Welcome to the World of Standards

ETSI

World Class Standards

ONAP – ETSI NFV
ARCHITECTURE ALIGNEMENT

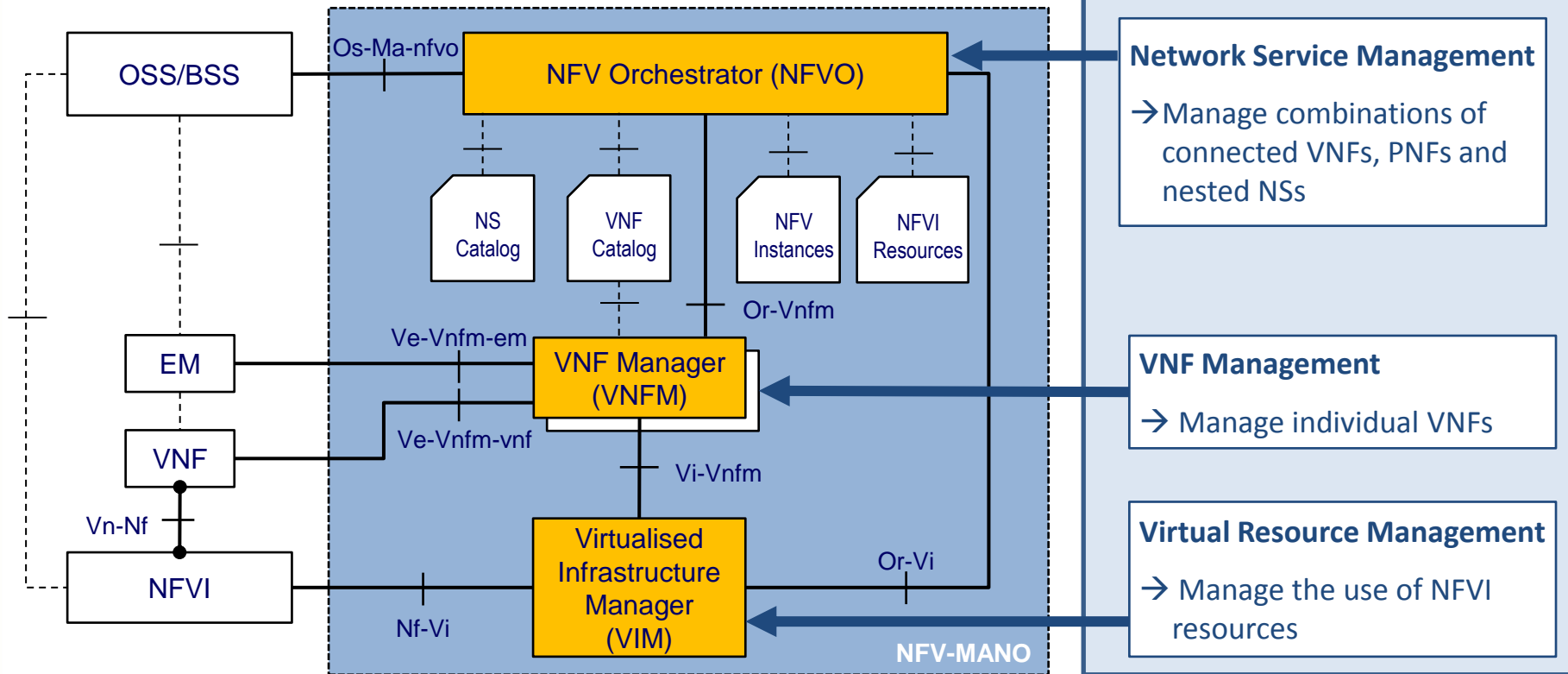Bruno Chatras, NFV ISG Vice-Chairman on behalf of the ISG leadership team

PART 1
ETSI NFV CONCEPTS

ETSI NFV Architecture, and NFV-MANO

(Specified in ETSI GS NFV-MAN 001)

OSS/BSS

Os-Ma-nfvo

NFV Orchestrator (NFVO)

NS Catalog

VNF Catalog

NFV Instances

NFVI Resources

EM

Ve-Vnfm-em

VNF Manager (VNFM)

Or-Vnfm

VNF

Ve-Vnfm-vnf

Vn-Nf

Vi-Vnfm

NFVI

Virtualised Infrastructure Manager (VIM)

Nf-Vi

Or-Vi

NFV-MANO

NFV Management & Orchestration

Network Service Management

→ Manage combinations of connected VNFs, PNFs and nested NSs

VNF Management

→ Manage individual VNFs

Virtual Resource Management

→ Manage the use of NFVI resources

Network Functions Virtualisation: Management of NFV Components

Network Service (NS) - built from interconnected VNFs and potentially Physical Network Functions (PNFs)

Virtualised Network Function (VNF) - built from interconnected VNFCs.

Virtualised Network Function Component (VNFC) - software instantiated in a virtualisation container on virtual resources.

