External API Casablanca Proposals

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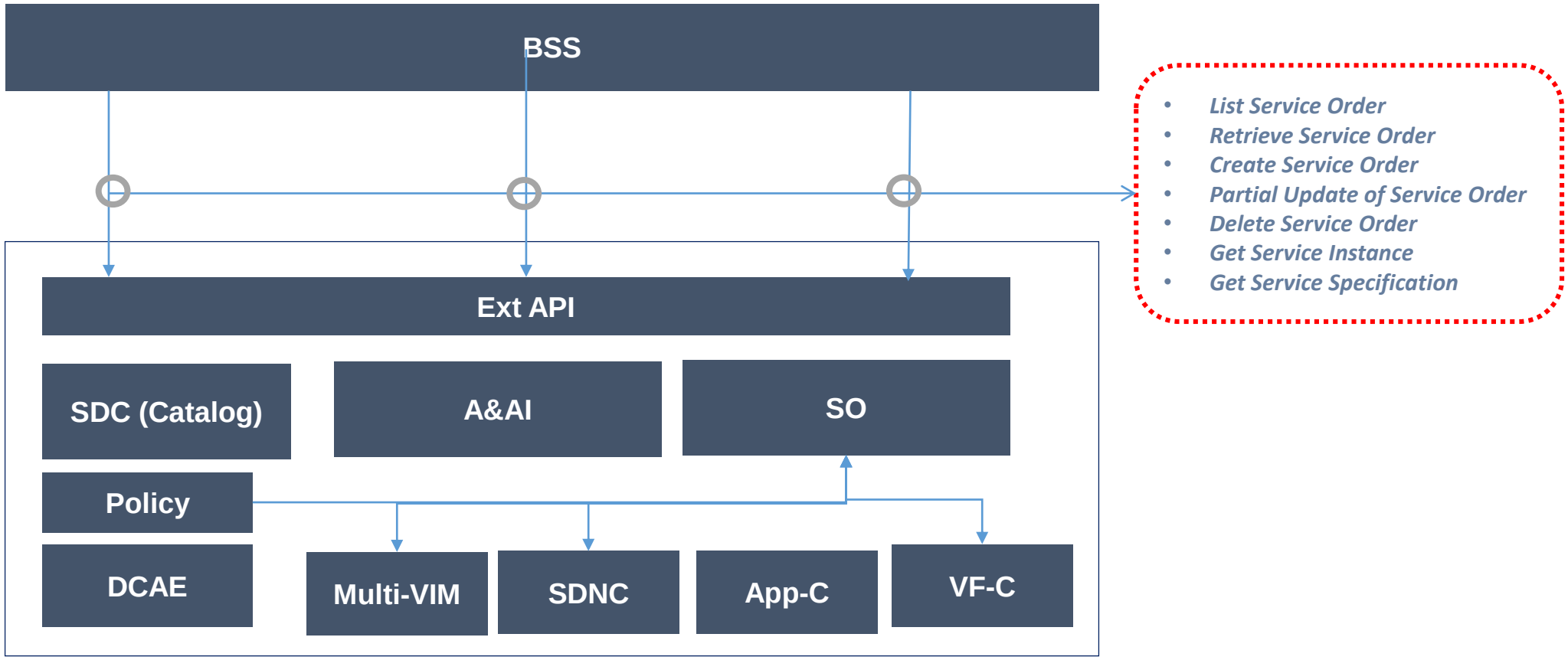
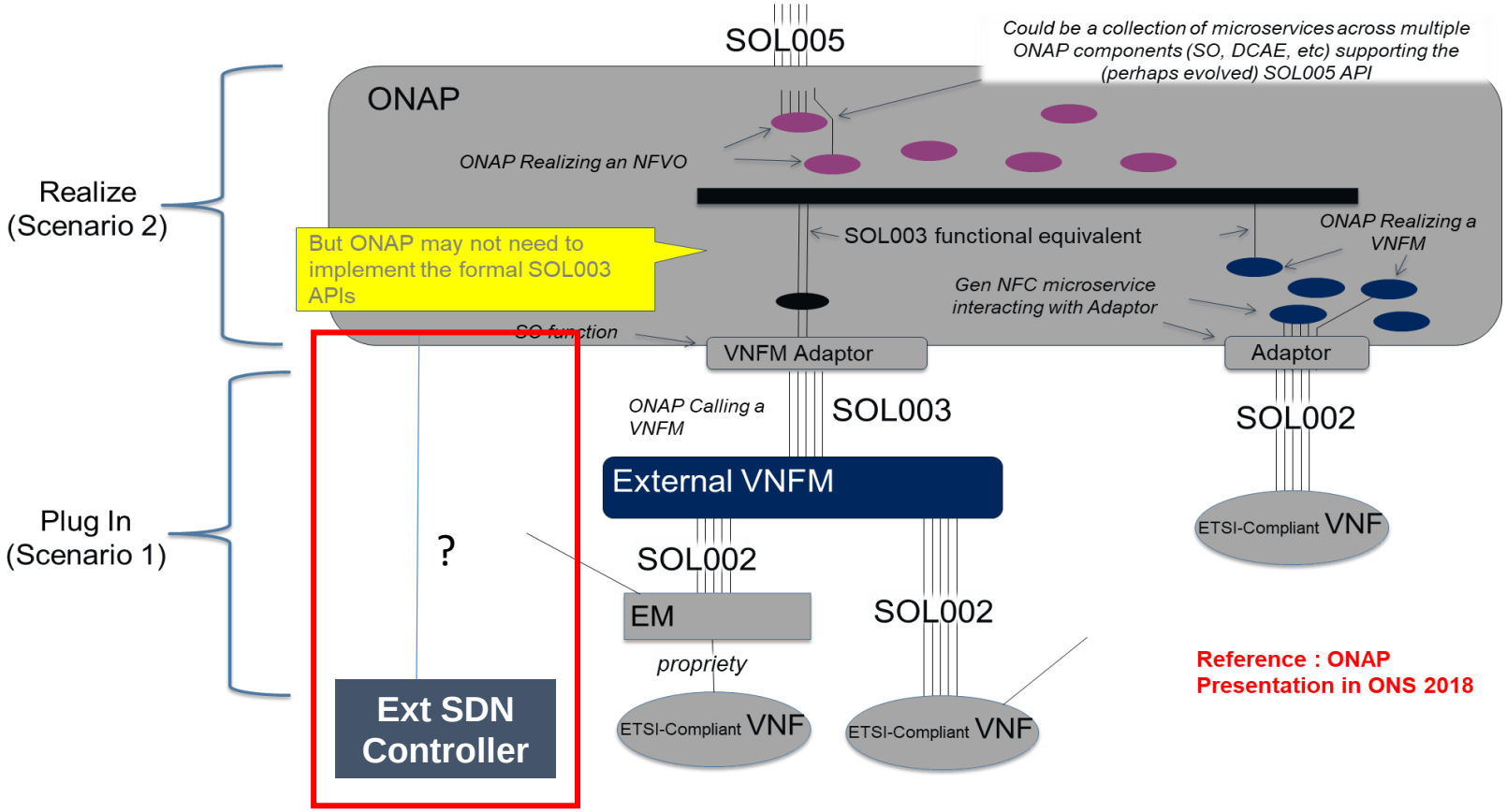
Ext API : Beijing Release



