



Edge Automation – Potential Strategies for Deploying ONAP at Edge

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Our Proposal

- Edge group to consider additional scope in ONAP for Edge Application Management – as per MEC guidelines
- ONAP deployment to suit edge automation scenarios
- MVP closely following the standards to enable interoperability.

Reference Implementation of MEC Architecture

Step1. MVP “Orchestration Level”:

- MEAO
- Ref Points: Mm1, Mv1

Step2. “Management Level”:

- MEMPM-V
- ME Platform LCM
- ME App LCM
- Ref Points: Mm2, Mm3*, Mv2, Mm6

Step3. “Platform and Applications”:

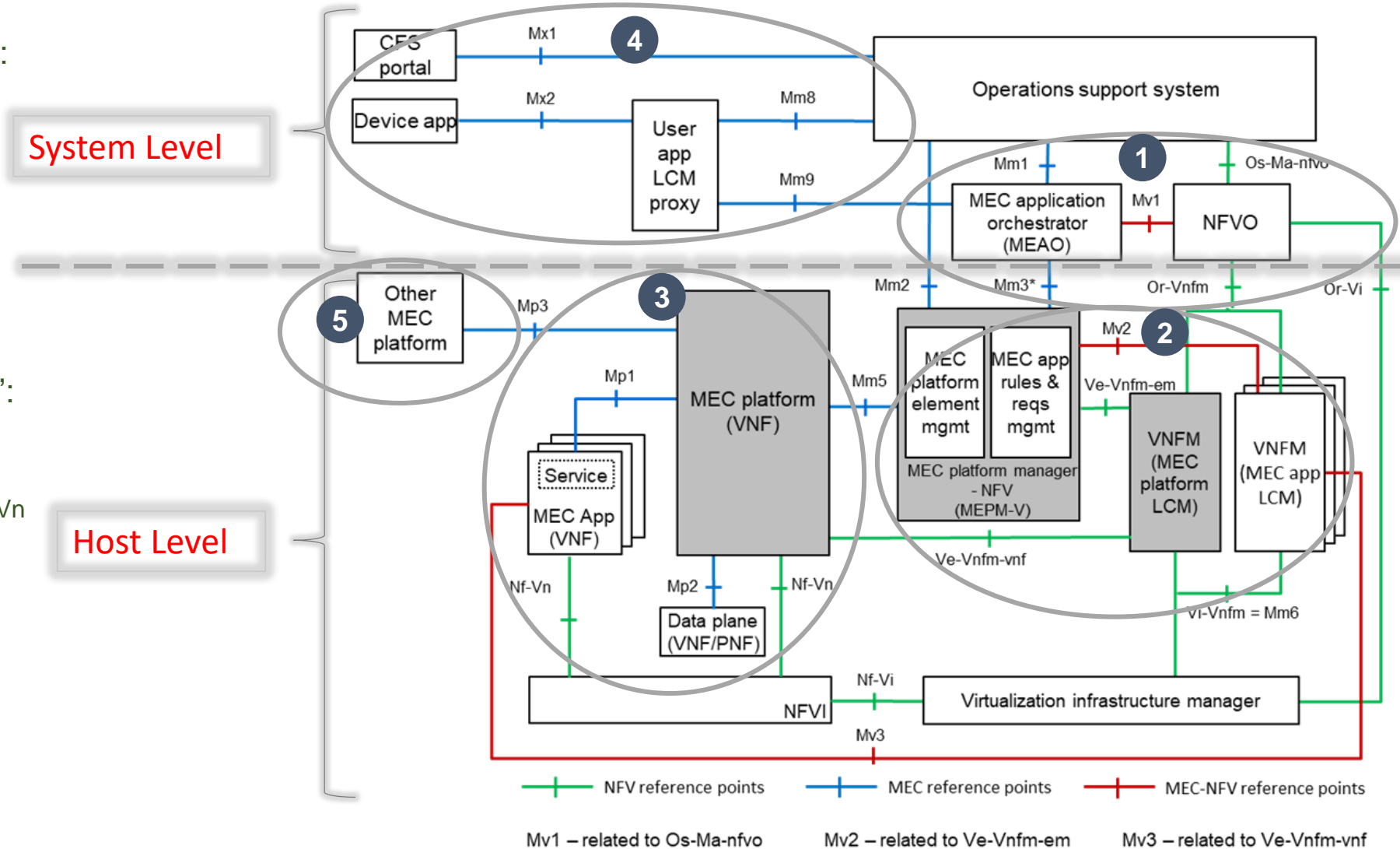
- ME Platform
- ME Application
- Ref Points: Mm5, Mp1, Mp2, Mv3, Nf-Vn

Step4. “External Interfaces”:

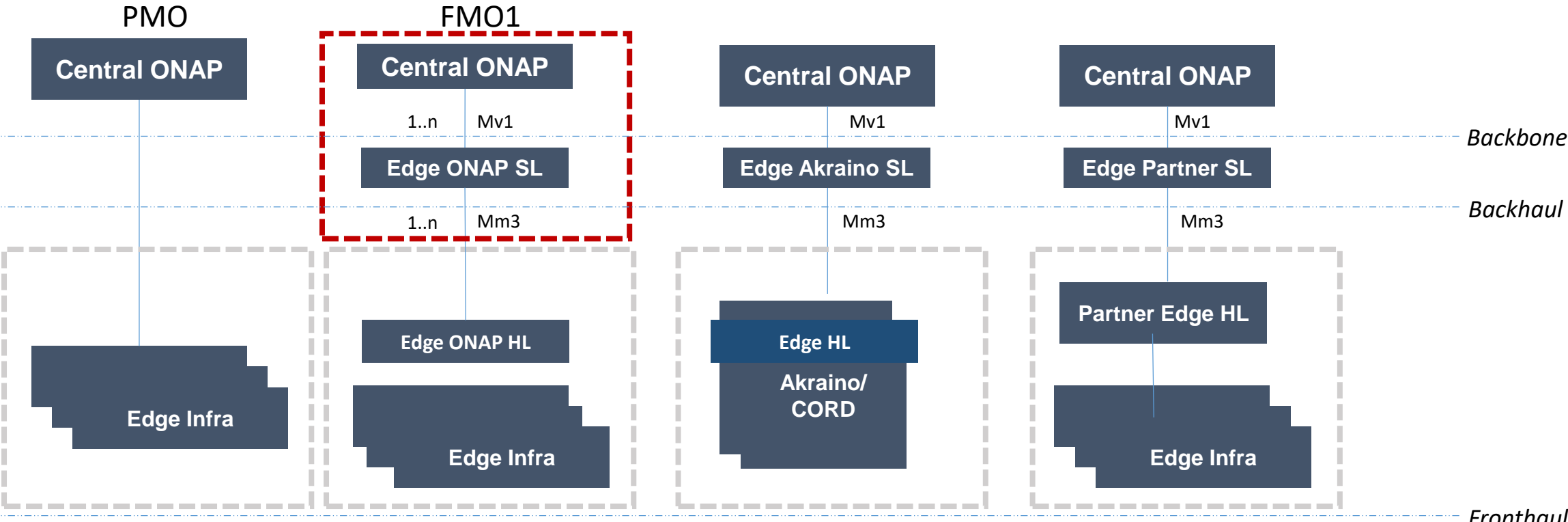
- CFS Portal
- UE Application
- User App LCM Proxy
- Ref Points: Mx1, Mx2, Mm8, Mm9

Step5. “Network Edge”:

- Ref Point: Mp3



Potential ONAP Edge Deployment Scenarios



Edge without a local Orchestration Solution

Edge with local ONAP Orchestration Solution

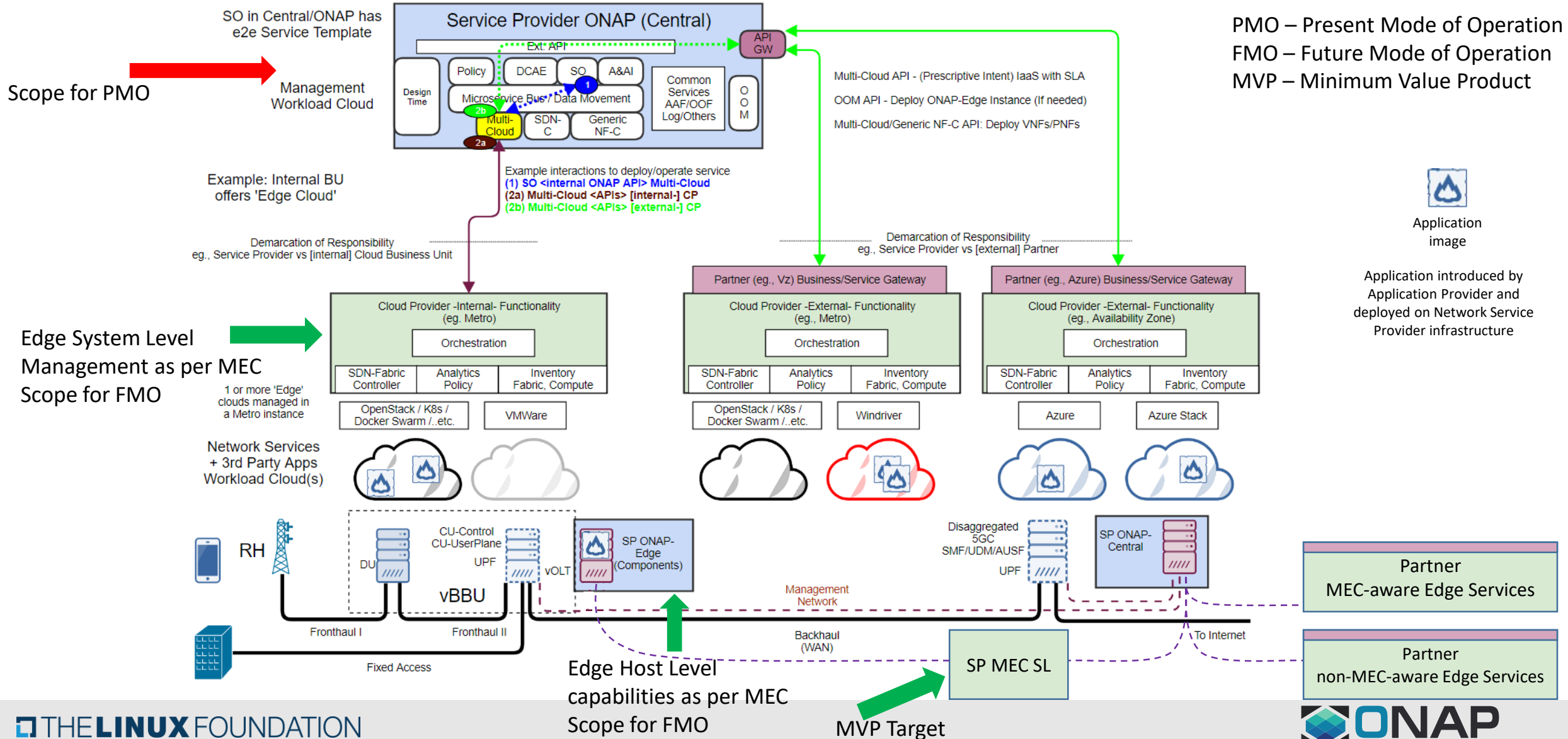
Edge with Akraino HL connected to Central ONAP

Partner Edge with non-ONAP Host Level Solution

PMO - (Present Mode of Operation)
 FMO1 - Future Mode of Operation

Central and Edge ONAP – not mean physical location of ONAP instance, but responsibility.