NFV Management & Orchestration

NS

VNF   VNF

Network Service (NS) Management

VNF

VNF Management

VNFC

SW instance

Virtual Network

Virtualized Resources Management

Virtualisation Layer

Compute   Storage   Network

Virtualisation Container

NFVI

Scope of NFV Management and Orchestration (a.k.a. NFV-MANO)

ETSI

- NFV-MANO focuses on resource management, each functional block acting at a different aggregation/abstraction level.

- NFV-MANO manages how the VNF or Network Service is realized (Virtualisation Containers, Virtual Links, Software images, …).

- NFV-MANO is VNF "application" and Network Service function agnostic. If something relates directly to what a VNF application or Network Service does, then it is out of scope of ETSI NFV.

- Hence, ETSI NFV does not address:

  - Application-aware Network Service configuration and management.

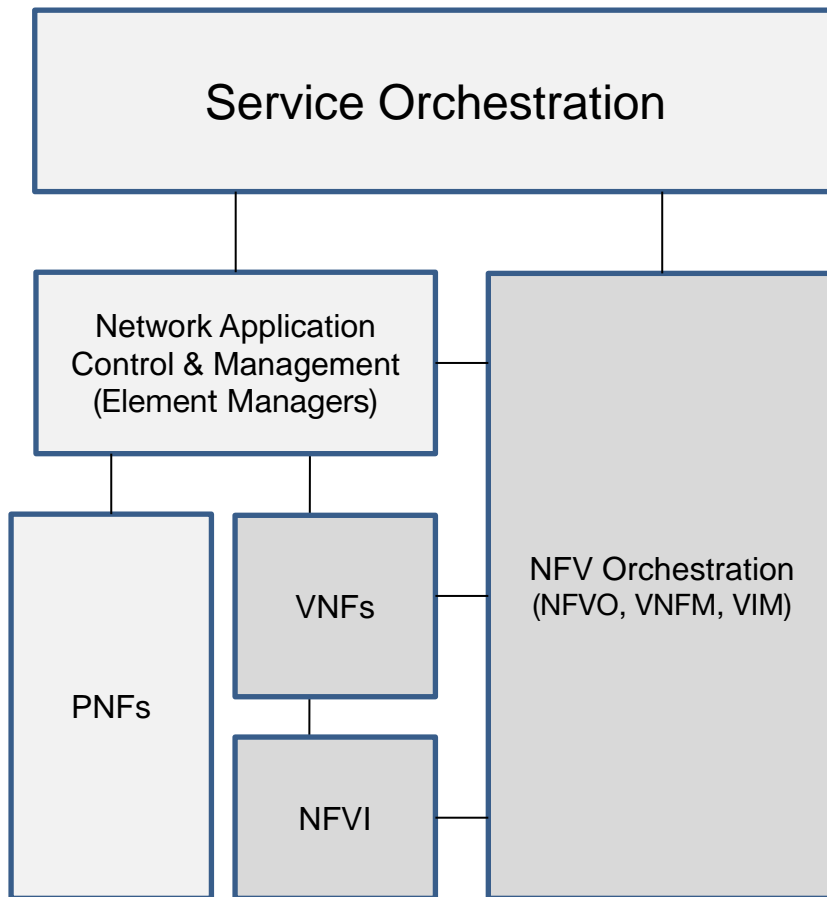 - VNF application layer configuration and management

"Application" refers to aspects that are not virtualisation-related and apply to both PNFs and VNFs , incl. Layer 1-2-3 NFs.

Two key aspects to understand

- NFV-MANO orchestration vs. Service Orchestration vs. Resource Orchestration
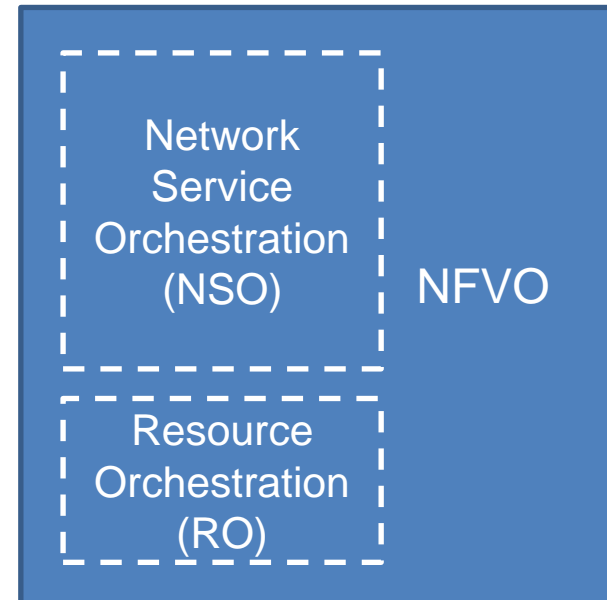
- VNFM vs EM role in VNF Lifecycle Management (LCM)

