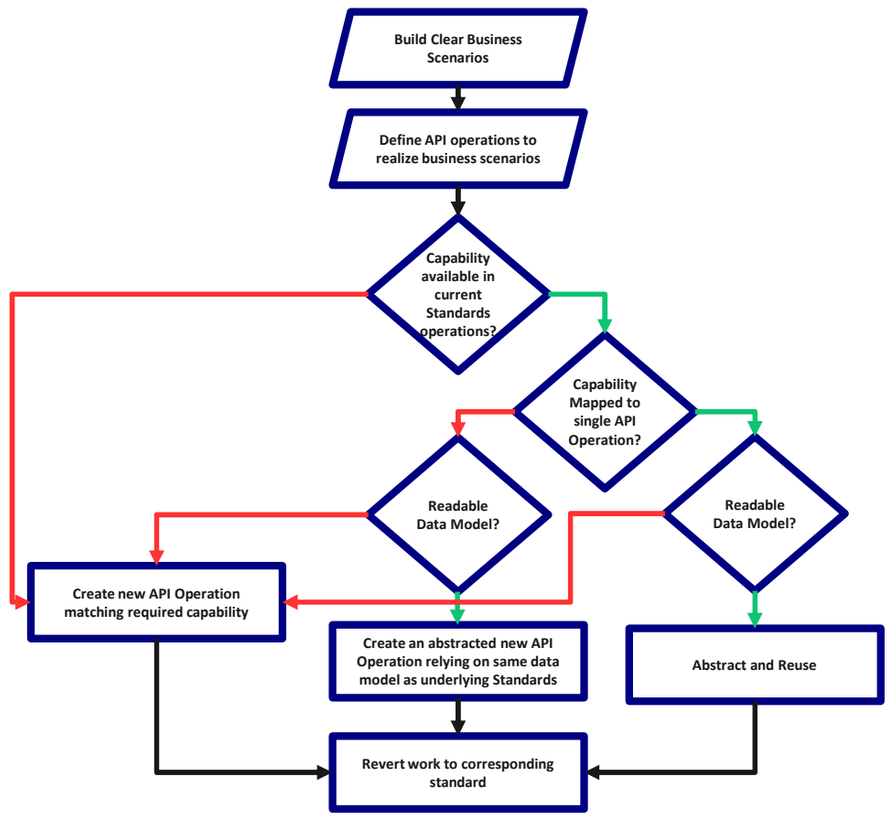
Challenged On

- TMForum guidelines of exposure are not aligned with CAMARA guidelines. This hinders the direct exposure of TMF APIs as CAMARA APIs
- TMF APIs extended using (Domain Context Specialization) approach are flexible to define any capability. When and how to use of the approach is yet to be agreed by the CSPs.
- Assessment of readability and measure of abstraction of the data models to be exposed to Application developers is unclear. No defined set of principles exists for assessment.

Way Forward

- Creating unified API repository -within CAMARA initiative- of business driven simplified APIs will be governed by the joint work of the telecommunication community following the approach drafted in the side diagram.

- TMF member representatives will participate in the CAMARA commonalities team to resolve issues identified within catalyst during abstraction and reuse, such as
  - Principles for capability and data model assessments highlighted in the diagram
  - Governance for newly created API operations
  - Naming conventions for operations and parameters
  - Error schema unification



**Flow to be confirmed in work group*


thank you
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