Ext API NBI is more aligned to TMF 641 (Service Order API), Partially to TMF 633 (Service Catalog Management) , TMF 638 (Service Inventory Management)

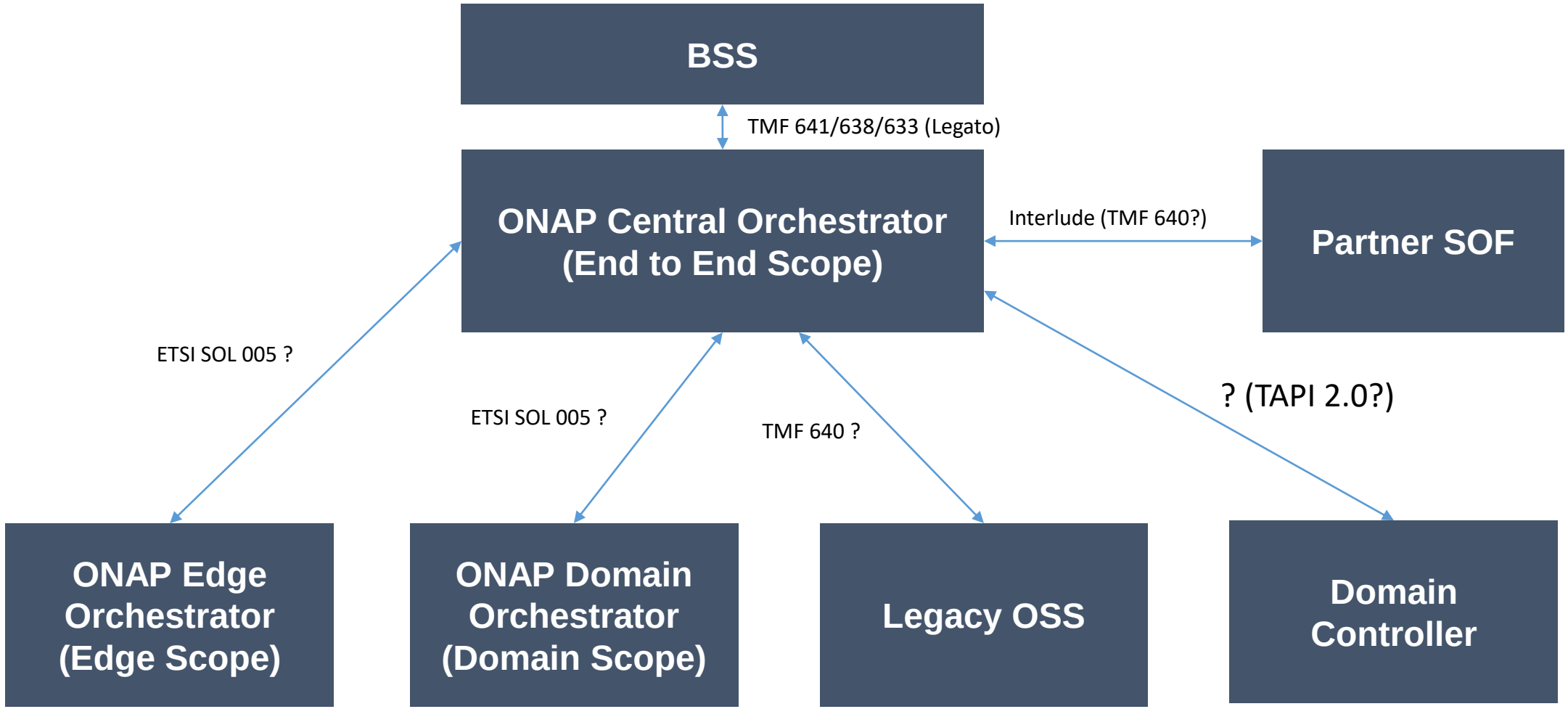
Problem Statement 1: ONAP Alignment to ETSI Standards



- In proposed ONAP alignment with ETSI Standards (ONS 2018) only the SOL003/SOL002 interfaces are being addressed for SBI
- External SDN Controller integration over a standard interface is not supported yet.
- Without a standard interface it may lead to a vendor specific implementation that will require adaptation on a case by case basis and operational/development overhead

Currently ONAP SDNC interaction with SO is internal and not exposed. There are scenarios which might require connection to External SDN Controller. But currently all such external SDNC interactions are planned to be enabled through ONAP SDNC

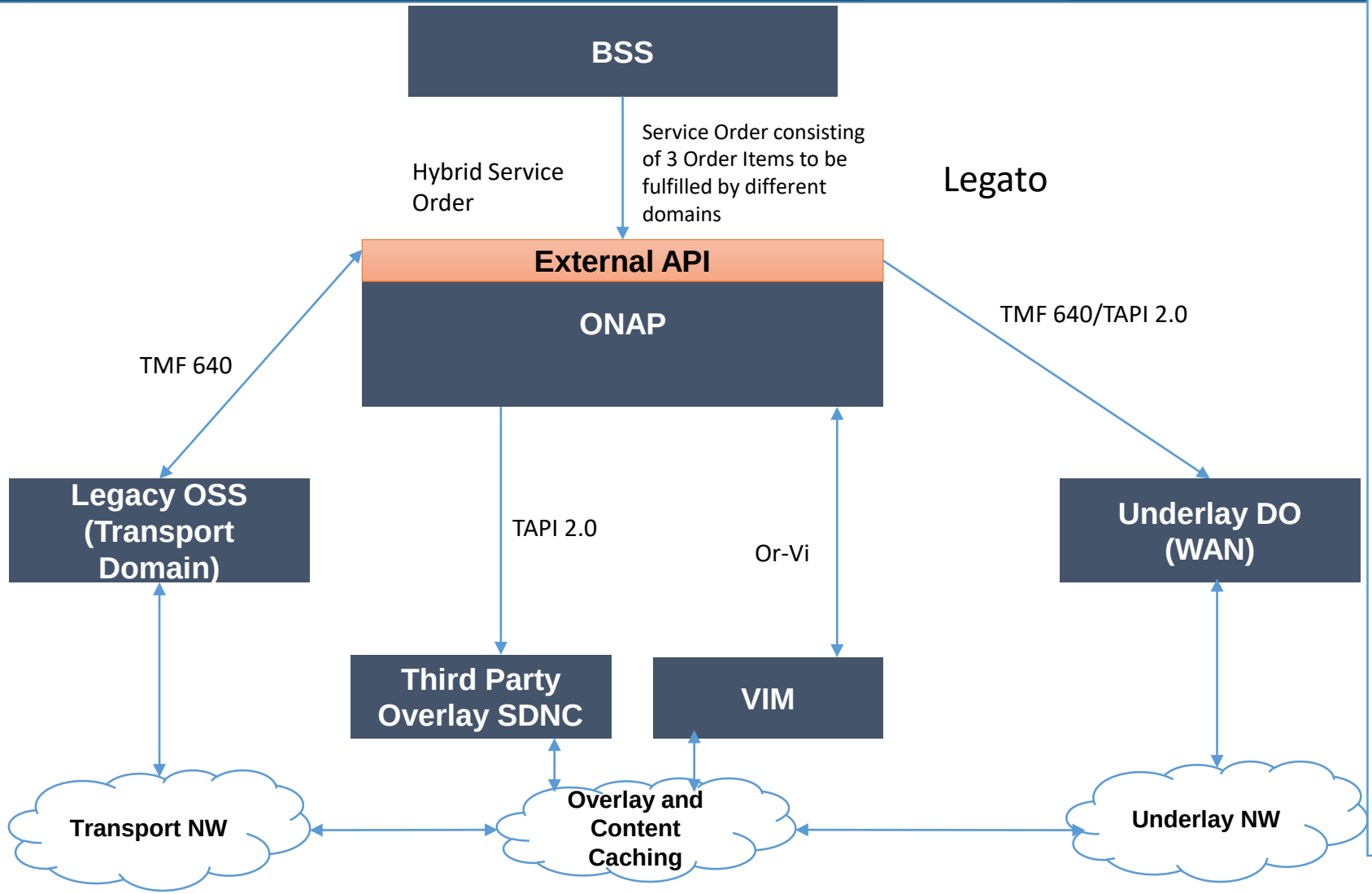
Problem Statement 2: ONAP Integration with DO and Edge Orchestrator