NFV Orchestration vs. Service Orchestration

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┌─────────────────────────────────────────┐
│         Service Orchestration            │
└─────────────────────────────────────────┘
        │                      │
┌──────────────────┐    ┌──────────────────┐
│ Network Application│   │                  │
│ Control & Management│  │                  │
│ (Element Managers) │   │                  │
└──────────────────┘    │                  │
   │       │            │ NFV Orchestration │
┌──────┐ ┌──────┐       │ (NFVO, VNFM, VIM) │
│      │ │ VNFs │       │                  │
│      │ └──────┘       │                  │
│ PNFs │ ┌──────┐       │                  │
│      │ │ NFVI │       │                  │
└──────┘ └──────┘       └──────────────────┘
```

- Many organizations have augmented the NFV architecture with a Service Orchestration function that is aware of the network service semantics, and coordinates all management actions, including PNF/VNF application configuration.

- NFV Network Service (NS) Orchestration (as performed by the NFVO) should not be confused with such type of Service Orchestration.

Disclaimer: This type of Service Orchestration is not currently addressed by ETSI NFV and falls in the OSS functional block of the NFV Architectural Framework
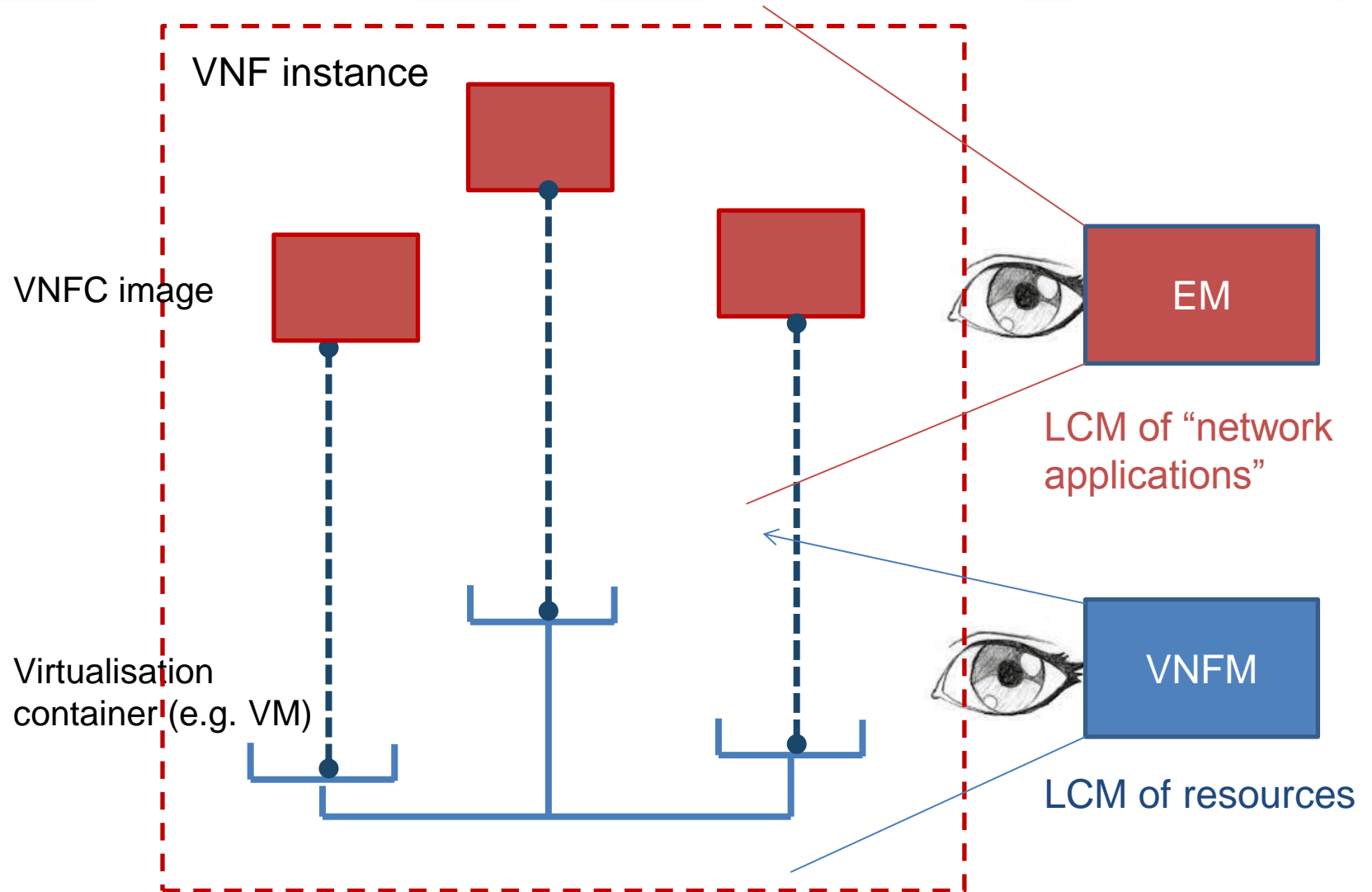
WARNING: NFVO vs. Resource Orchestration