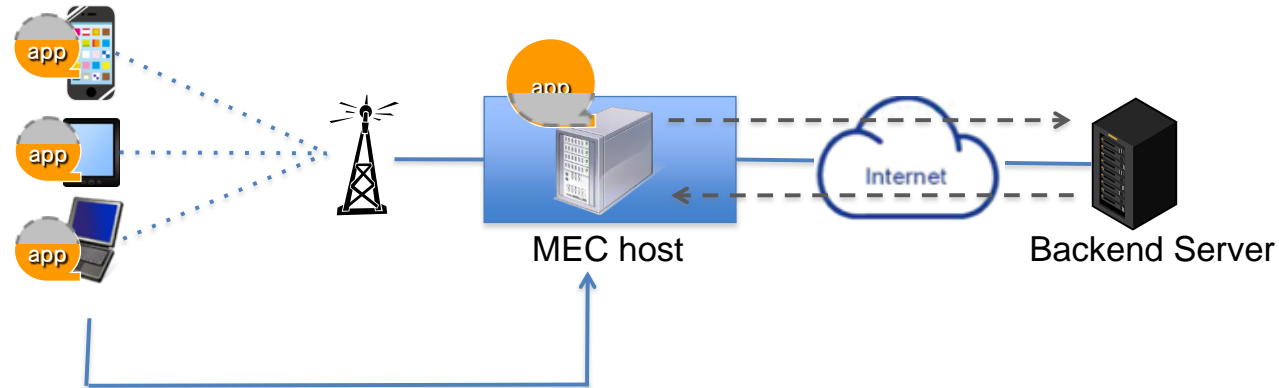
Focus of this presentation



About MEC Use Cases in General

- 3 kind of Use Cases:
 - Consumer-oriented services (AR, VR, Cognitive Assistance...)
 - Operator and third party services (device location tracking, big data, security, safety)
 - Network performance and QoE improvements (performance, video optimization...)
- MEC does not care about in what MEC Application do in Use Case.
 - MEC just fulfill requirements of MEC Application (Mobility, Compute resources...).
 - Like MANO does not care what VFN do (vCPE, vEPC, vFW...), but care about LCM
 - MEC Application requirements - still evolving.

Use Case: Application computation off-loading (Example 1)

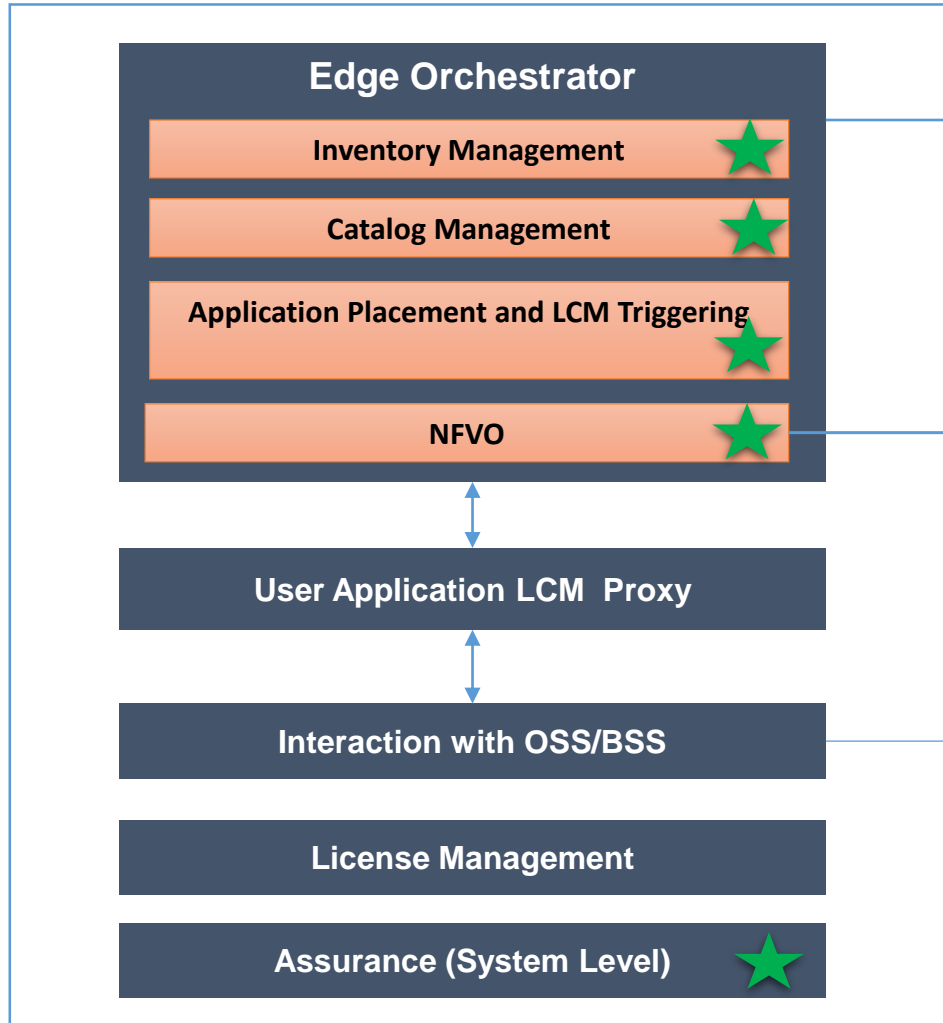


Reference ETSI GS
MEC 002 V2.2.0
(2018-08) A.23

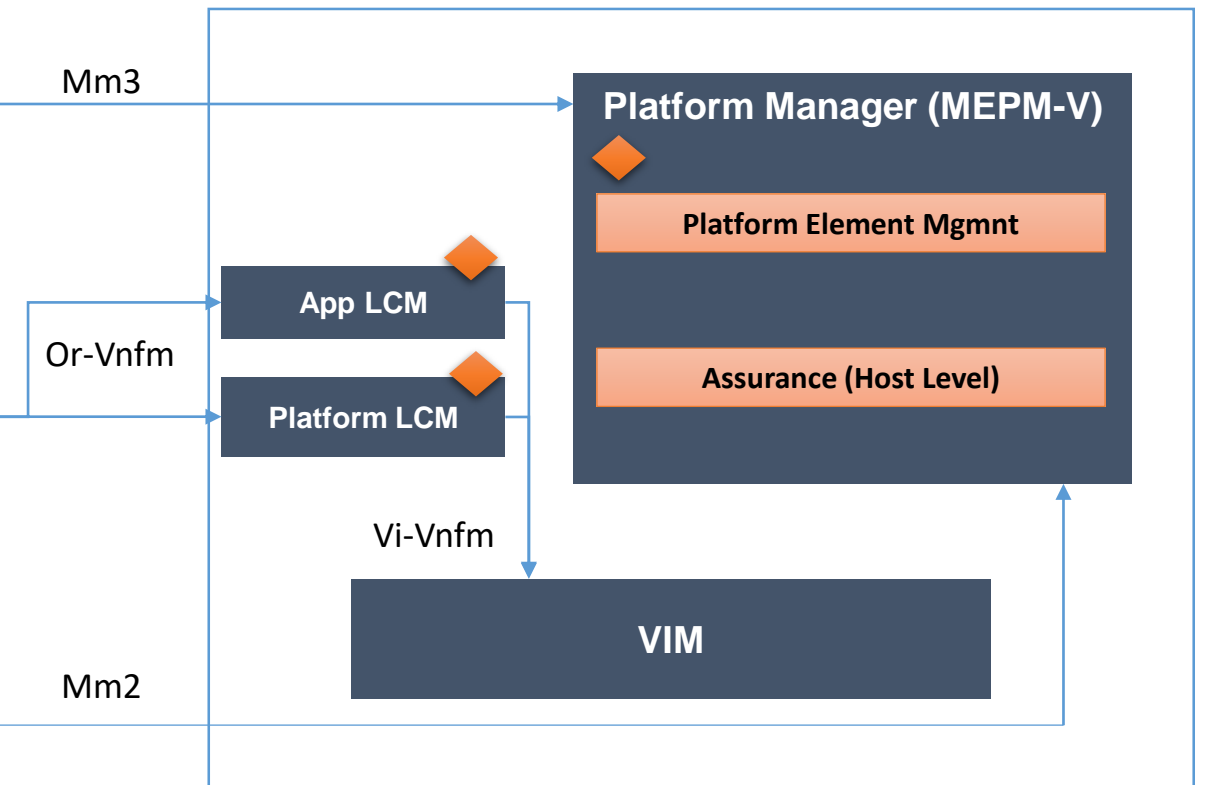
- MEC host executes compute-intensive functionalities with high performance instead of mobile devices.
- Business value of such applications is:
 - graphical rendering (high-speed browser, artificial reality, 3D game, etc.),
 - intermediate data-processing (sensor data cleansing, video analysing, etc.)
 - value-added services (translation, log analytics, etc.).
- This is most simple Use Case is good for ONAP Dublin deployment showcase.
 - Need to demonstrate LCM on dummy MEC Application.
 - Include all basic MEC Management components (SL/HL) and reference points.
 - No need to support Mobility and integration with 5G RAN for Radio Interface.
 - No need to demonstrate Slicing and integration with 5G Core.