Section 1

Hybrid Service Orchestration through External API

Limiting Scenario 1: Hybrid Service Orchestration in Single SP Domain

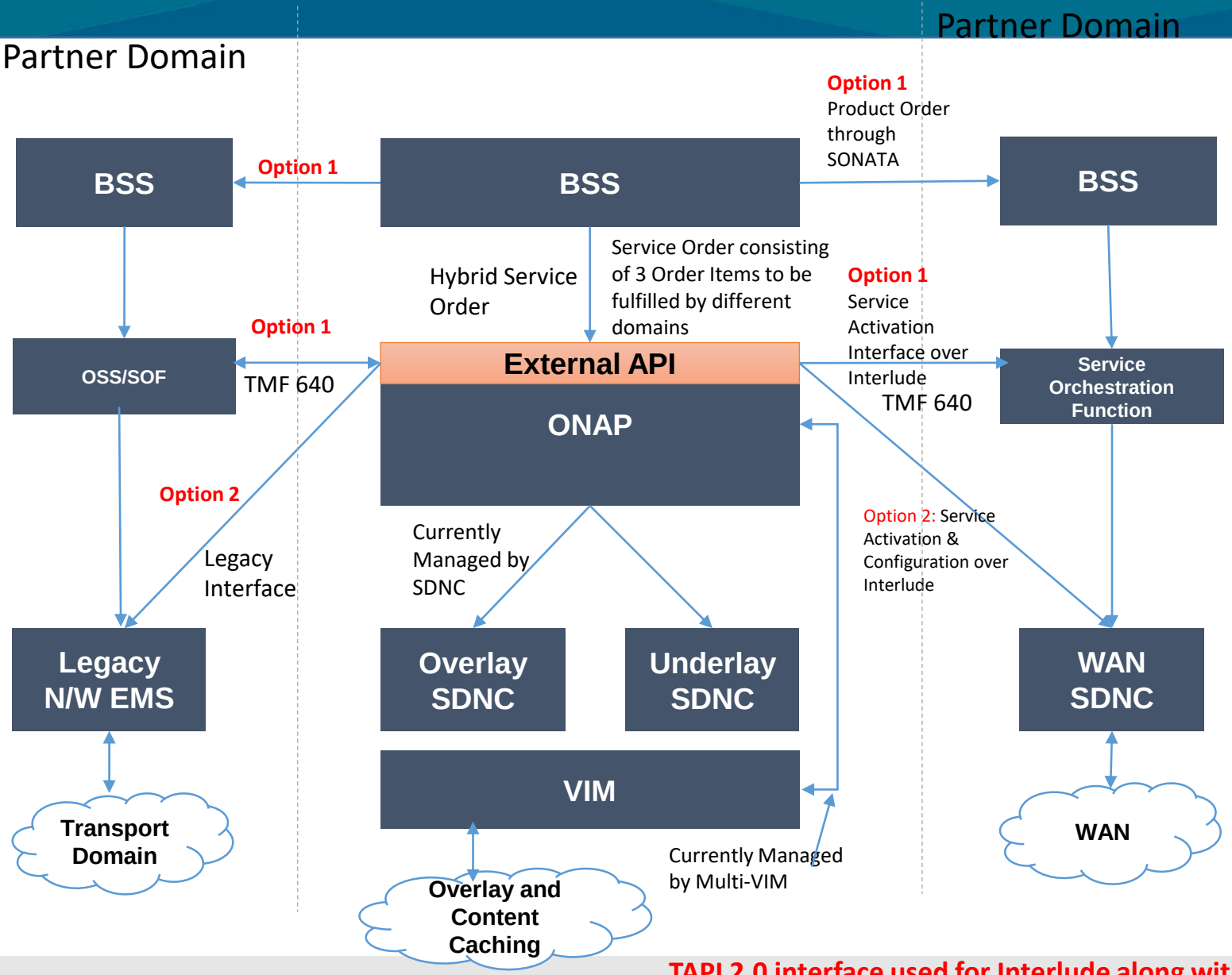


Current Implementation: Any end to end hybrid service request (received by External API as Service Order) should be processed by SO and then delegated to ONAP SDNC for resource activation and configuration, VF-C/App-C, Multi- VIM for VNF Orchestration. ONAP SDNC interacts with all the related network controllers to realize the activation request.

Expectation :

- For end to end hybrid service external API should act like a forking point after decomposing the service order to delegate the Resouce activation configuration to different domains. Low over head in ONAP, Can leverage Standard interface.
- DO or OSS responsible for each Domain may realize the ICM layer in MEF and Ext API may realize SOF. In this scenario External API to respective DOs might be Presto ref point realized with TMF 640 or TAPI 2.0.

Limiting Scenario 2: Hybrid Service Orchestration



1

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2

Current Implementation: ONAP SDNC does not differentiate between multi-layer SDNCs, it treats all the SDNC alike and depends on the DG implementation to make sense of required custom treatment.
Limitation : High implementation/modelling overhead

Expectation : To have a standard SBI which can handle layer specific constructs without requiring differentiated treatment at ONAP SDNC.