- ETSI GS MAN 001 states that the NFVO has two main responsibilities
  - Network Service Orchestration (NSO)
  - Resource Orchestration (RO)
- However, <u>both</u> NSO and RO are resource-oriented, application agnostic, management functions and are not intended to be implemented separately.

Network Service Orchestration (NSO)

NFVO

Resource Orchestration (RO)

VNFM

VNF LCM: A twofold vision

VNF instance

VNFC image

Virtualisation container (e.g. VM)

EM

LCM of "network applications"

VNFM

LCM of resources

PART 2
EVOLVING THE ONAP ARCHITECTURE

DISCLAIMER: These slides are only for discussion to share and collect feedback. They are not intended to suggest a functional mapping at this stage.

ETSI
World Class Standards

NFV-MANO vs. ONAP scope

- "Application"-Layer management and other Operations Support Systems (OSS) functions (incl. application-aware service orchestration) deliberately left out of the scope of NFV-MANO to enable
  - Re-use of already fielded components
  - Use of independently specified new components (e.g. service orchestrators)

- Many components of the ONAP architecture are outside the scope of NFV-MANO and can complement MANO functions to create an end-to-end platform.
 - Roadblock: Reference points between ONAP components do not (seem) to match NFV-MANO reference points.

High level positioning of NFV functional blocks on the ONAP R2 architecture – Option 1
