Welcome to the World of Standards

ETSI

World Class Standards

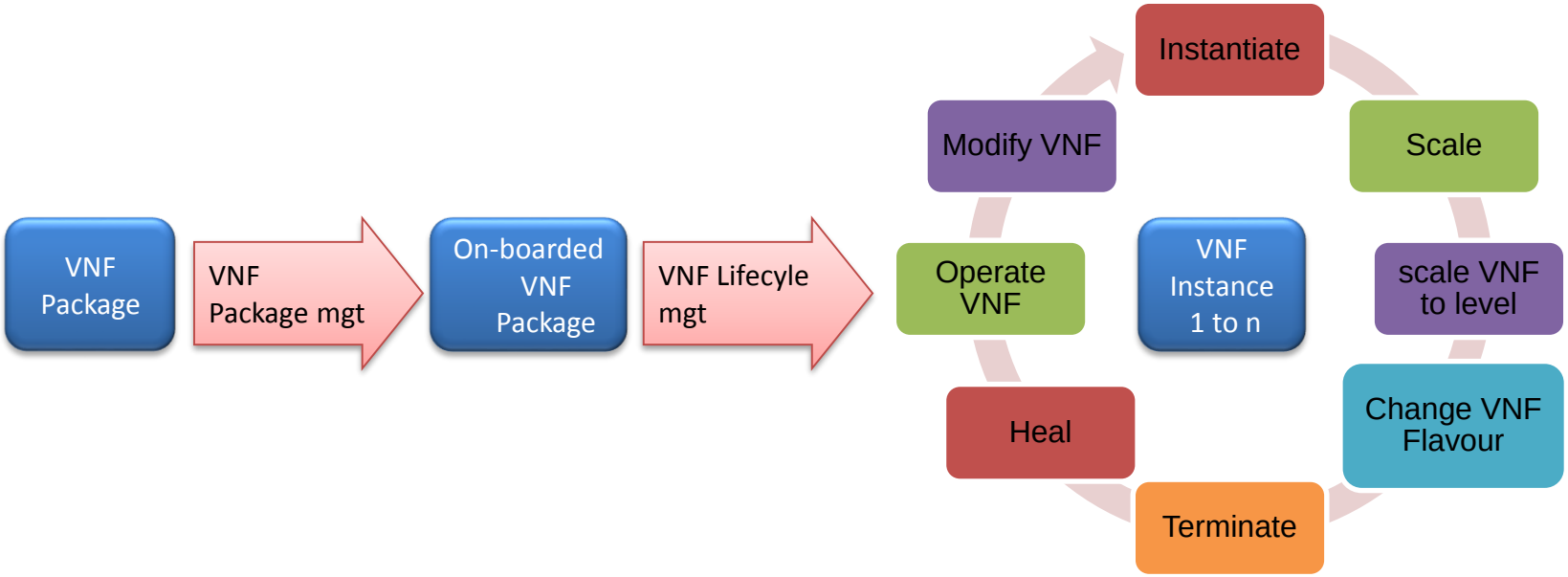
VNF OPERATION USE CASES

Thinh Nguyenphu, ETSI NFV SOL Vice-Chair,
Nokia Bell Labs and CTO Nokia

NFV WORLD CONGRESS

VNF Operation Use Cases

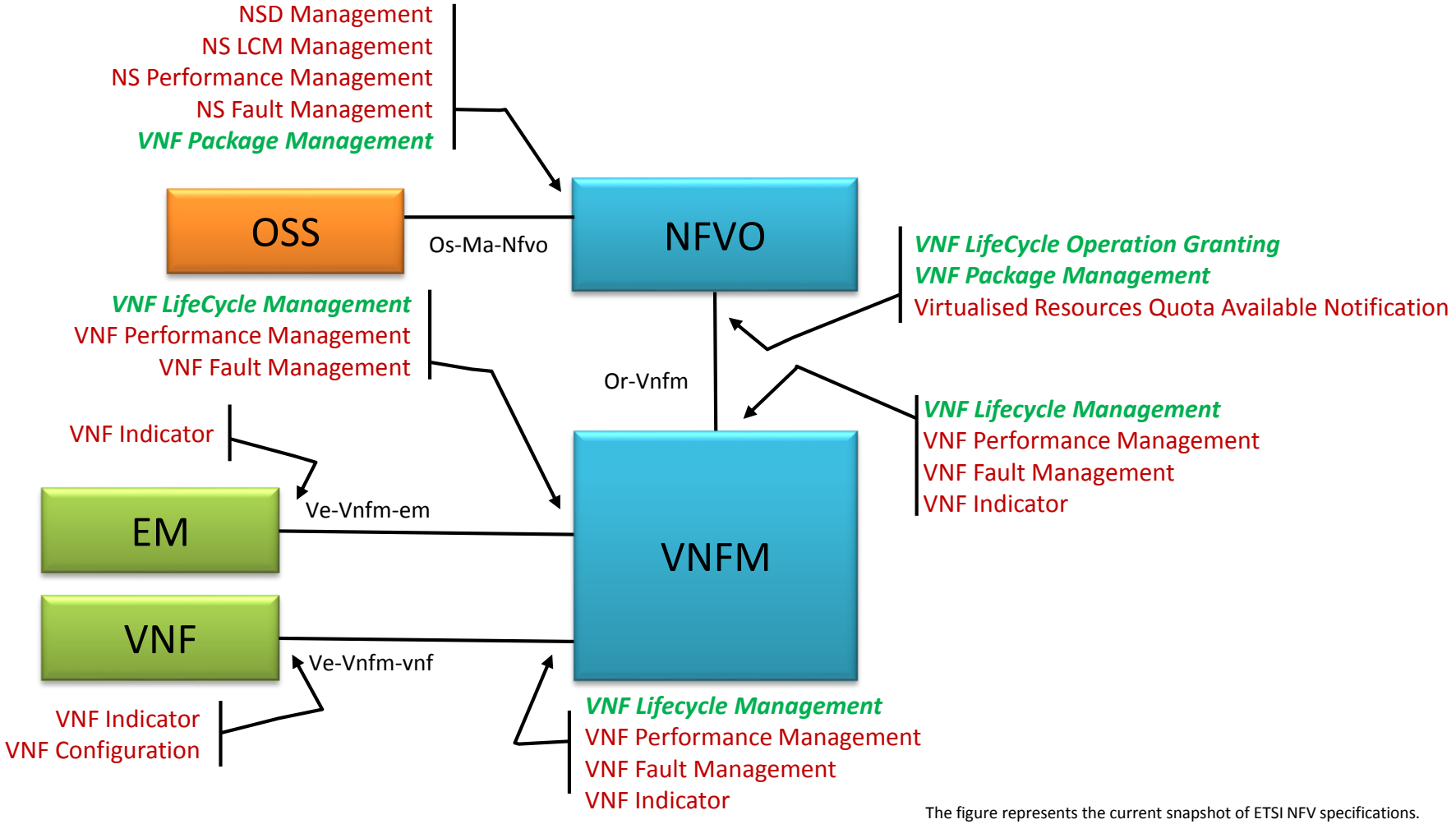
- VNF Package Management (e.g. On-board a VNF Package)
- VNF Lifecycle Management (e.g. Instantiate VNF, Scale VNF)



Note: see next slide for detail of all operations

VNF Package & VNF Lifecycle Management Operation

In these use cases, VNF Package Management, VNF LifeCycle Operation Granting, VNF Lifecycle Management operations are illustrated



The figure represents the current snapshot of ETSI NFV specifications.