TAPI 2.0 interface used for Interlude along with TMF 640

Use Case and Potential options for supporting Hybrid Service Orchestration

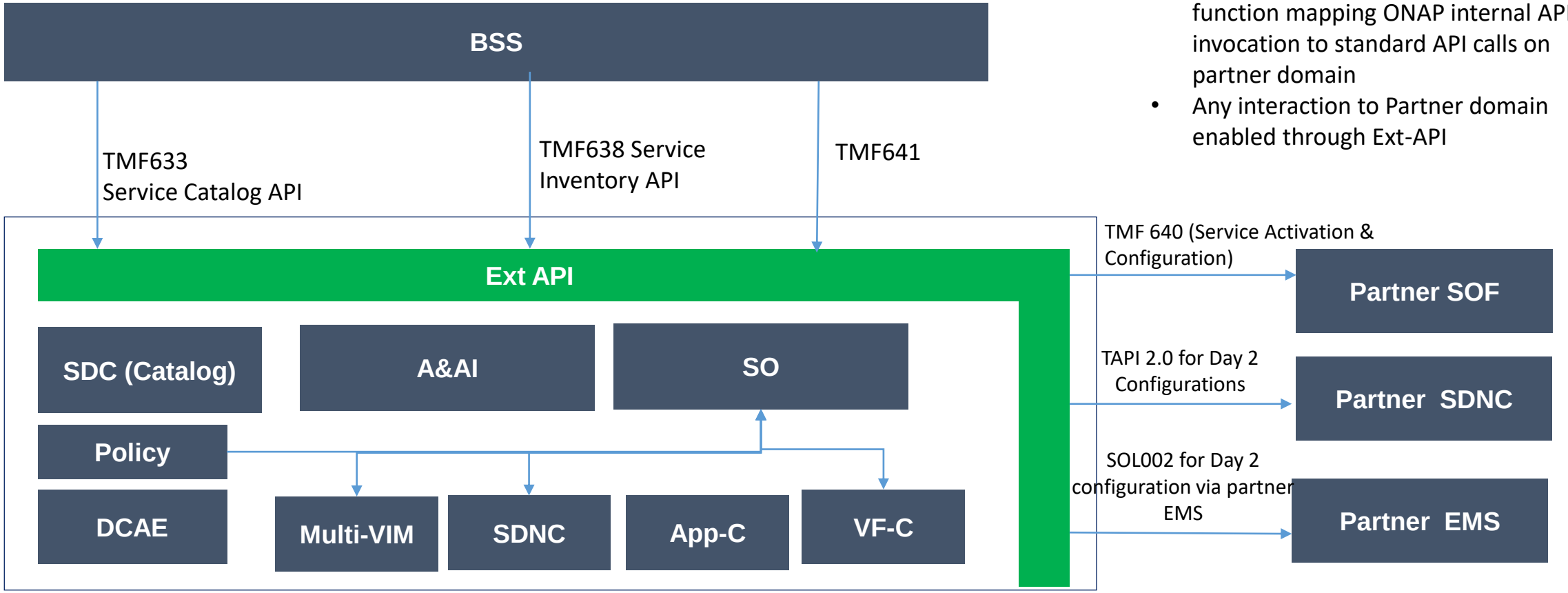
- Use Case : Service Provider with ONAP as key Orchestration solution receives and order for hybrid service (L3 VPN with internet connection and content caching)
  - Transport Service provided by Partner Legacy network
  - WAN underlay provided by partner
  - ONAP hosts VPN end points and Content acceleration functions.
- Option 1: SP with ONAP
  1. BSS queries the partner product catalog and places a product order to partner BSS domain - Transport network, WAN underlay
  2. BSS updates ONAP inventory with available resources from partner (or auto discovery is initiated).
  3. ONAP Designer using SDC designs partner services as infrastructure service
  4. ONAP Designer using SDC designs customer facing service that uses infrastructure service.
  5. BSS places a Service Order in ONAP for End to End Service based on the Product Order
  6. ONAP Ext API sends a service configuration request using TMF 640 API to partner SOF and Service instantiation request to ONAP using Os-Ma.
  7. ONAP Ext API carries out End to End Service Testing.
  8. ONAP Ext-API sends update connectivity service to Partner SDNC/EMS to update connectivity service with performance requirement, customer configuration.
- Option 2:
  - #1 to #5 same as in Option 1 , except for step 6 ONAP Ext API sends a request to Partner WAN Controller for Service Configuration and Activation over a TAPI 2.0 interface

Potential Capability Enhancements for External API

- Day 0:
  - Receives service order for enabling end to end service
  - Wait for notification from BSS on availability of partner services/resources
- Day 1 :
  - Query ONAP Service catalog for the infrastructure service corresponding to the partner domain
  - Send an activation request to partner domain for infrastructure service over TMF 640
  - Place a service instantiation request on ONAP over ETSI Os-Ma
  - Carry out end to end testing
- Day 2:
  - Send the customer configuration in terms of FW, QoS, performance monitoring configurations to partner SDNC over TAPI interface
- Day 3:
  - Tune partner SDNC to meet end to end SLA.

Hybrid Service Orchestration : ONAP Context : Scenario 1

- External API Aware of Partner domain.
- External API acts like a mediation function mapping ONAP internal API invocation to standard API calls on partner domain
- Any interaction to Partner domain enabled through Ext-API