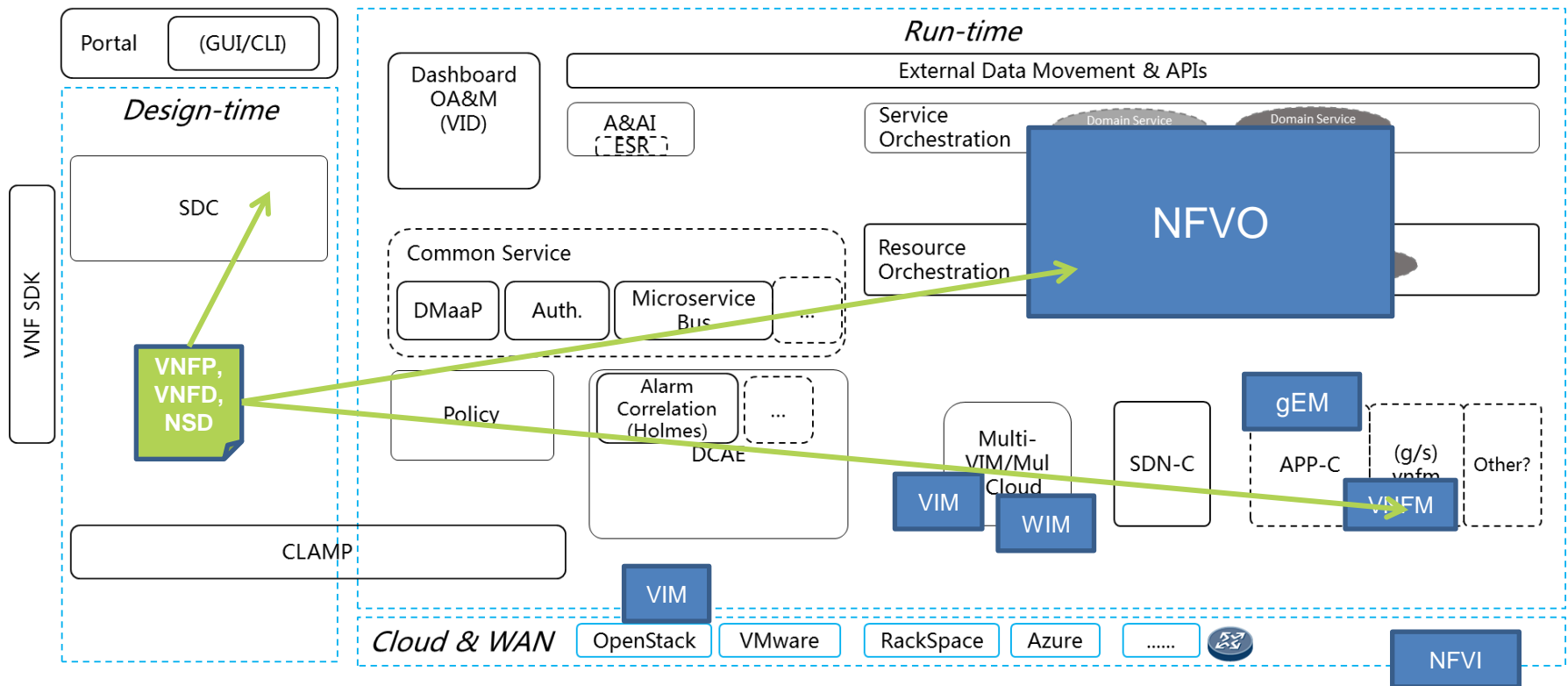
We understand that APP-C currently provides both
1/ generic "application" management functions that are under the responsibility of an EM in the NFV architectural model (e.g. restart)
2/ A small subset of the VNFM functionality (e.g. ability to terminate a VNF)
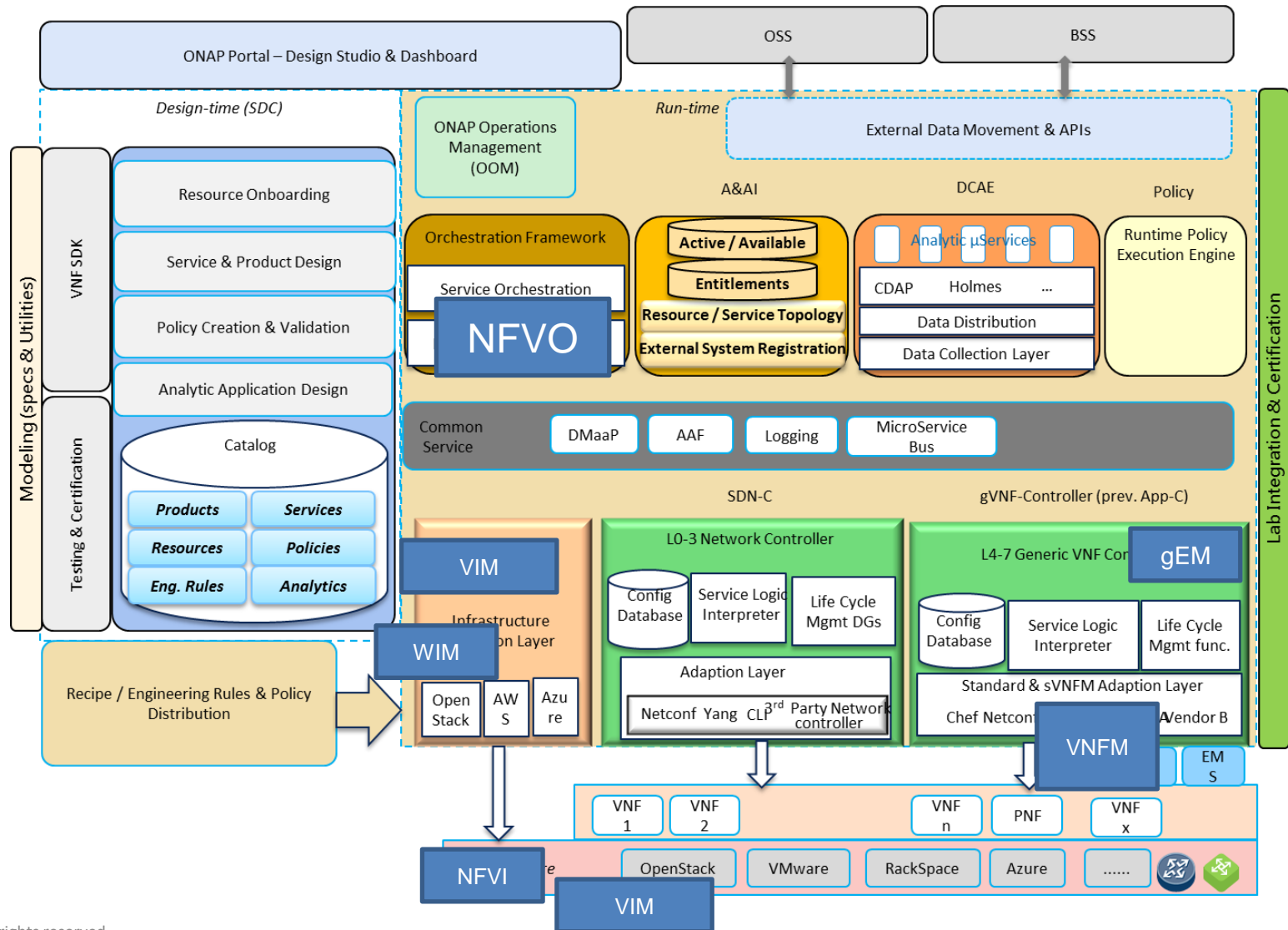
Assumptions on the ONAP R2 architecture evolution to make it ETSI-compatible

- Within the Orchestration Layers, Application-Oriented Service Orchestration is separated from NFVO / VNFM functionality.
  - Application-Oriented Service Orchestration coordinates resource-oriented lifecycle management procedures subcontracted to NFV-MANO with "application-oriented" lifecycle management subcontracted to other components (likely the APP-C and the SDN-C).

- The VNF LCM functionality performed by a VNFM is entirely performed by a single architectural component (APP-C or VFC or the Orchestration Layer)

- Depending on the configuration,
  - The APP-C behaves as a generic EM only or as a VNFM-only, or both.
  - The VFC behaves as an ETSI-compliant NFVO and/or VNFM
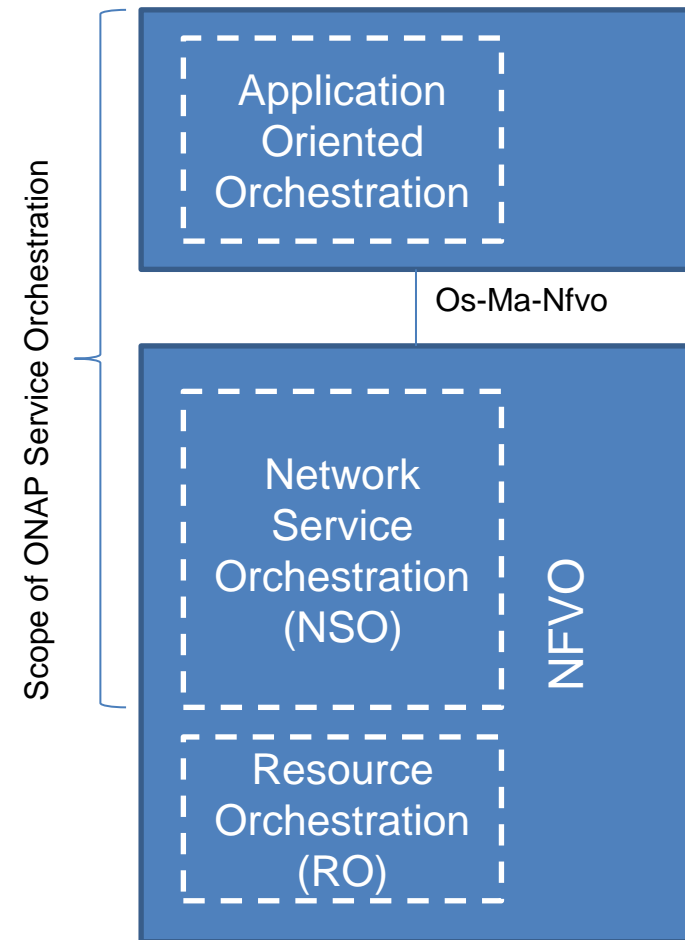
Scope of ONAP Service Orchestration

Application Oriented Orchestration

Os-Ma-Nfvo

Network Service Orchestration (NSO)

NFVO

Resource Orchestration (RO)

- Application-Oriented Service Orchestration in the Service Orchestration layer is able to consume ETSI-compliant APIs exposed by an NFVO (i.e. NFV-SOL 005 APIs).