Typical Management Functionalities at Edge for various NFV based Use Cases (General) – Reference ETSI MEC

FMO Edge Orchestration (MEC System Level Management)



FMO Host Level (MEC Host Level Management)



← Scope of ONAP MVP. Can be aggregate for multiple Edges

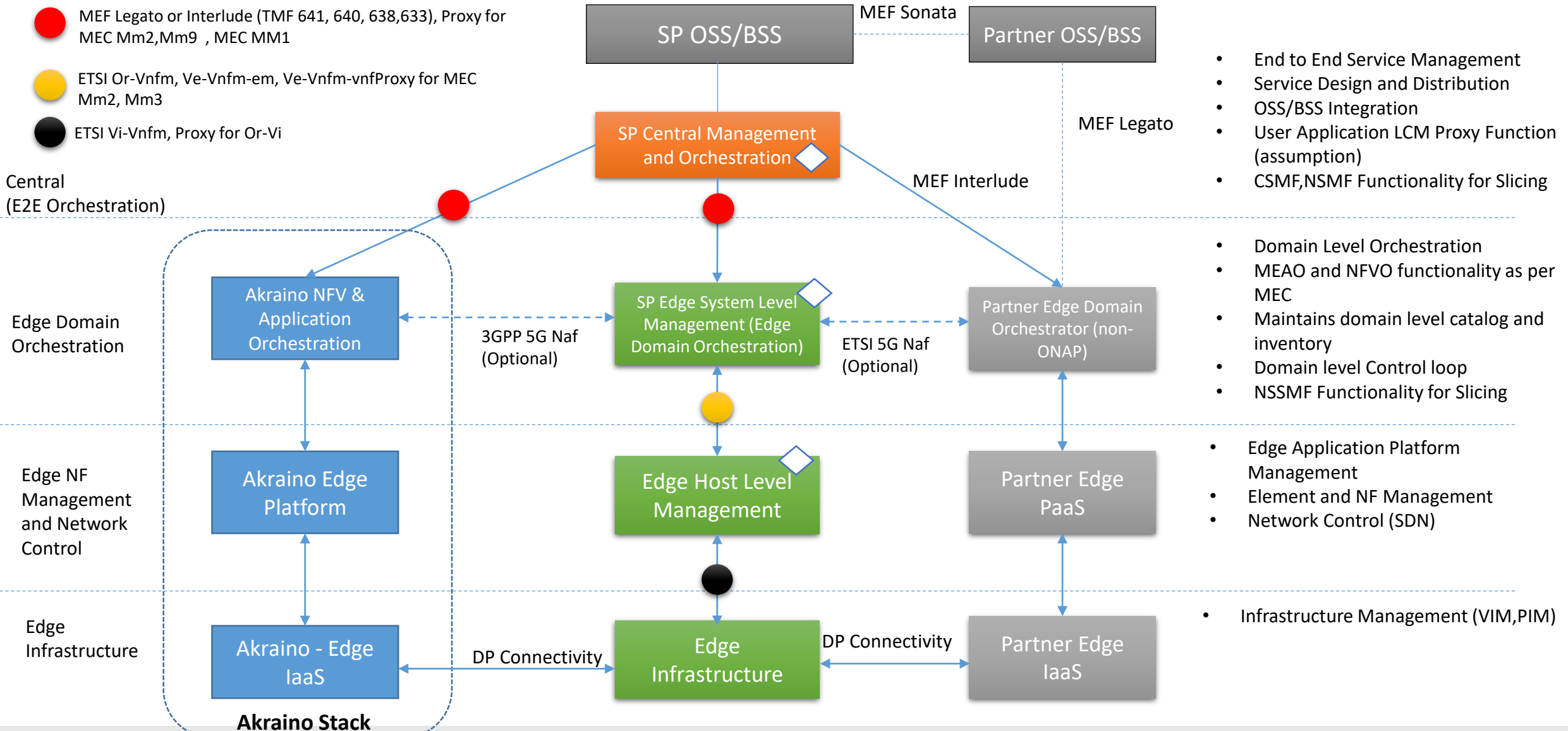
↑ Scope of VNF vendor and Cloud Provider

★ Available Functions in ONAP, but need adaptation for MEC.

◆ Optionally placed at System Level as well

FMO : Functional Responsibility of Central and Edge Management System

- MEF Legato or Interlude (TMF 641, 640, 638,633), Proxy for MEC Mm2,Mm9 , MEC MM1
- ETSI Or-Vnfm, Ve-Vnfm-em, Ve-Vnfm-vnfProxy for MEC Mm2, Mm3
- ETSI Vi-Vnfm, Proxy for Or-Vi



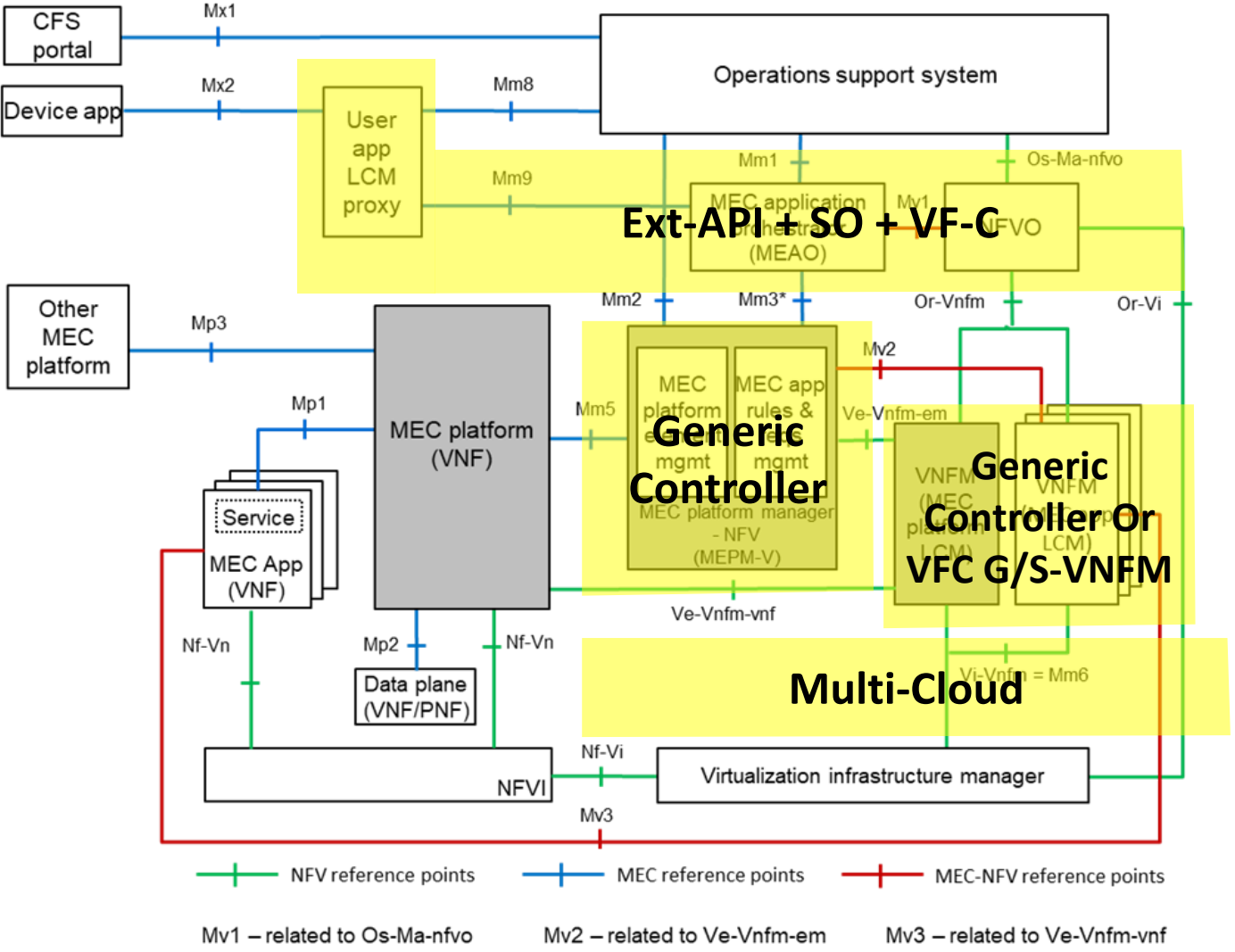
- End to End Service Management
 - Service Design and Distribution
 - OSS/BSS Integration
 - User Application LCM Proxy Function (assumption)
 - CSMF,NSMF Functionality for Slicing
-
- Domain Level Orchestration
 - MEAO and NFVO functionality as per MEC
 - Maintains domain level catalog and inventory
 - Domain level Control loop
 - NSSMF Functionality for Slicing
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- Edge Application Platform Management
 - Element and NF Management
 - Network Control (SDN)
-
- Infrastructure Management (VIM,PIM)