Packaging a VNF: VNF Package

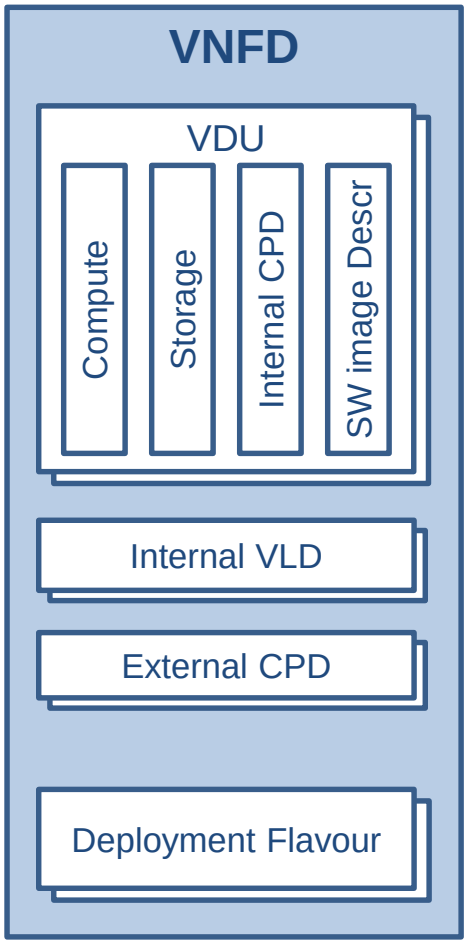
- The VNF Package contains:
  - the VNF descriptor (VNFD) that defines metadata for package onboarding and VNF management,
  - the software images needed to run the VNF, and
  - (optional) additional files to manage the VNF (e.g. scripts, vendor-specific files etc.).
- The VNF Package is digitally signed and delivered by the VNF provider as a whole.
  - The VNF Package is immutable (protected from modification).
- The VNF Package is stored in a repository by the NFVO.
- The VNF Package can be accessed by VNFM.

Reference:
- ETSI GS NFV-IFA 011
- ETSI GS NFV-SOL 004

Packaging a VNF: VNF Descriptor (VNFD)

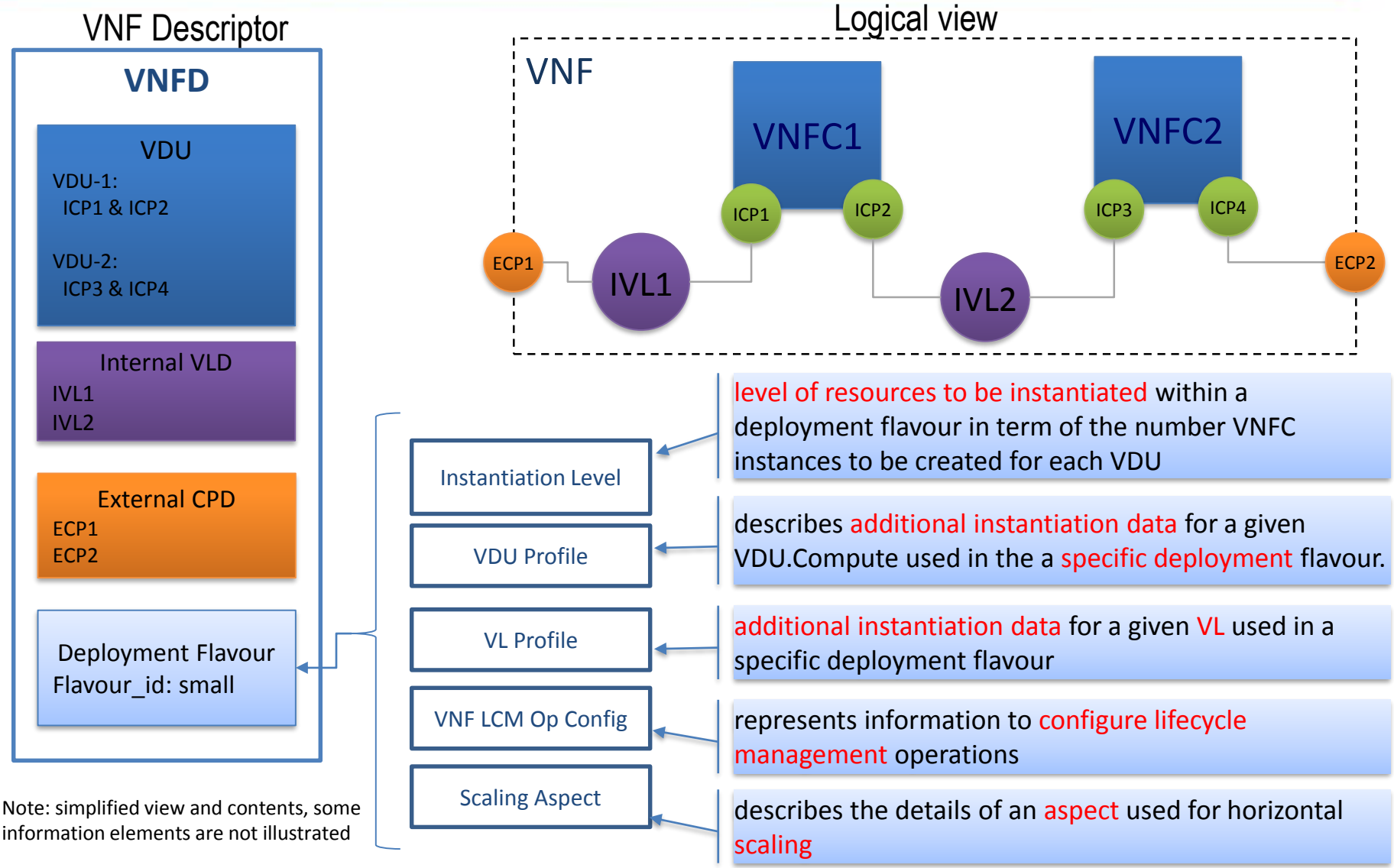
- The VNFD defines VNF properties, such as:
  - resources needed (amount and type of Virtual Compute, Storage, Networking),
  - software metadata,
  - connectivity:
    - External Connection Points (described via CP Descriptors, CPD).
    - Internal Virtual Links (described via VL Descriptors, VLD)
    - Internal Connection Points (described via CP Descriptors, CPD)
  - lifecycle management behavior (e.g. scaling, instantiation),
  - supported lifecycle management operations, and their configuration,
  - supported VNF specific parameters, and
  - affinity / anti-affinity rules.