- Application-Oriented Service Orchestration in the Service Orchestration layer do not directly consume the Open Stack APIs exposed by the infrastructure manager.

- If playing the VNFM role, the APP-C exposes ETSI compliant APIs (i.e. NFV-SOL 002 APIs).

- If playing the generic EM role, the APP-C can consume ETSI-compliant APIs exposed by a VNFM and exposes ETSI-compliant APIs to the VNFM (i.e. NFV-SOL 002 APIs)

- If playing the NFVO and/or VNFM role, the VFC exposes ETSI-compliant APIs

PART 3
CONCLUSION

Conclusion

- Many components of the ONAP architecture are outside the scope of NFV-MANO but can complement MANO functions.
    - Roadblock: Reference points between ONAP components do not (seem) to match NFV-MANO reference points.

- ONAP & ETSI NFV compatibility has room for improvement.
    - Compatibility would enable re-using and leveraging specifications developed in ETSI, based on industry consensus achieved over the past 4 years.
    - A loosely couple E2E architecture with minimum dependencies and standard APIs between components would provide a path to convergence.
    - The industry needs to agree on standard VNF package format and VNF descriptors, regardless of the architecture and implementation of the management system consuming them.

More information:

NFV Technology Page (information)
http://www.etsi.org/nfv

NFV Portal (working area)