Edge Applications Categorization : A management and control point of view

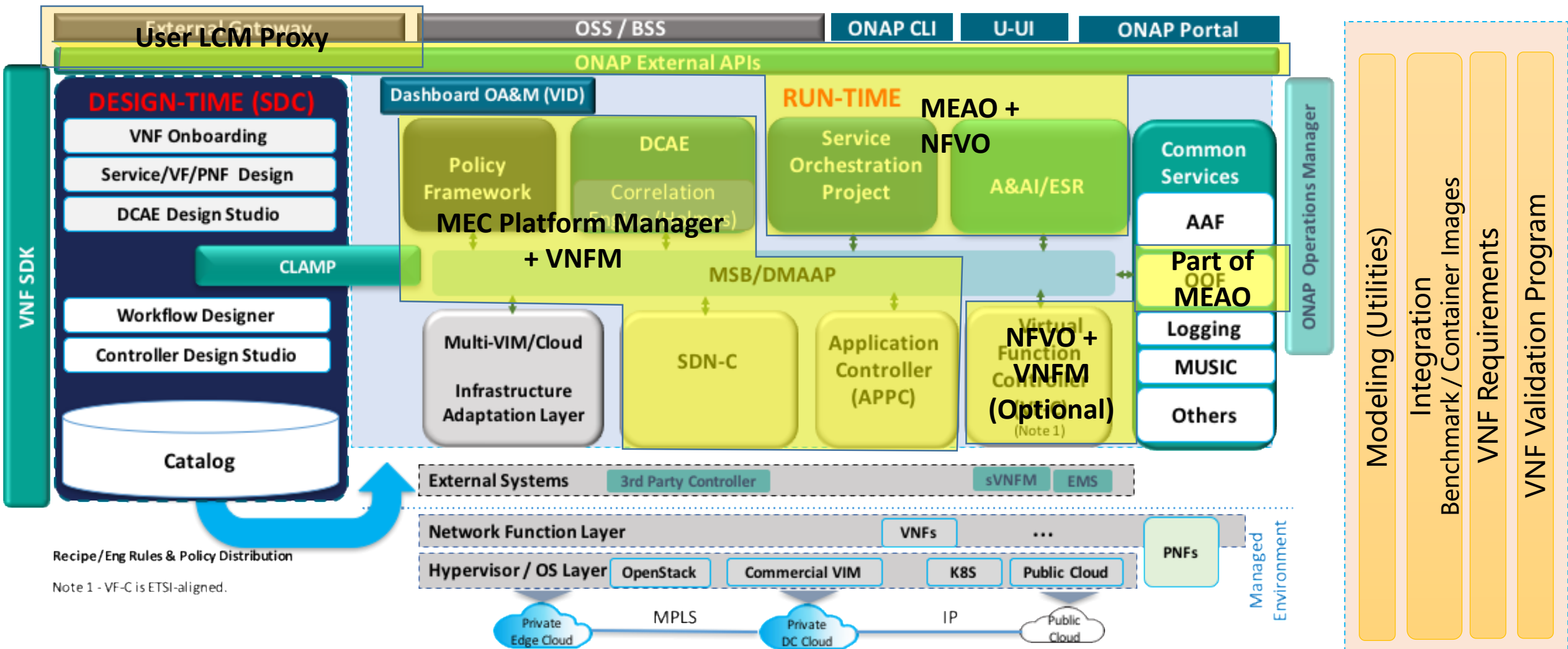
- Applications can be classified at a high level as follows
 - Near Real Time Data Plane Applications : Deployed in the DP and resides in the Edge Cloud infra near to other NFs – e.g. Video Cache, IoT etc
 - Near Real Time Control Plane Applications : Deployed in the close proximity of the host level management functions, managed by the Edge Platform – e.g. Traffic steering rules update
 - Non-Real Time Data Plane Applications : Deployed in public cloud and traffic is steered to them by local cloud proxy applications
 - Non-Real Time Management Applications : Deployed in the close proximity of the system level management functions – e.g. Fault and Performance Aggregation per host, Closed control loop
 - Non-Real Time Operational Applications : Deployed in the close proximity of the End to End/ Central Orchestration, typically used for end to end monitoring at NOC, SOC – e.g Fault and Performance Aggregation across systems, SLA Monitoring

MEC mainly focus on the applications deployed on the Data plane serving UEs directly . This slide try to emphasize the need for other type of applications which have management and operational scope and potential deployment model .

FMO : MEC Functional Mapping to ONAP



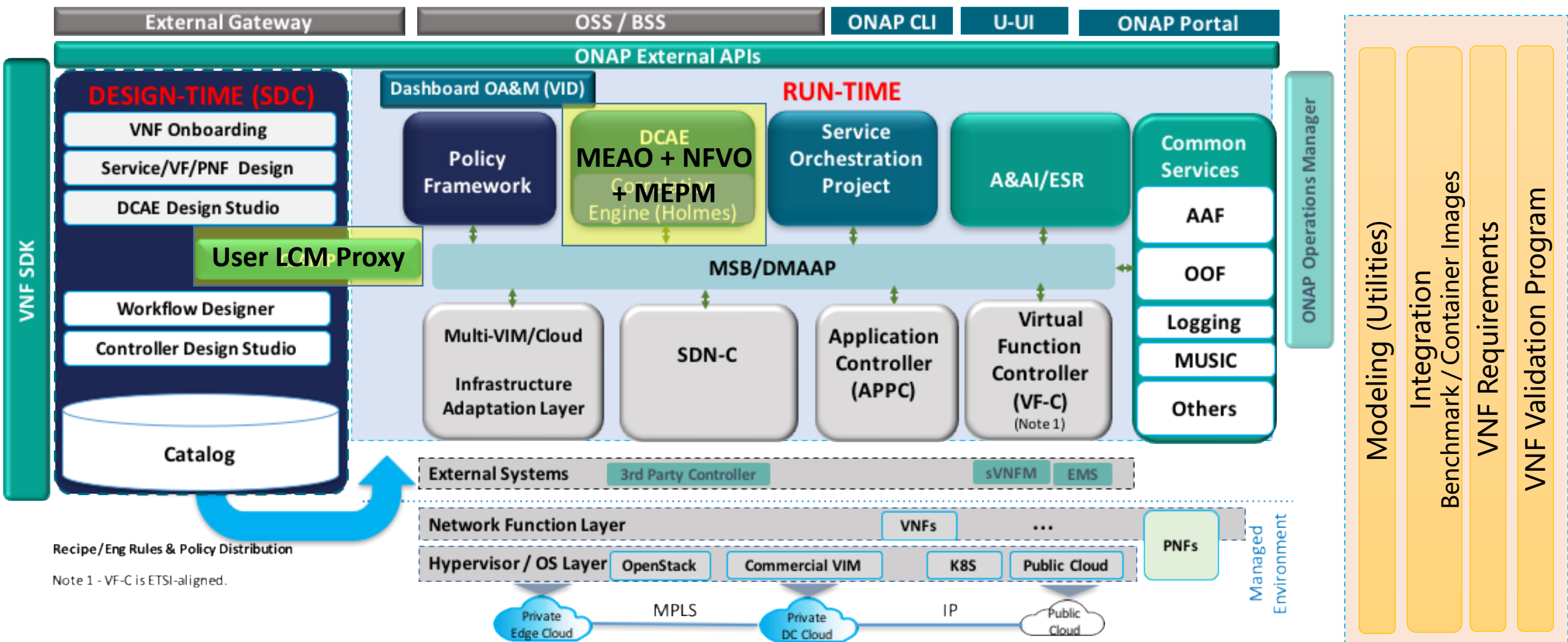
FMO : ONAP Functional Mapping to MEC Functions : Typically for Data Plane Applications



Recipe/Eng Rules & Policy Distribution

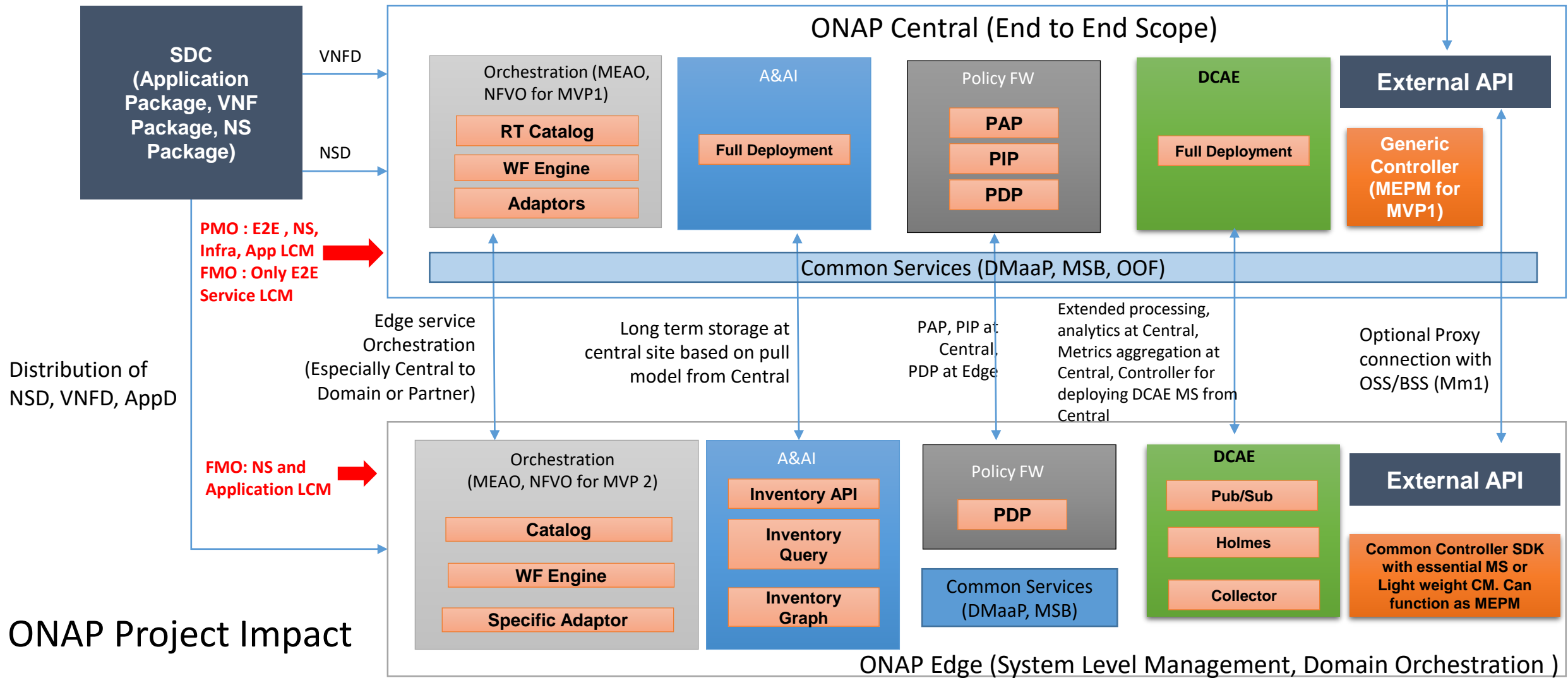
Note 1 - VF-C is ETSI-aligned.