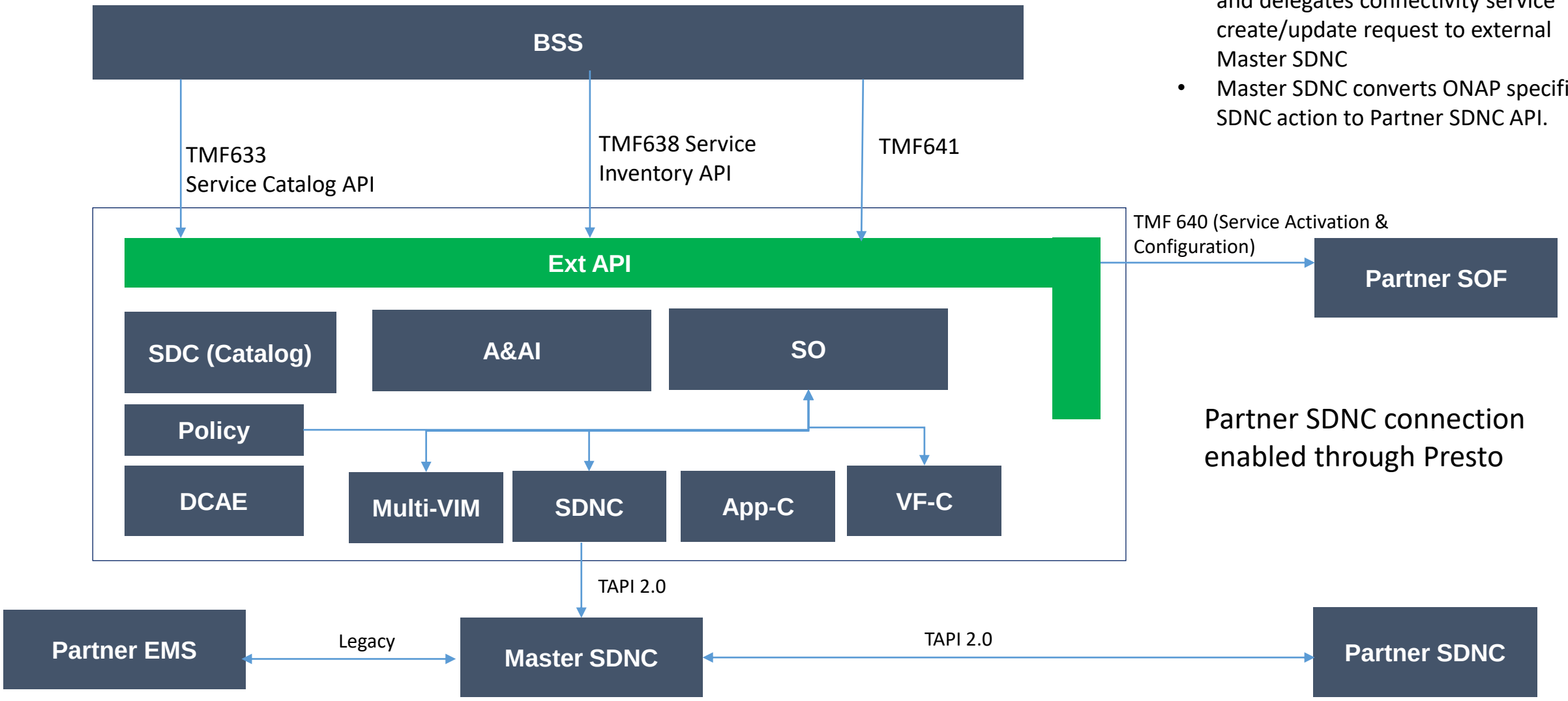


Ext API is visualized as an integration layer for NBI and East-West

Partner SDNC connection enabled through Interlude

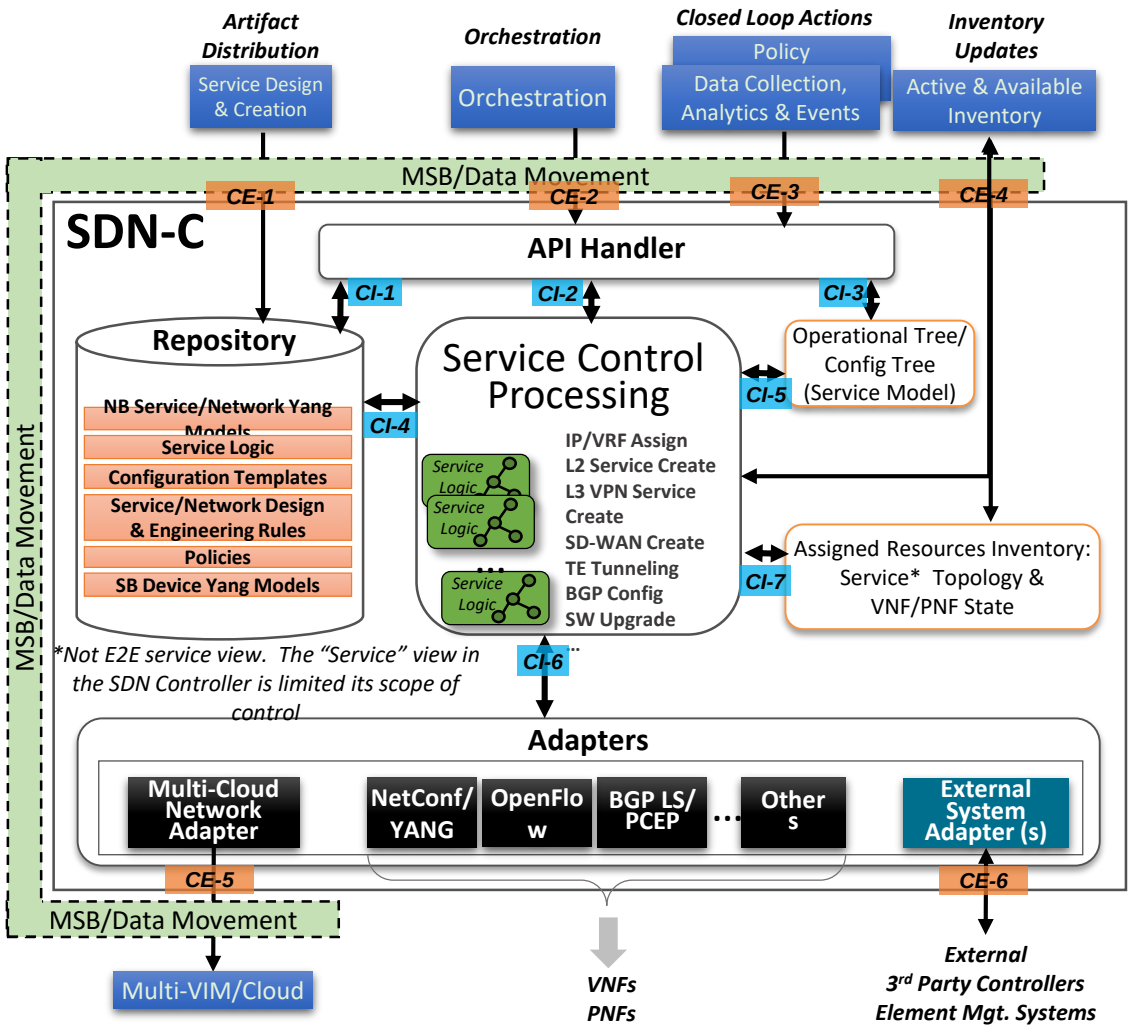
Hybrid Service Orchestration : ONAP Context : Scenario 2

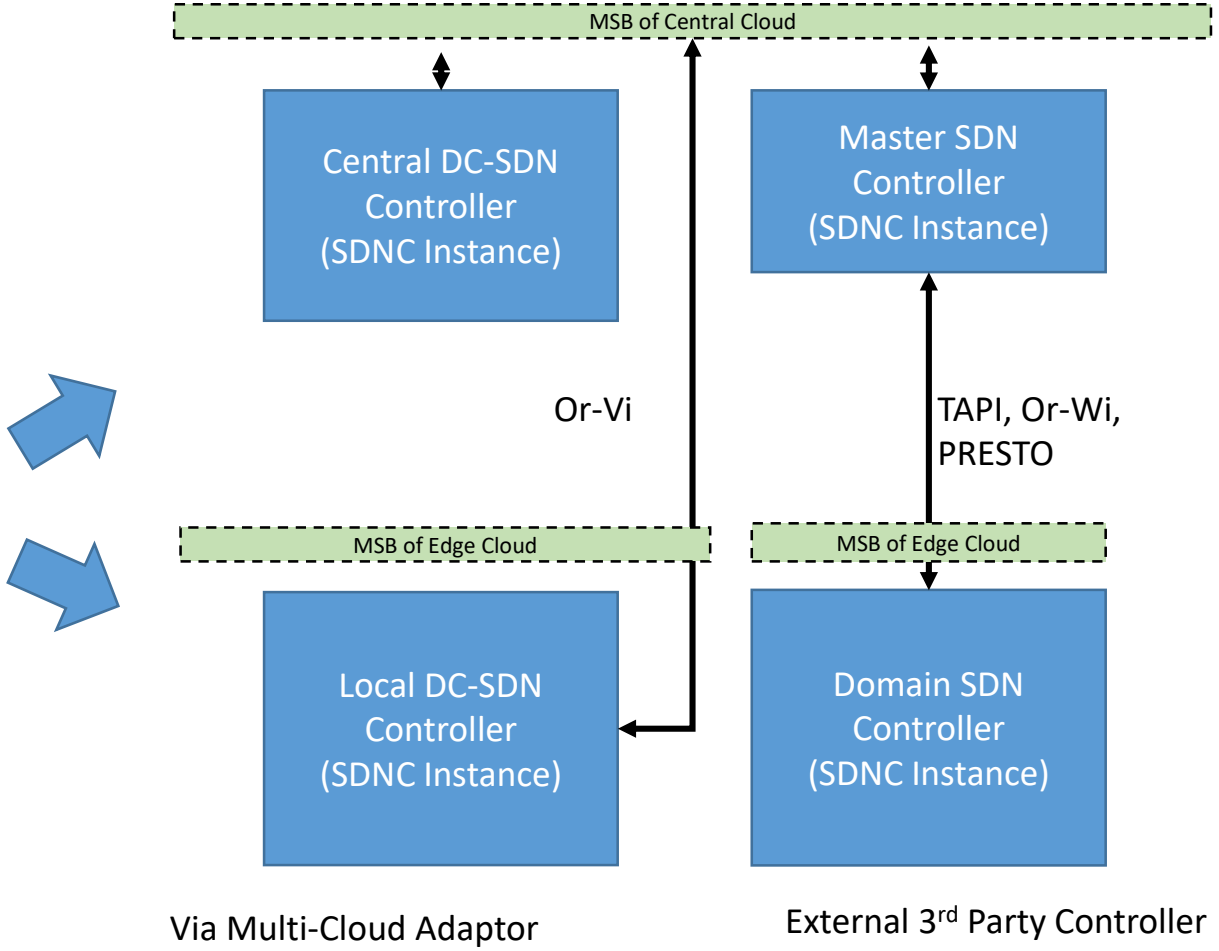
- ONAP SDNC unaware of partner domain and delegates connectivity service create/update request to external Master SDNC
- Master SDNC converts ONAP specific SDNC action to Partner SDNC API.