- The VNFD defines deployment flavours (size-bounded deployment configurations, e.g. related to capacity).



Reference:
- ETSI GS NFV-IFA 011
- ETSI GS NFV-SOL 001

VNF Descriptor (VNFD)



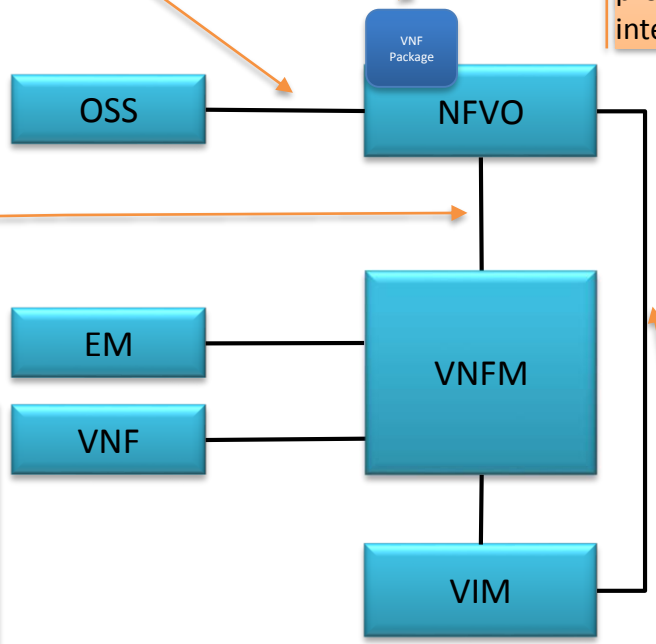
Note: simplified view and contents, some information elements are not illustrated

Use Case: VNF Package Management: On-Boarding

1) VNF Package is onboarded by the OSS into the NFVO, which then manages the on-boarded VNF Packages

1a) During the on boarding of the VNF Package, a validation of the package is performed. The validation is a procedure that verifies the integrity of the VNF Package.