FMO : ONAP Functional Mapping to MEC Functions : Typically for Monitoring Applications

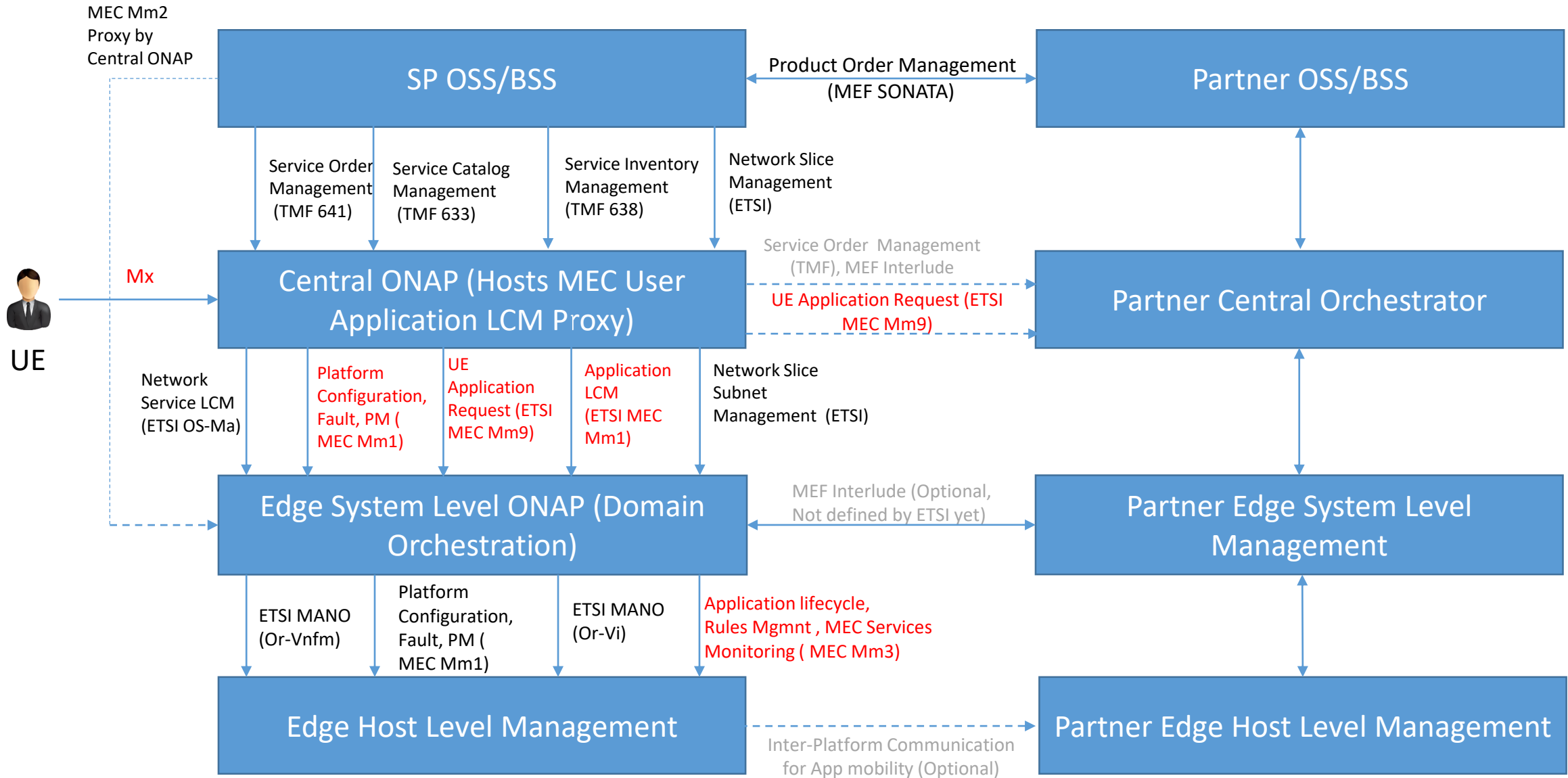


FMO : An MVP View for ONAP at Edge and Central

OSS/BSS



FMO : Central and Edge ONAP API Scope (MVP2)



ONAP Central vs Edge System Level Functionality Split (FMO)

ONAP Central

Component	Capability
SDC	End to end service design, Service distribution to Central and Edge ONAP System Level
External API	Proxy the connection to OSS/BSS to enable MM2, Coordinate communication with
SO	Optional – Infrastructure Service for ONAP Edge, Onboarding and LCM for System level monitoring applications (Mainly DCAE Apps)
DCAE	Host applications that aggregate monitoring data and carry out analytics from multiple Edge System level management functions.
A&AI	Edge System level Inventory reconciliation
VID	Infrastructure Service Instantiation
CLAMP	Closed loop configuration, deployment for Edge System level infrastructure services
Policy	For managing CL Policy
Generic Controller	Can Function like MEPM in MVP 1 scenario

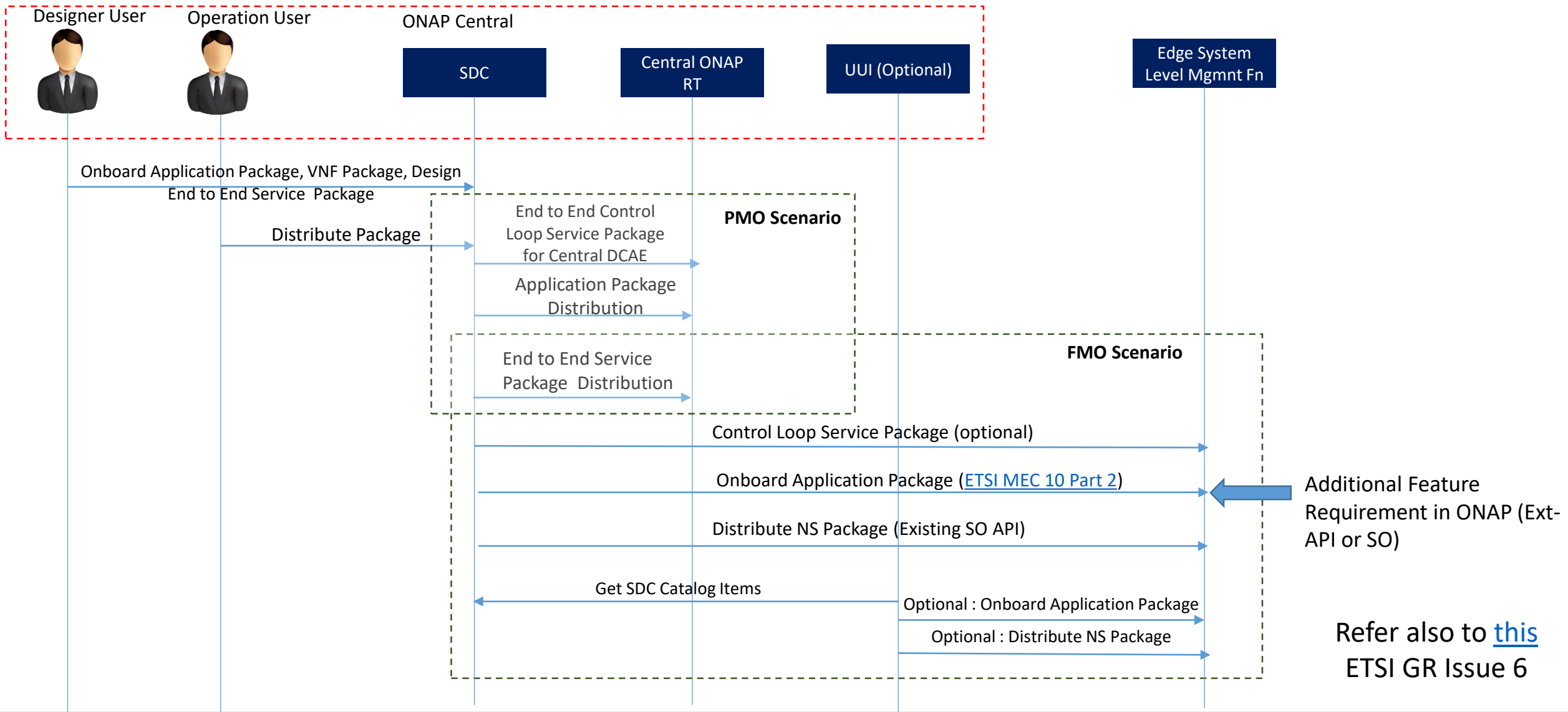
ONAP Edge System Level

Component	Capability
Runtime Catalog	Maintains application and VNF packages those are distributed by SDC from Central
SO/VFC	Application and NS Lifecycle , Edge Platform LCM, Role of MEAO + NFVO
DCAE	Host applications that aggregate monitoring data from multiple host level management systems and carry out analytics for CL
A&AI	Edge Host level inventory reconciliation
Generic Controller	For VNF and Application LCM , Application Traffic Steering . Can take the role of Platform Manager
Policy	For managing the CL Policy
Ext-API	For enabling the MEC System level NBI
CLAMP	Optional – For onboarding/instantiation the Control loop applications