Partner SDNC connection enabled through Presto

SDNC Federation : To support Master and Domain SDN Controllers





TAPI 2.0

- Get Topology List/Details
- Get Node Details
- Get Link Details
- Get Node EdgePoint Details
- Get Service InterfacePoint List/Details
- Get ConnectivityService
- Get Connection Details
- Get Connection Endpoint Details
- Create/Update/Delete ConnectivityService
- Compute/Optimize P2P Path
- Get Virtual NS
- Create Virtual NS
- Delete Virtual NS

TMF 640

- Get Service
  - GET /API/service/{ID}
- Create Service
  - POST /API/activation/service
- Update Service
  - PATCH /API/service/{ID}
- Delete Service
  - DELETE /API/activation/service/{ID}
- Get Allowed Operations
  - HEAD /API/activation/service/{ID}
- Get a monitor
  - GET /API/monitor/{ID}
- Register Listener
  - POST /API/Hub
- Unregister Listener
  - DELETE /API/Hub/{ID}
- Publish Event
  - POST /client/listen

Day 2 Customer Configurations

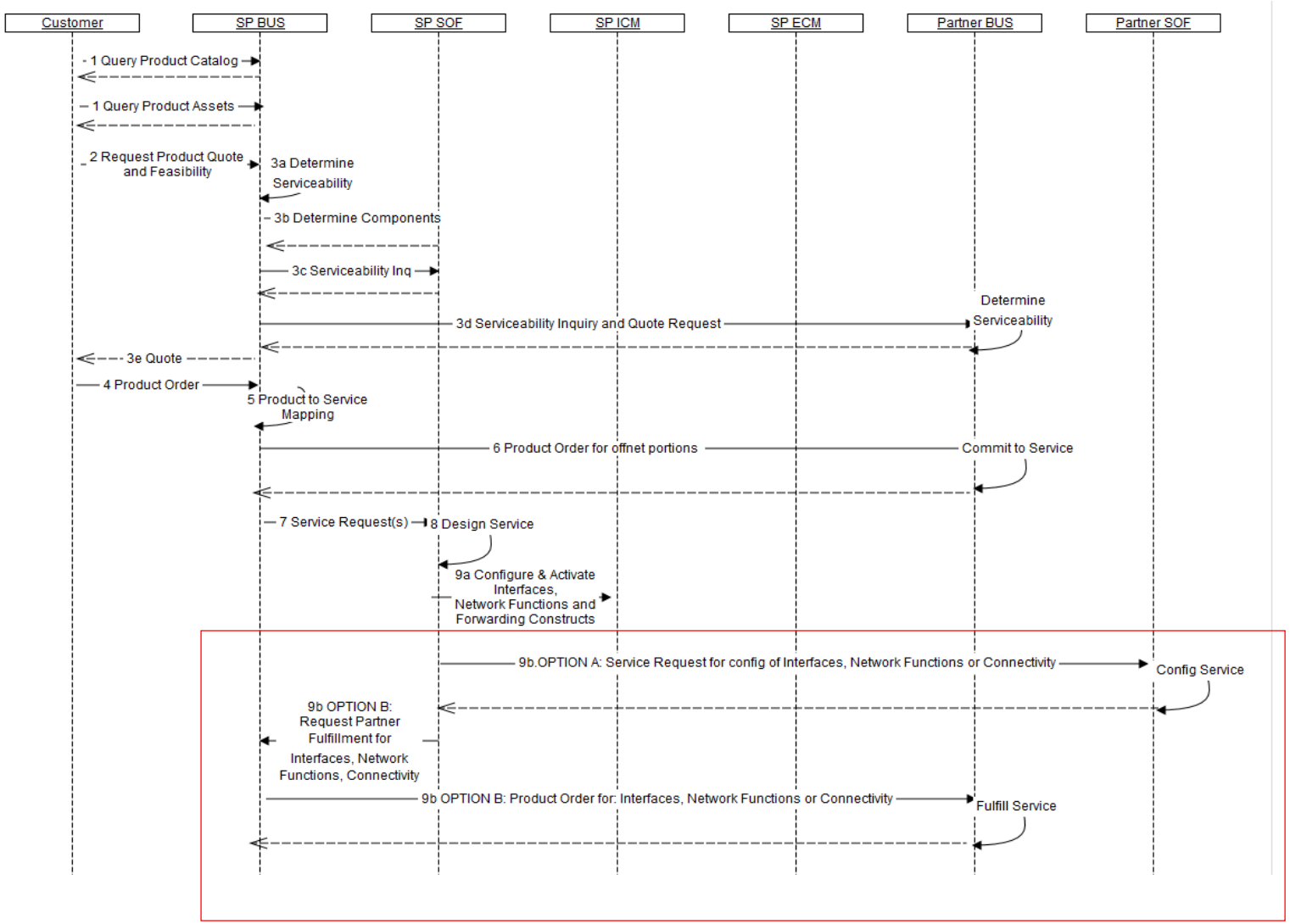
SFC Creation , QoS Configuration

MEF Interlude Capability

- Service Provider controls aspects of the Service within the Partner domain (on behalf of the Customer) by requesting changes to dynamic parameters as permitted by service policies.
- Service Provider queries operational state of the Service.
- Service Provider requests change to administrative state of a service or service component (e.g. Service Interface)
- Service Provider requests update to defaulted service parameters which are allowed to be customized (policy-controlled)
- Service Provider requests creation of connectivity between two Service Interfaces as permitted by established business arrangement.
- Service Provider provider queries the Partner's Service Inventory for services provided by the Partner to the Service Provider.
- Service Provider receives Service specific event notifications from the Partner.
- Service Provider receives Service specific performance information from the Partner.
- Service Provider requests test initiation and receives test results from the Partner.