3) All subscribers (including VNFM) get notified when VNF packages are onboarded or removed
4) The VNFM can obtain the VNFD and information about the VNF Package from the NFVO by performing a query.
5) VNFM fetches either a whole VNF Package or selected artifacts



2) The NFVO could prepare the VIM(s) for instantiation of the onboarded VNFs, by downloading software images to the VIMs

1) Onboard VNF package Operation:
   - OnboardVnfPackageRequest/Response
2) Add Image Operation:
   - AddImageRequest/Response
3) Subscription & Notify Operation:
   - SubscribeRequest/Response
   - NotifyRequest/Response
4) Query On-boarded VNF Package Info Operation:
   - QueryOnboardedVnfPkgInfoRequest/Response
5) Fetch VNF Package Operation:
   - FetchVnfPackageRequest/Response

Note: Rel. 2 specification do not specify the sequence of these operations.
This use case example is only for illustration.

Reference:
- ETSI GS NFV-IFA 013
- ETSI GS NFV-IFA 005
- ETSI GS NFV-SOL 005

Use Case: VNF instantiation: 1/3

- Pre condition
  - VNF Packaged on-boarded
  - VNF instance ID created and VNF instance is not in instantiated state
  - VNF Package artifacts are available and fetched by VNFM

Use Case: VNF Instantiation 2/3

1) The instantiation of a VNF will be initiated by NFVO by using Instantiate VNF operation {InstantiateVnfRequest} including VNF Descriptor ID & VNF instance ID (vnfdid, vnfInstanceId)

2) VNFM plans resource consumption and defines placement constrains from VNFD.

3) VNFM informs NFVO of the start of the VNF LCM operation {VnfLcmOperationOccurrenceNotification}

4) VNFM performs Grant Request VNF Lifecycle Operation exchange {GrantVnfLifecycleOperationRequest}

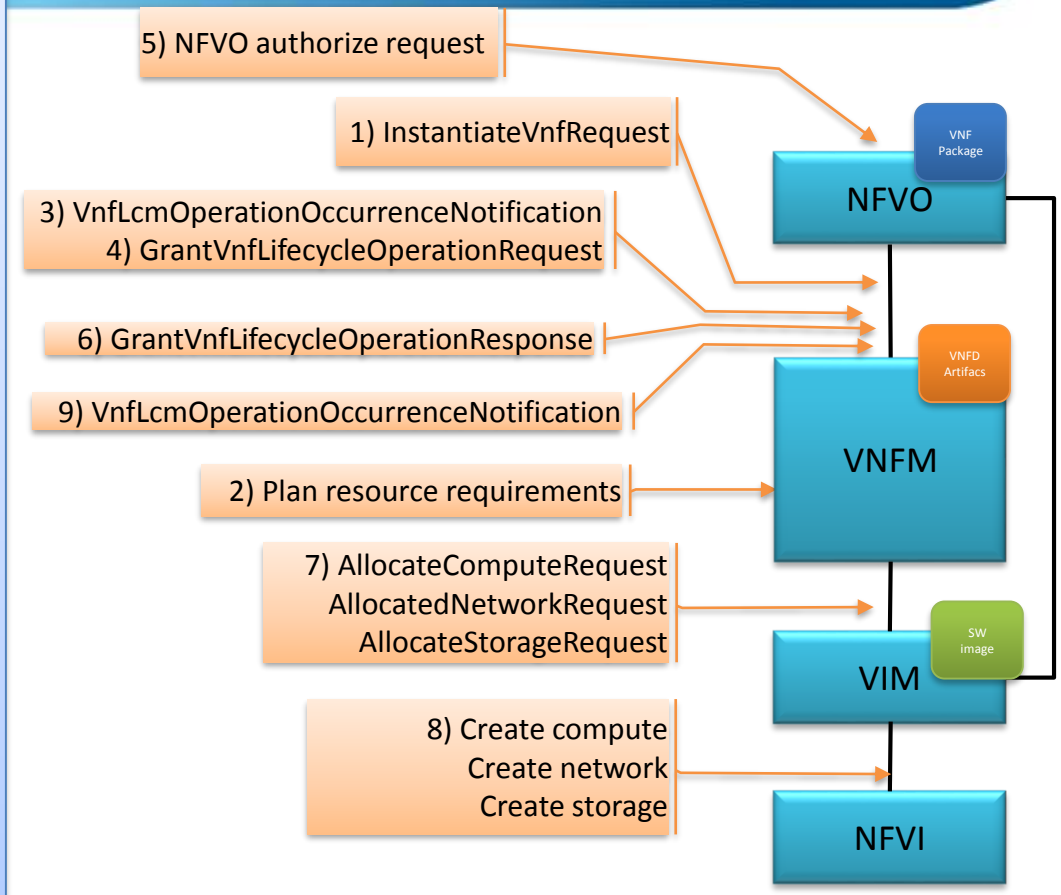
5) NFVO checks impact to NS and resources, placement constrains, etc.