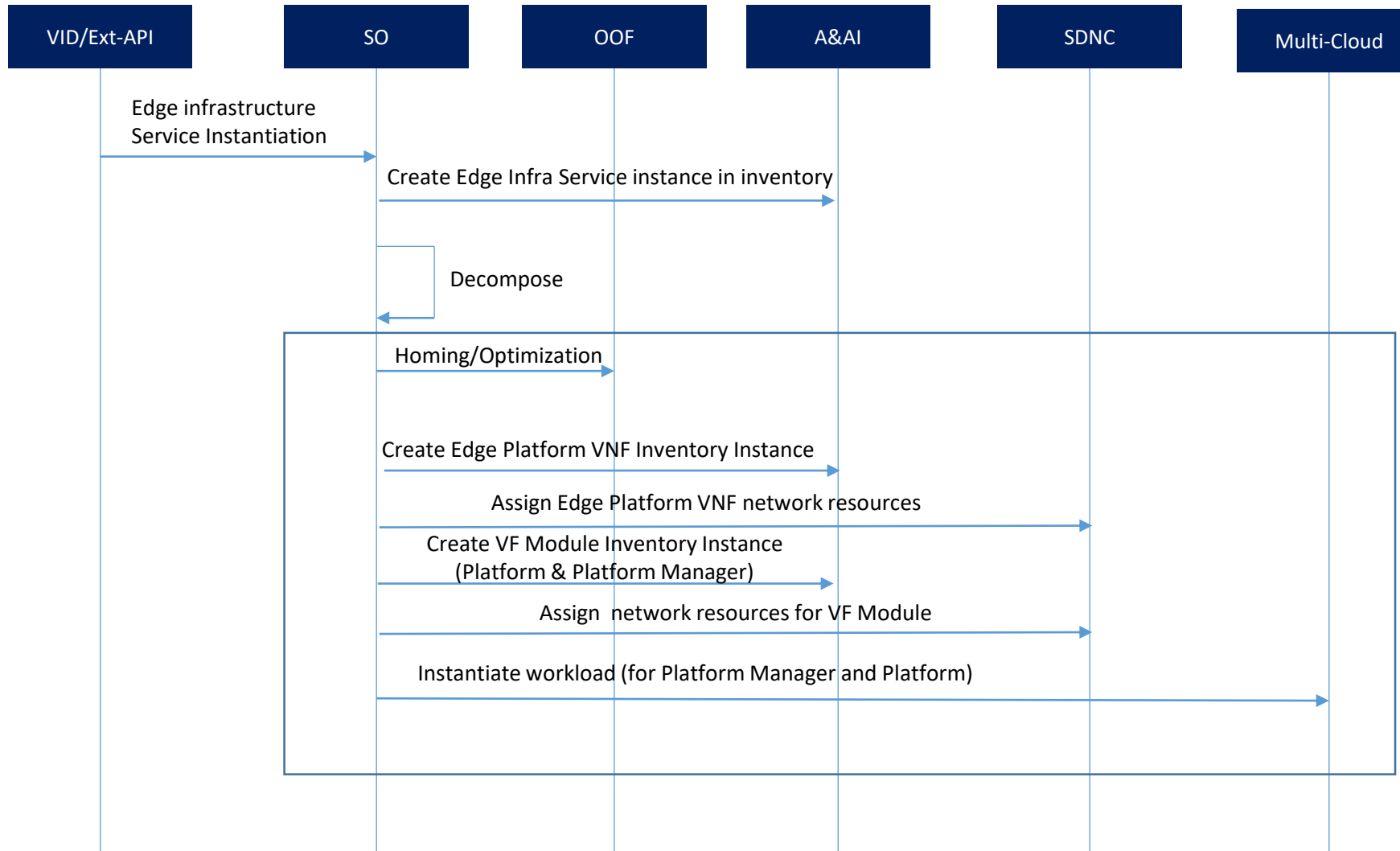
ONAP Edge Host Level

Component	Capability
Generic Controller	Persona for Edge Platform Management , especially for provisioning the application and connectivity rules

Operational Scenario: Sequence Diagram for Application Onboarding



Operational Scenario : Edge Platform Instantiation – PMO



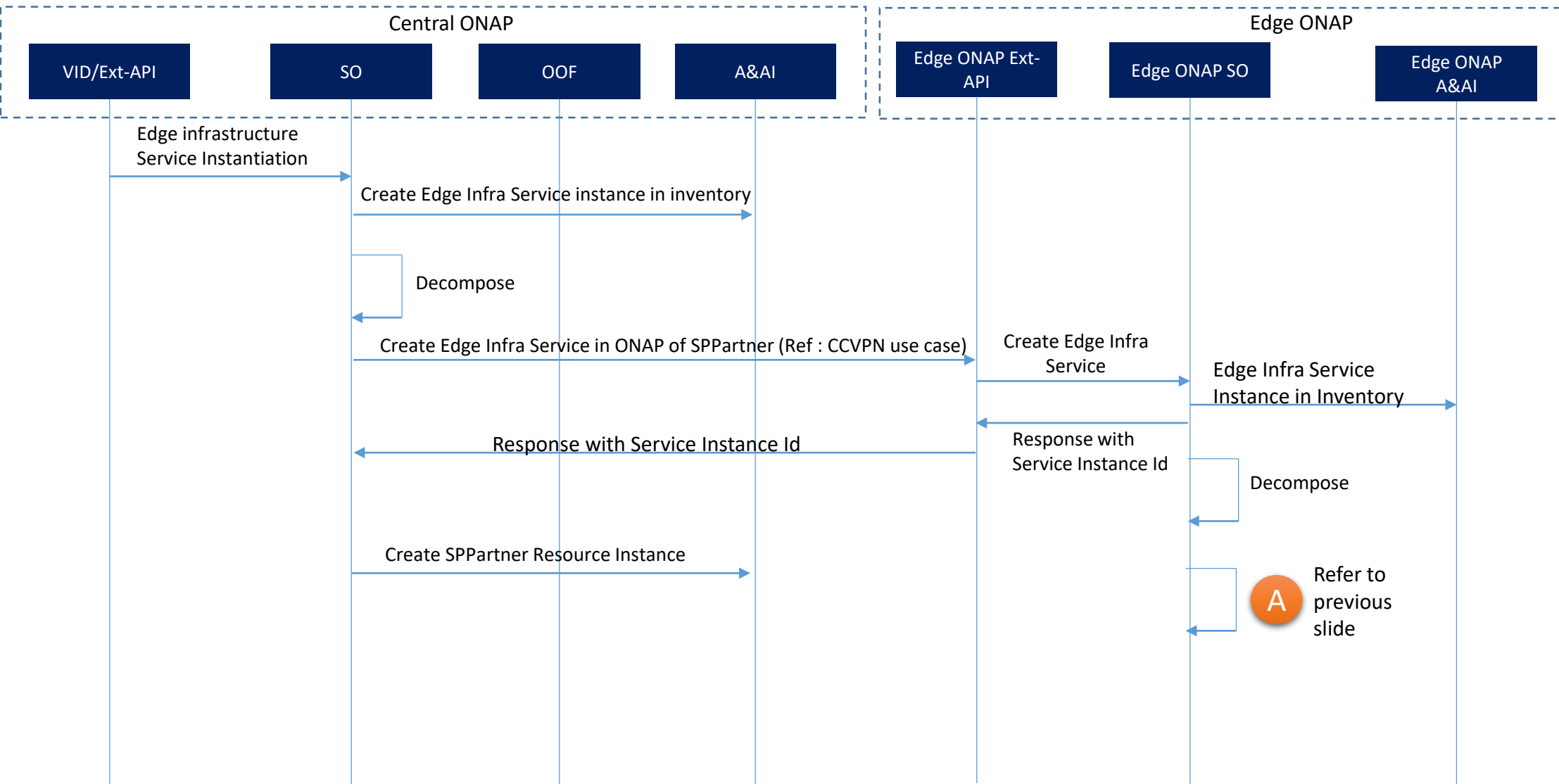
Assumptions :

- VNFM for Edge applications and Edge Platform is supported by Central ONAP or external to ONAP
- Application LCM is responsibility of Central ONAP
- Platform Manager consolidates the metrics, events from platform and passes on the aggregated metrics to ONAP Central
- Edge Platform is instantiated as Infra service component
- Central ONAP Generic Controller acts like a Platform Manager for multiple Edge hosts

A Common flows

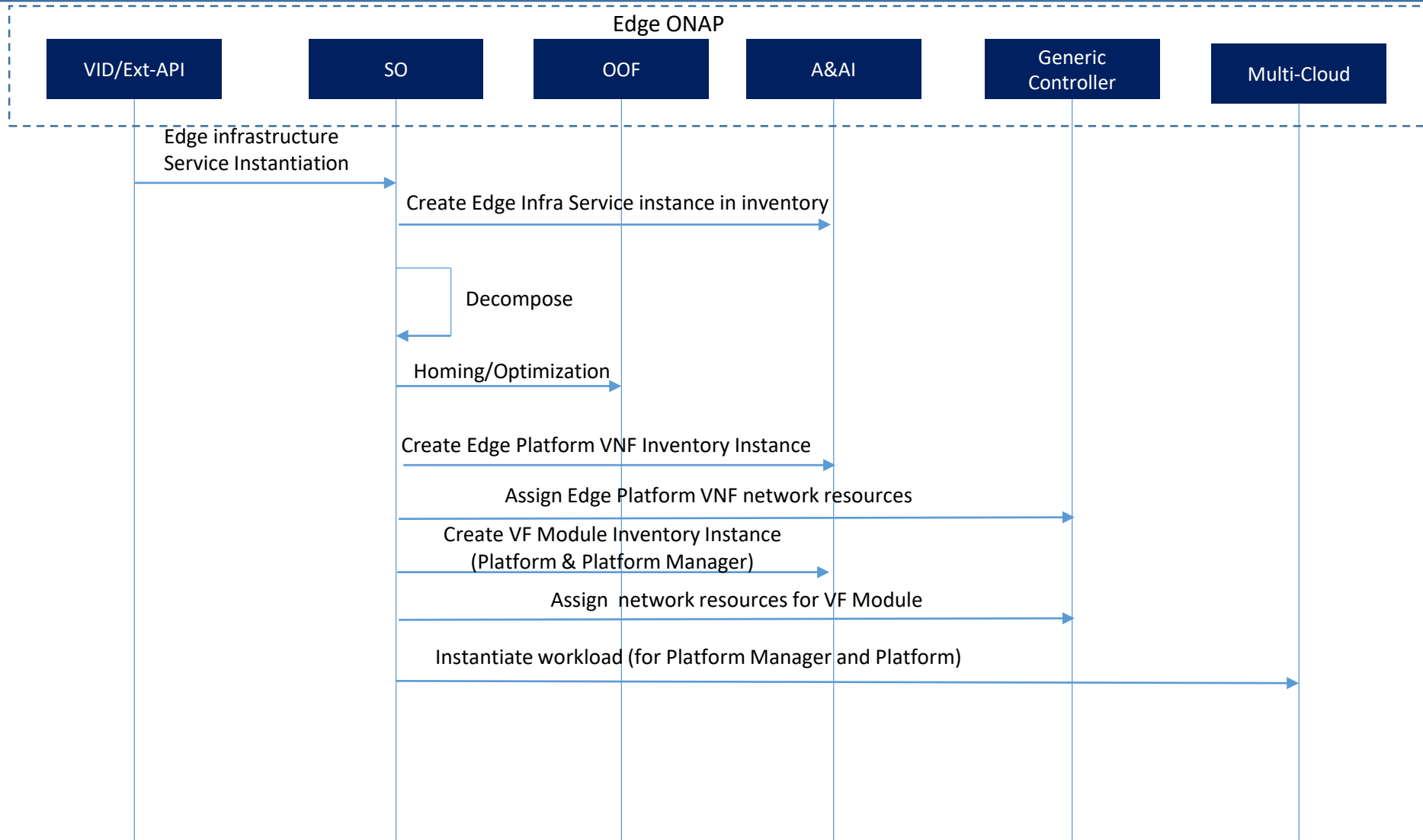
Operational Scenario : Edge Platform Instantiation – FMO