Both TMF 640 and TAPI 2.0 might be required to enable interlude capability between SP and Partner domain

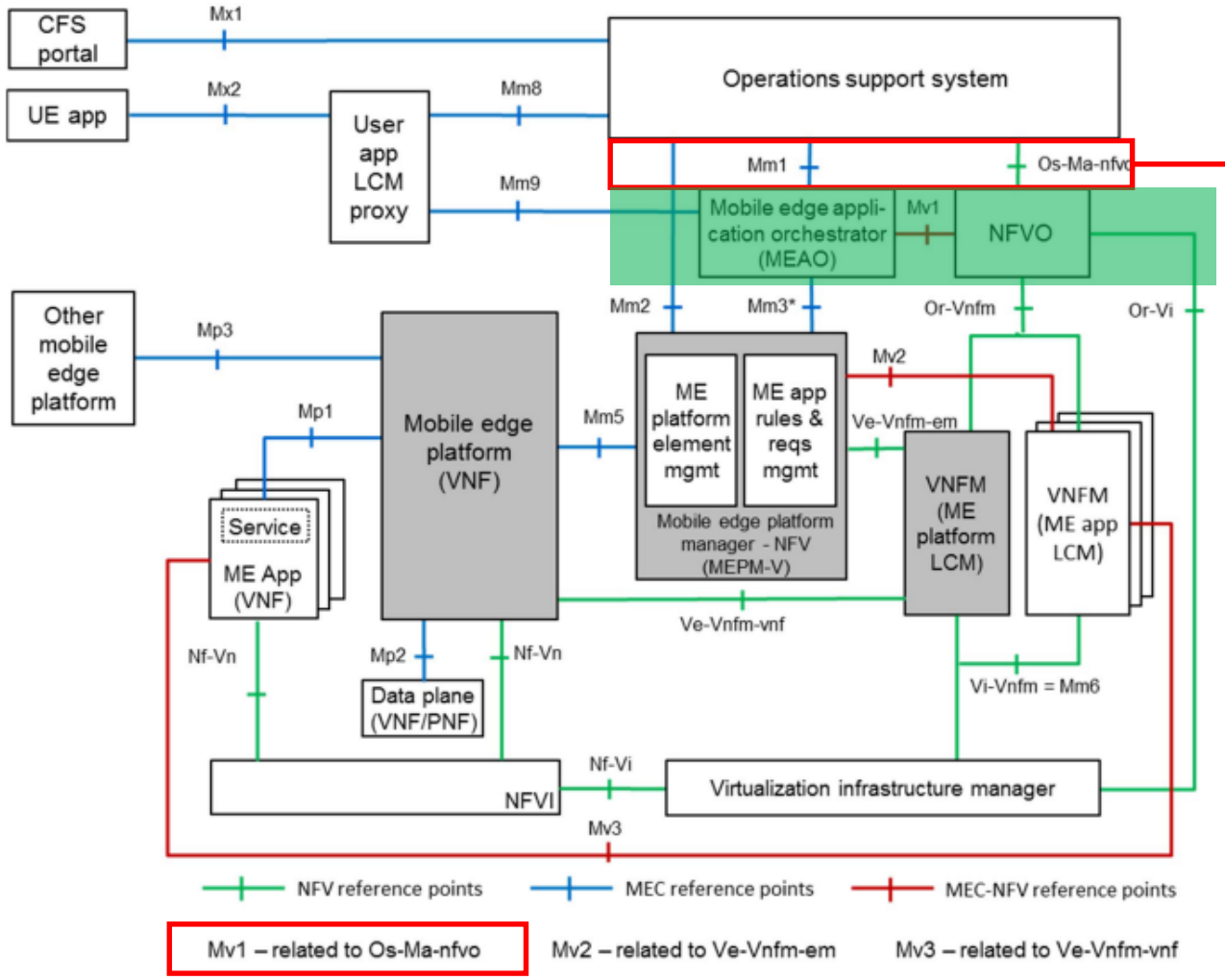
Context in MEF LSO Sequence



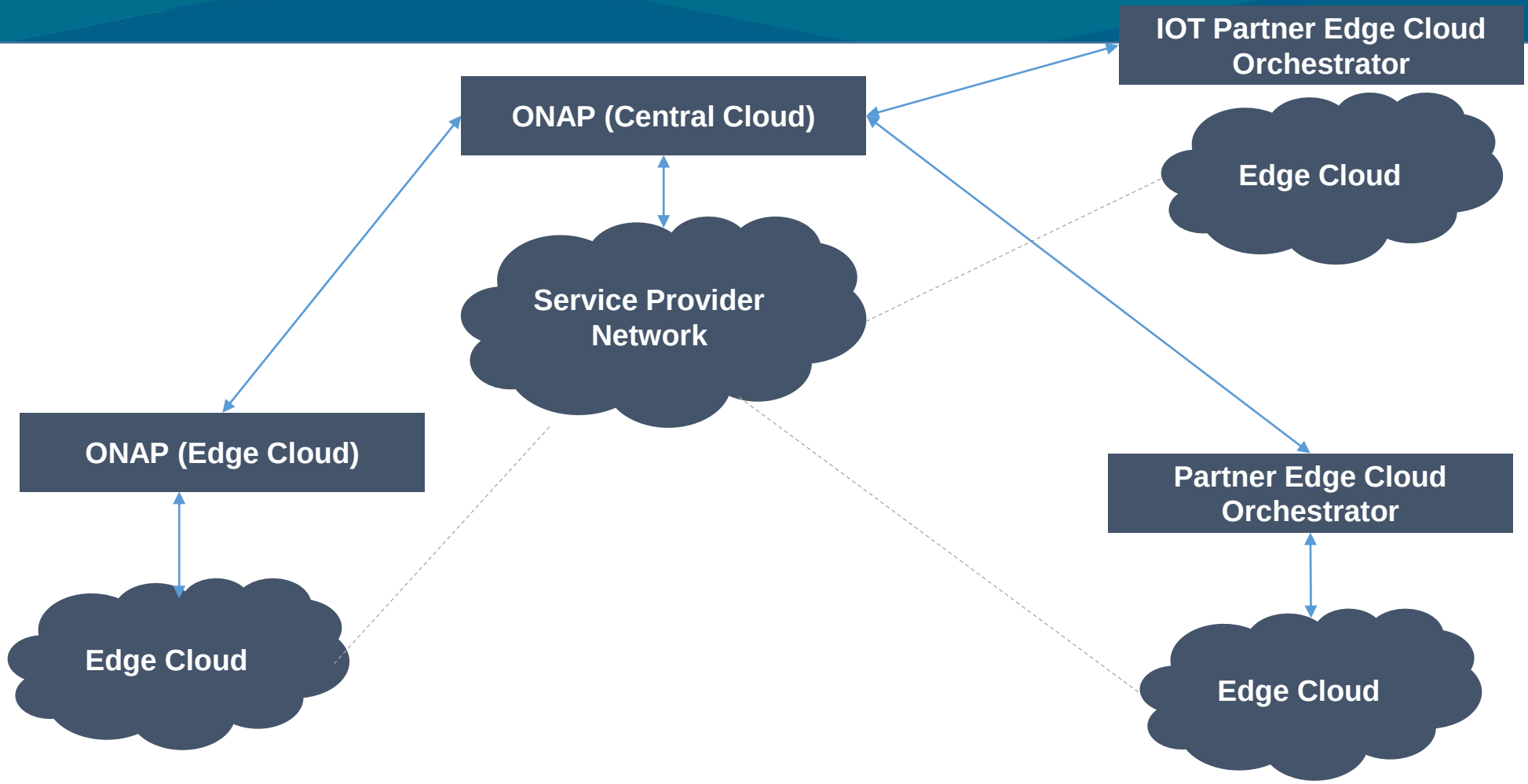
Section 2

External API as Edge Automation Enabler

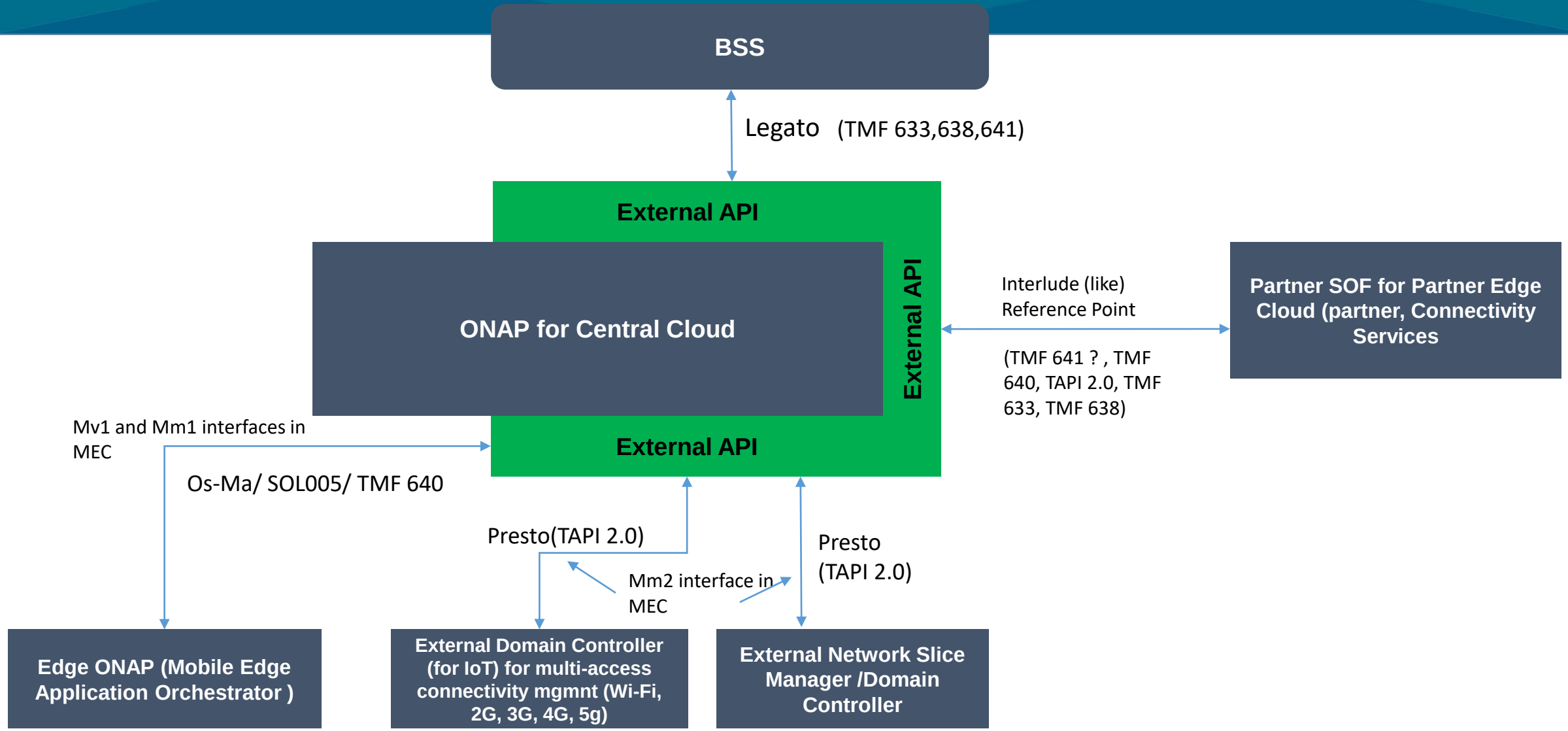
ETSI MEC Architecture



Scenario : Edge Automation



ONAP External API Role in Edge Automation



TAPI as enabler for Network Slice

- Network Slice is a logical network consisting of all required resources connected together
- Network Slice is NOT a Service , but a logical network – enabler for service. Resources in Network slice may be physical or virtual, dedicated or shared.
- Network slice has similar characteristics like Virtual network service defined in TAPI 2.0
- MEF Presto Reference point leverages TAPI 2.0 for SOF-ICM connectivity service realization.
- External API support of Presto/TAPI can enable creation of Network Slices in the partner domain or SP domain on demand
- With integration to SO, Slice can be on-boarded in to ONAP as an infrastructure service and activated using the Presto interface supported by Ext-API SB .

TAPI_FR 1: Create Virtual Network Service	
Description	For the client side of the API to request creation of a virtual network from a network (maybe physical or virtual network, recursively) provided by the server side of this API, according to the traffic volume between the access points of the client. As a result, the server side of this API will reserve a set of resources to build up the virtual network, over which the client side of the API is allowed to e.g. configure virtual connections (through other transport APIs).
Pre-conditions	The server side of this API should have the topology information of the network under its control.
Inputs	• List of following details for every *ServiceInterfacePoint* for the *Virtual Network Service* – Reference (Name/ID) to the *ServiceInterfacePoint* • Virtual Network Constraints including – Required Constraints such as Traffic Matrix – Any optional Constraints such as Service Level • Start Time & End Time
Outputs	• Virtual Network Service ID: The identifier of the Virtual Network Service instance that was created that includes identifier/reference of the virtual *Topology* that was created.
Notifications	• *ObjectCreation* notifications on *VirtualNetworkService*, and associated/created *Topology, Nodes, Links and NodeEdgePoints* • *AttributeValueChange* notifications on affected *ServiceInterfacePoints* • *StateChanges* on related *State* attributes in the affected objects