http://portal.etsi.org/nfv

NFV Proofs of Concept (information)
http://www.etsi.org/nfv-poc

NFV Plugtest (information & registration)
http://www.etsi.org/nfvplugtest

Open Area:

Drafts http://docbox.etsi.org/ISG/NFV/Open/Drafts/

Issue tracker http://nfvwiki.etsi.org/index.php?title=NFV_Issue_Tracker

BACKUP SLIDES

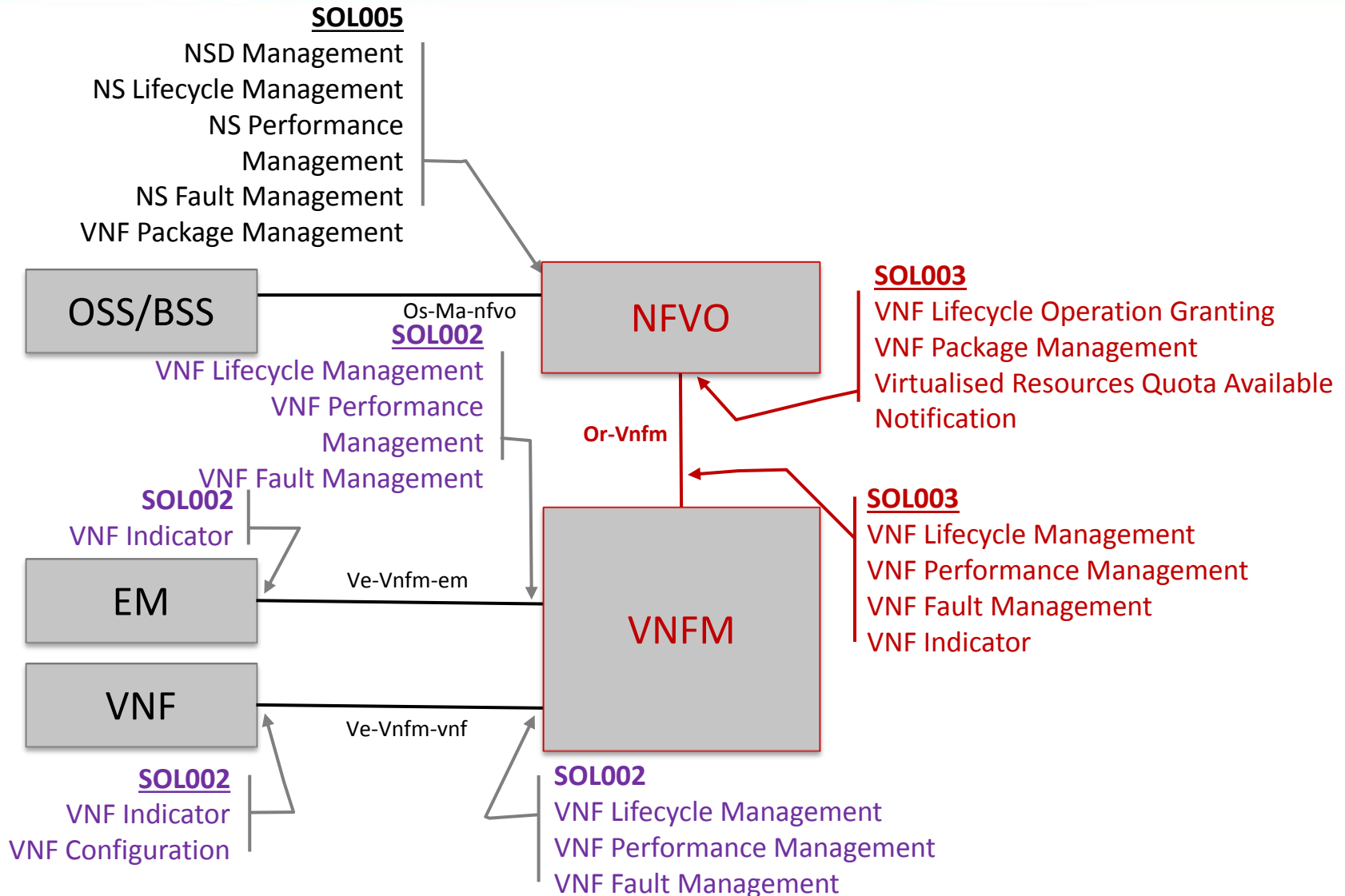# What is a Network Service?
A look inside

ETSI
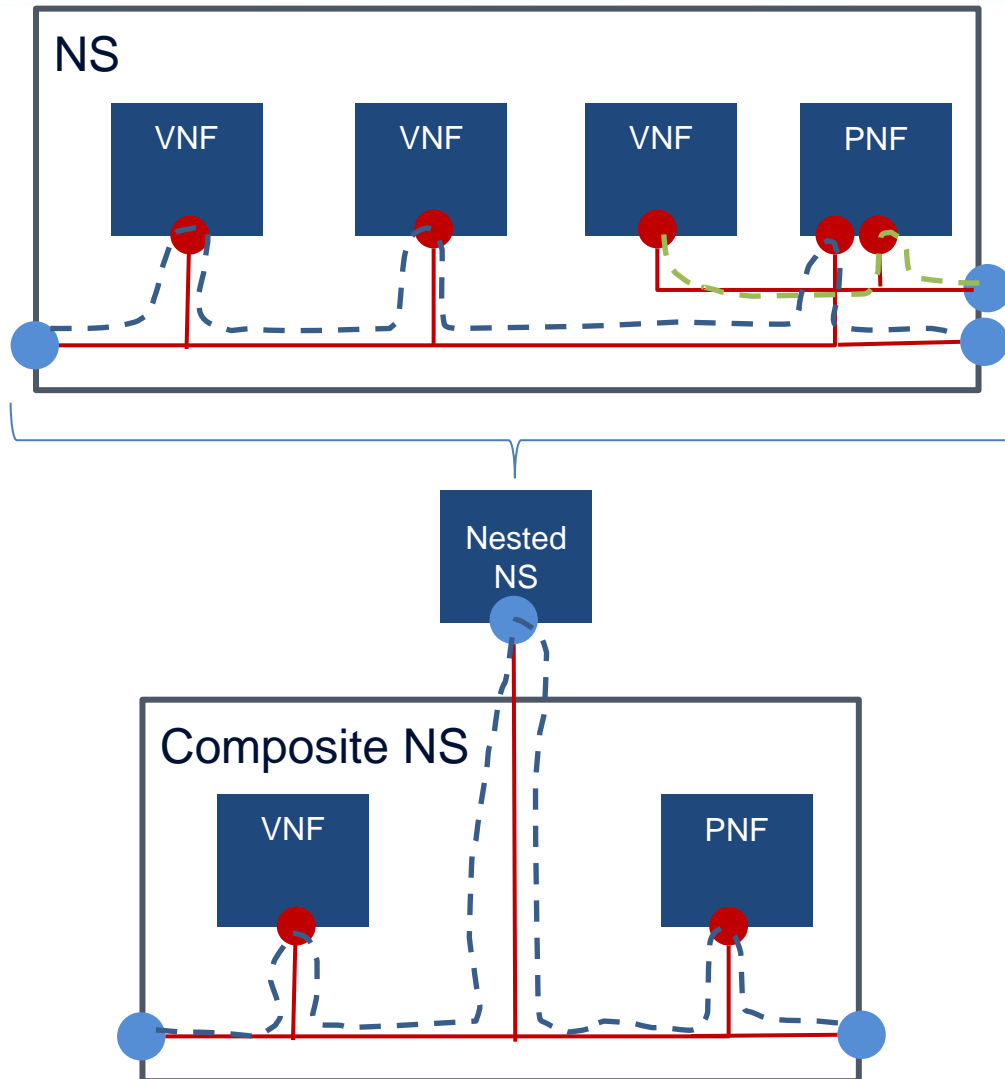
Legend:
- SAP
- VNF/PNF External Connection Point
- ——— Virtual Link (Virtual Network)
- – – – VNF Forwarding Graph

- Physical Network Functions and Virtual Network Functions may be combined in the same network service.

- NFV Network Services may be built in a modular manner, then combined in Composite Network Services.

- NS has constituent VNFs and PNFs

- Composite NS can have nested NS included as reference

- Virtual Link (VL) provides the connectivity between constituent VNFs and PNFs

- VNF Forwarding Graph (VNFFG) is composed of Network Forwarding Paths (NFP), each one as a sequence of connection points and a classification and selection rule.

- A NS has Service Access Points (SAP) used to access the NS from the outside

ETSI NFV MANO architecture: interfaces & operations

SOL005
NSD Management
NS Lifecycle Management
NS Performance Management
NS Fault Management
VNF Package Management

OSS/BSS

Os-Ma-nfvo

NFVO