Case 1 : Platform Instantiation controlled by Central ONAP

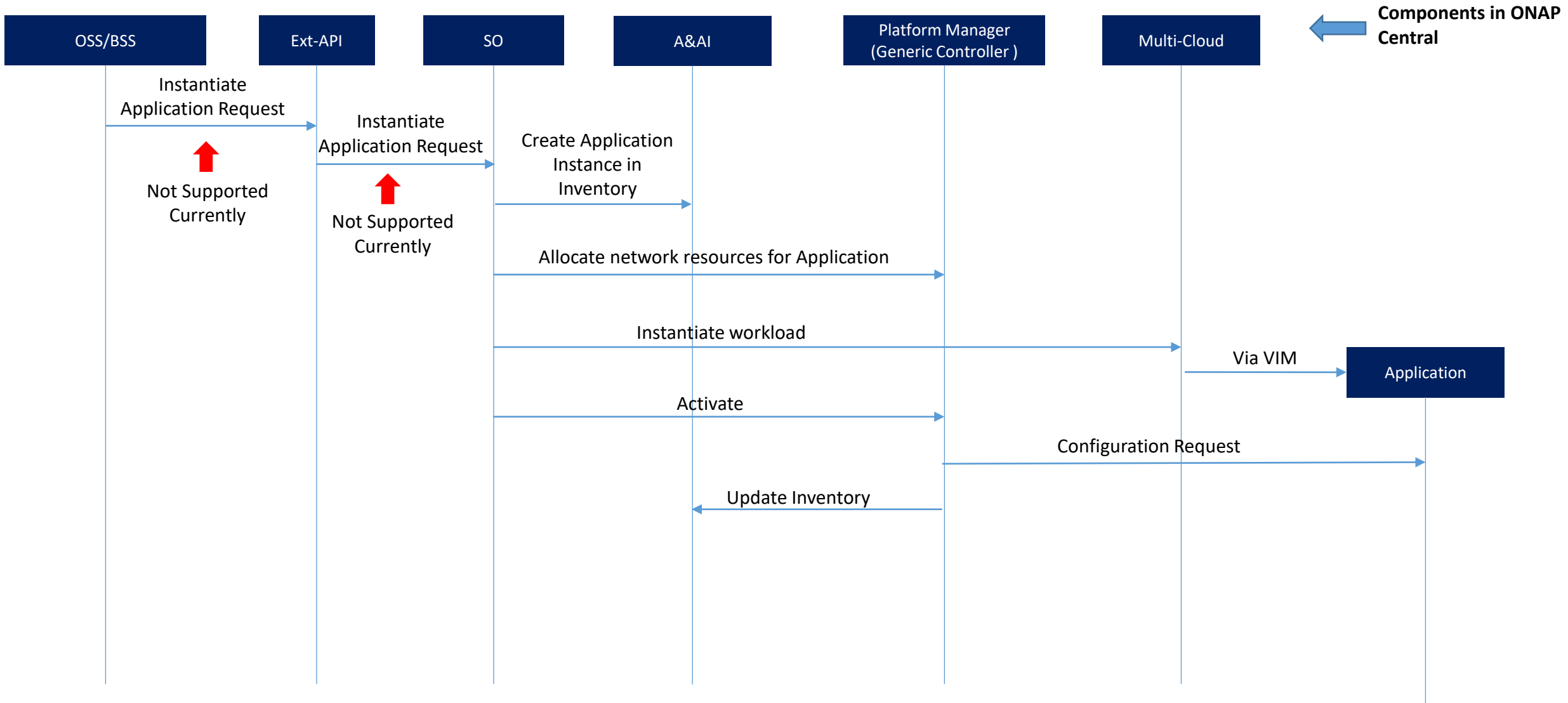


Operational Scenario : Edge Platform Instantiation – FMO

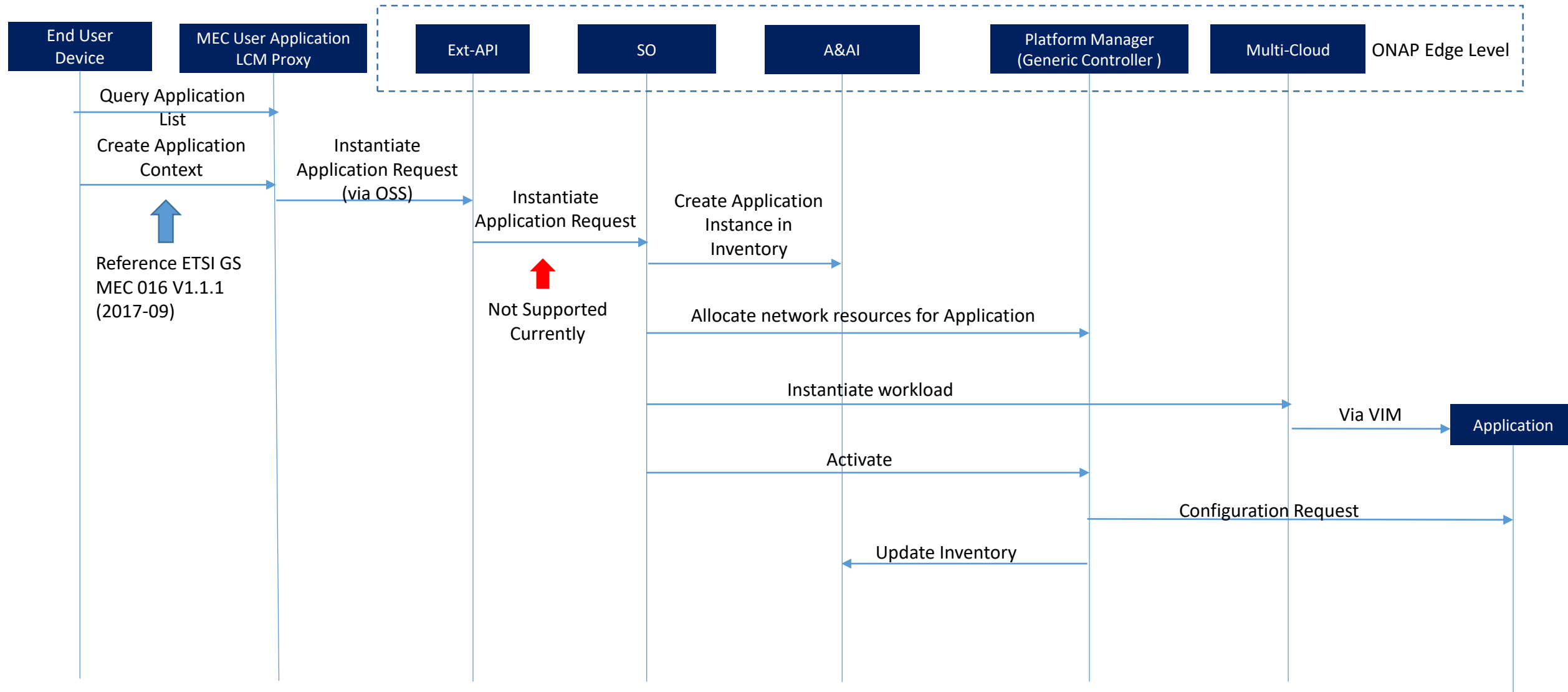
Case 2 : Platform Instantiation controlled by Edge ONAP



Operational Scenario : Sequence Diagram for Application Instantiation : PMO



Operational Scenario : Sequence Diagram for Application Instantiation : FMO



Summary – What we are suggesting ?

- MEC recommends separation of System Level and Host Level Management
- Enable MEC functional capabilities in ONAP components – Especially System Level Management and Host Level Management as FMO
- System Level Management mapped to Edge Orchestration Component
- Enhance ONAP scope to handle Application LCM Orchestration
 - Different Categories of Applications
 - Modelling constructs to support Application Descriptors , NSD – AppD Association
 - License Management of Applications
 - Application onboarding and instantiation workflows
 - End user dynamic application instantiation capability
 - Enable Capabilities as per 3GPP 5G AF for application traffic steering

Next Steps

- Wiki pages detailing (target: Dublin)
 - Study on the impact of Application Orchestration on ONAP
 - Study on aligning ONAP with MEC Architecture
- A use case proposal for edge application orchestration through ONAP (target: Dublin)
- Study on the Control loop scenarios for Edge Deployment of Non Real-time management applications at Edge