Error-conditions	• There are not enough resources to set up the virtual network that meets the client traffic requirement.
Post-conditions	• The server side of this API reserves a set of resources to build up the virtual network. • The server side of this API maintains the resources and the status of the created virtual networks, as well as the mapping relationship between the created virtual networks and the network under control of the server side. • The client side of this API is allowed to have virtual connection control over the virtual network.

Modeling alignment is still a pain point

External API Roles (as per the scenario given)

- At the Central ONAP NBI : For receiving the Service Order for setting up the end to end network consisting of Edge and Central Cloud network functions
- Central ONAP East-West : Interface with partners for interacting with edge cloud orchestrator offered by partner
- Central ONAP SBI :
  - Proxy connection between OSS/BSS and Edge Cloud Orchestrator (Mv1 as per MEC)
  - Interaction with external Network Slice Manager/Controllers for slice provisioning as per central cloud prescribed model
  - Interaction with Edge Cloud Orchestrators for provisioning services at edge cloud
  - Interaction with IoT Partner Domain Controllers for provisioning the connectivity services for IoT based services
  - Day 2 customer configurations
- **Potential APIs to be supported in Ext-API**
  - **TMF 641 (supported partially) , TMF 640, TMF 633 (supported partially), TMF 638 (partially supported), TAPI 2.0, ETSI OS-Ma**

Section 3

Suggestions for Casablanca

Suggestions for Casablanca

- A hybrid use case scenario to be supported in Casablanca for showcasing the external API interface usage capabilities (addressed - already a hybrid use case is being proposed by China Mobile)
- Positioning of Ext-API not only as a NBI mapping function, but also as a SBI, East-West mediation function with support for multiple standard interfaces
- Leverage TMF640, Os-Ma and TAPI 2.0 APIs (all the external facing SDO alignment to be supported through External API)
- Support Presto/TAPI capabilities in Ext-API to support inter domain and edge connectivity scenarios
- Consideration is Ext-API for Federated Network Slicing
- Consideration of Ext-API as an end to end service enabler which delegates order items across partner and service provider domains , also across relevant logical deployment domains (layers, regions) without loading other ONAP functions (to worry about model mapping, service decomposition etc.)
- Ext API to have own Catalog and Inventory to maintain end to end context
- Ext API positioning to meet the MEC architecture requirement