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

SOL002
VNF Indicator

SOL003
VNF Lifecycle Operation Granting
VNF Package Management
Virtualised Resources Quota Available Notification

Or-Vnfm

EM

Ve-Vnfm-em

SOL003
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management
VNF Indicator

VNF

Ve-Vnfm-vnf

VNFM

SOL002
VNF Indicator
VNF Configuration

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

- Virtualisation is a well established technology.

- ETSI NFV Management and Orchestration (MANO) adds automated deployment of complex Virtualised Network Functions (VNFs).

- Architectural framework extended with a WAN Infrastructure Manager (WIM) managing network resources across multiple NFVI-POPs. Details under study in GR NFV-IFA 022.
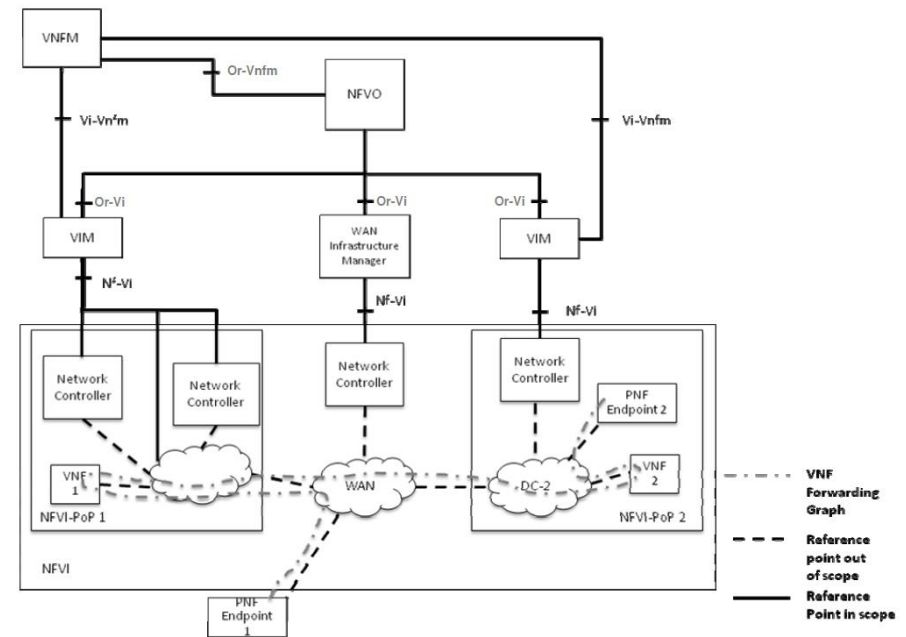
Boundaries of ETSI NFV activity

Out of scope for ETSI NFV

Functional and Configuration Management

ETSI NFV does not address:

- Application-aware Network Service configuration and management.

- VNF application layer configuration and management

Limited scope for ETSI NFV

NFV Infrastructure and its managements.

ETSI NFV does define:

- Some requirements for enhancement

- Corresponding information models where applicable

*Application Layer = Network application, including L1-3 functions

Os-Ma-nfvo

OSS/BSS

NFV Orchestrator (NFVO)

EM

Application Layer

VNF

Vn-Nf

NFVI

Nf-Vi

Virtualised Infrastructure Manager (VIM)