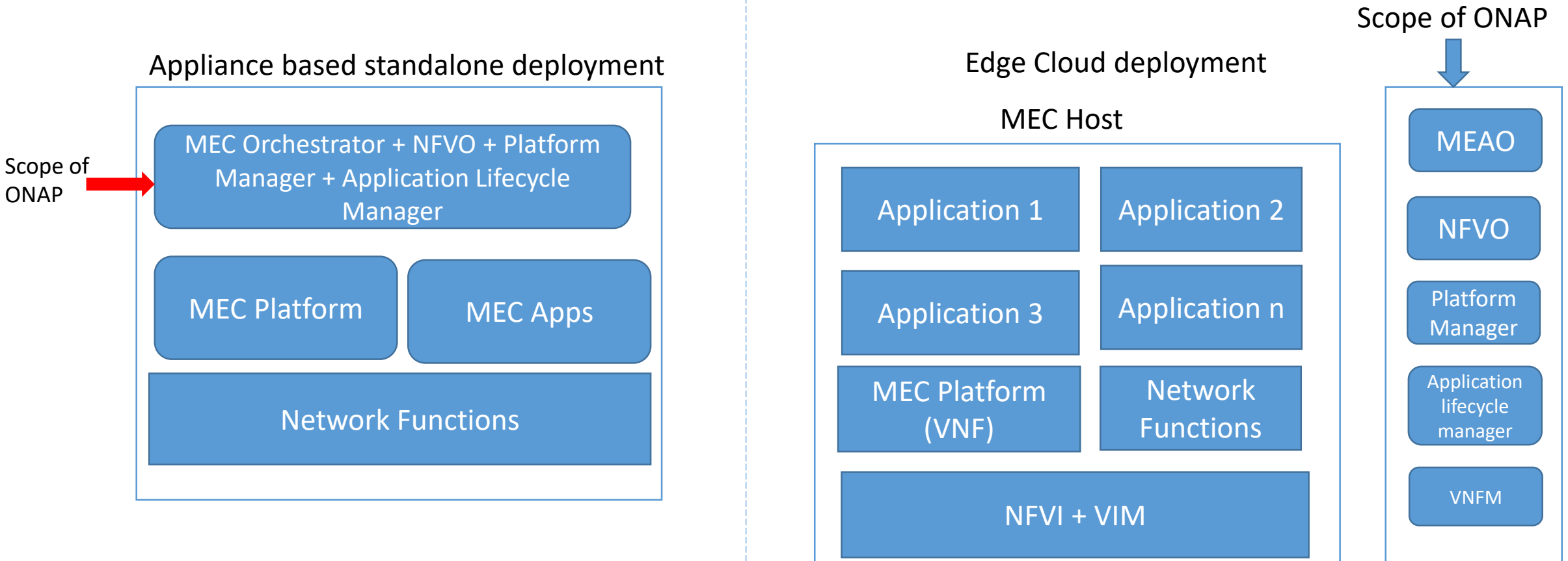


ONAP

OPEN NETWORK AUTOMATION PLATFORM

Thanks

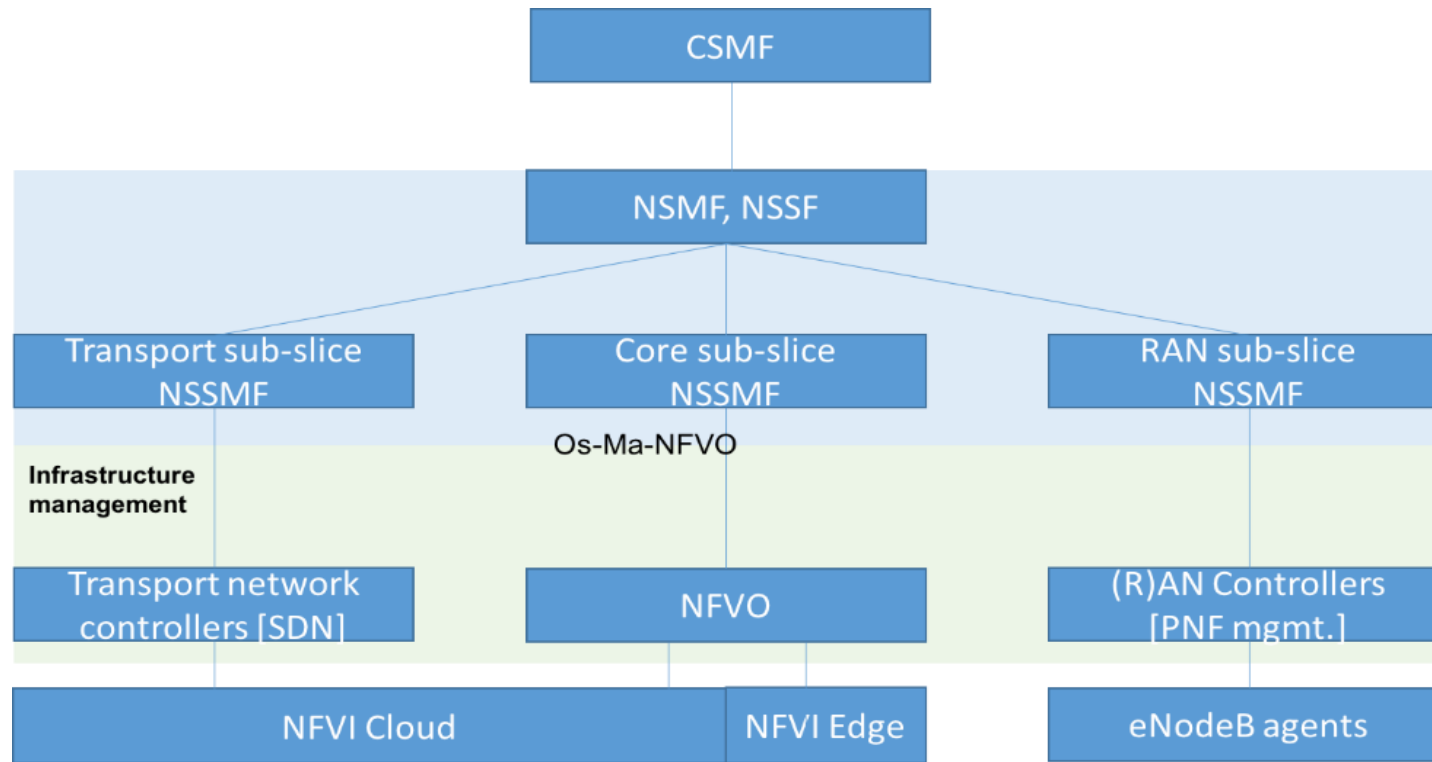
Deployment Models



Option 1: ONAP deployed as a standalone single node VM as part of the appliance

Option 2: ONAP deployed as a separate cluster for managing a set of MEC hosts

MEC and Slice Management



Modelling Impact – AppD Support

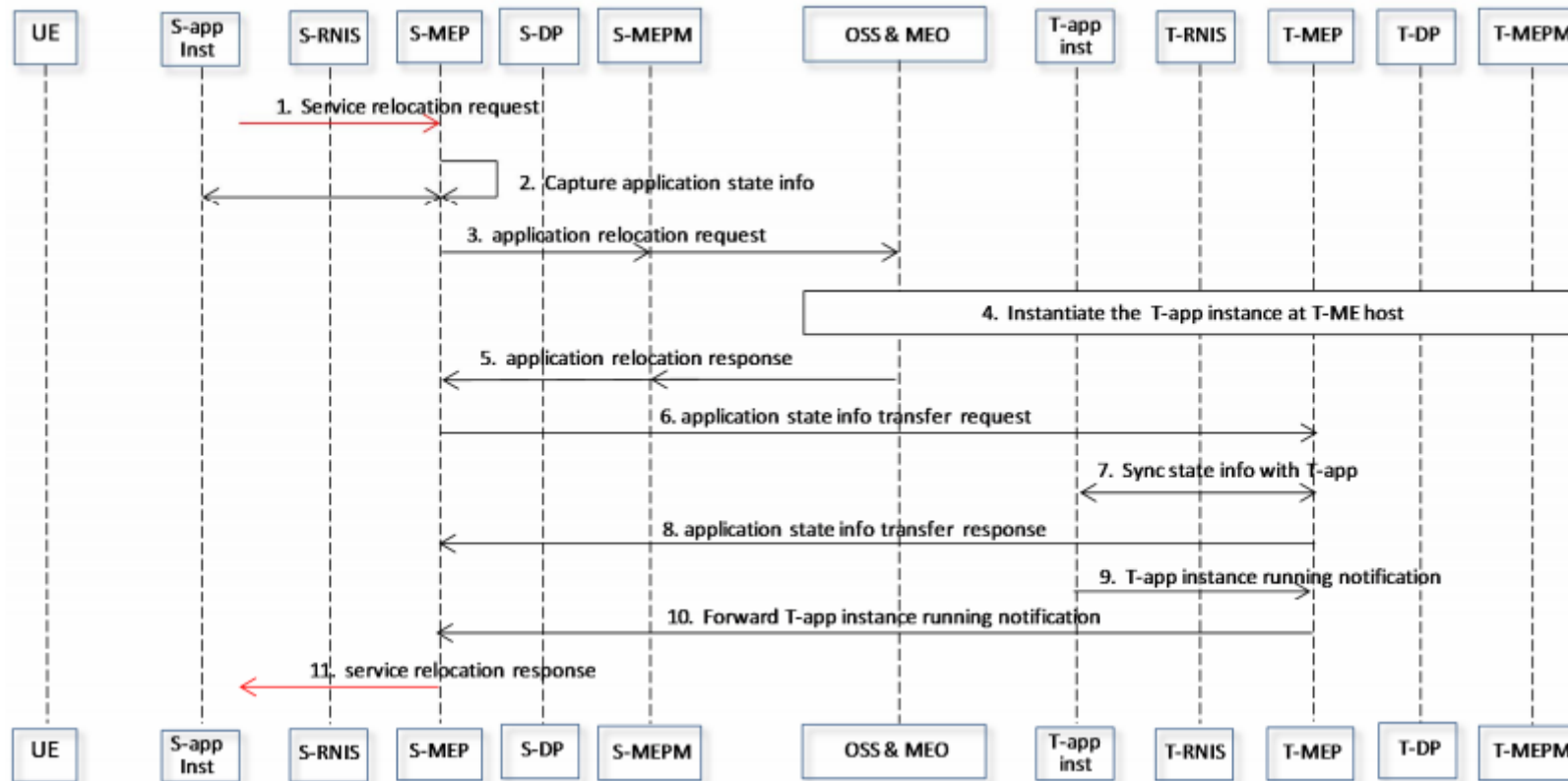
VNFD attribute	AppD attribute
vnfdId	appDId
vnfProvider	appProvider
vnfProductName	appName
vnfSoftwareVersion	appSoftVersion
vnfdVersion	appDVersion
	mecVersion
vnfProductInfoName	appInfoName
vnfProductInfoDescription	appDescription
vnfmInfo	
localizationLanguage	
defaultLocalizationLanguage	
vdu	

VNFD attribute	AppD attribute
>swImageDescriptor	swImageDescriptor
virtualComputeDesc	virtualComputeDescriptor
virtualStorageDesc	virtualStorageDescriptor
intVirtualLinkDesc	
vnfExtCpd	appExtCpd
	appServiceRequired
	appServiceOptional
	appServiceProduced
	appFeatureRequired
	appFeatureOptional
	transportDependencies
	appTrafficRule
	appDNSRule
	appLatency
deploymentFlavour	
>vnfLcmOperationsConfiguration	
	terminateAppInstanceOpConfig
	changeAppInstanceStateOpConfig
configurableProperties	
modifiableAttributes	
lifeCycleManagementScript	
elementGroup	
vnfIndicator	
autoScale	

Reference **ETSI GR MEC 017 V1.1.1 (2018-02)**
VNFD as per ETSI GS NFV-IFA 011, AppD as per ETSI GS MEC 010-2

Additional attributes to support AppD

MEC Application Mobility



ETSI GR MEC 018 V1.1.1 (2017-10)

Akraino Stack