6) NFVO sends instantiate approval to VNFM via using Grant VNF Lifecycle Operation {GrantVnfLifecycleOperationResponse}, with additional information to be used in the resource management operation.

7) For all resources (compute, storage, network) that are required to instantiate the VNF, the VNFM requests the VIM to allocate and create these.

8) VIM instructs NFVI to create and allocate all requested resources.

9) VNFM informs NFVO of the result of the VNF LCM operation {VnfLcmOperationOccurrenceNotification}



Note: Rel. 2 specification do not specify the sequence of these operations. This use case example is only for illustration. Actual message(s) depend on the target deployment technology used in environment.

Reference:
ETSI GS NFV-IFA 007
ETSI GS NFV-IFA 006
ETSI GS NFV-SOL 003

Use Case: VNF instantiation: 3/3

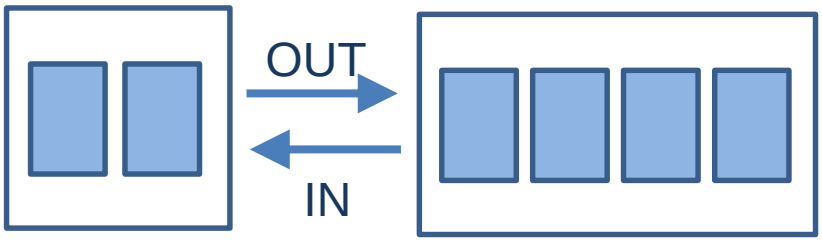
- Post condition
  - VNF is instantiated on the virtual infrastructure, i.e. the needed virtualized resources have been created.
  - VNF is accessible via its OAM interface and ready for application data configuration

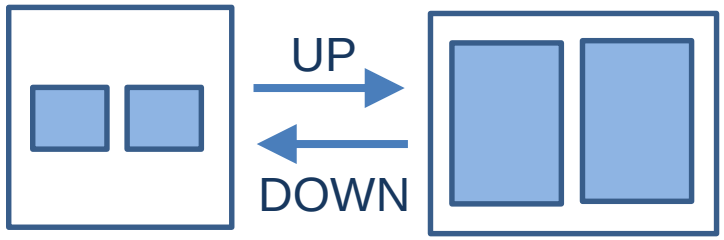
Managing the VNF lifecycle: VNF runtime information

- Based on the definitions in the VNFD, VNF instances can be created in the NFVI (aka cloud).
- The runtime information of each VNF instance, VnfInfo, is managed by the VNFM.
- The VnfInfo element includes information such as
  - VNF instance identifier, VNF instance state,
  - scale status (current „size“ of VNF),
  - metadata (version info, pointer to VNFD and VNF package, vendor-specific metadata),
  - virtualised resources used (Virtualised Compute, Storage, Network),
  - list of VNFCs,
  - configurable parameters,
  - external connectivity (external VLs, external CPs), and
  - connectivity to VIM(s) used to manage the resources of the VNF.

Managing the VNF lifecycle: 1/2
Scaling a VNF

- Basic idea: Elasticity
  A VNF's resource consumption (e.g. number of VNFCs) changes with load.
- VNF scaling shall be non-service disruptive.
- Modes:
  - Horizontal scaling (scale in/out) → Add/remove virtualised resources (e.g. VNFCs)
  - Vertical scaling (scale up/down) → Reconfigure the capacity / size of existing virtualised resources (e.g., VM flavor, storage size)
  - In the ETSI NFV current release only horizontal scaling of the VNFs is supported





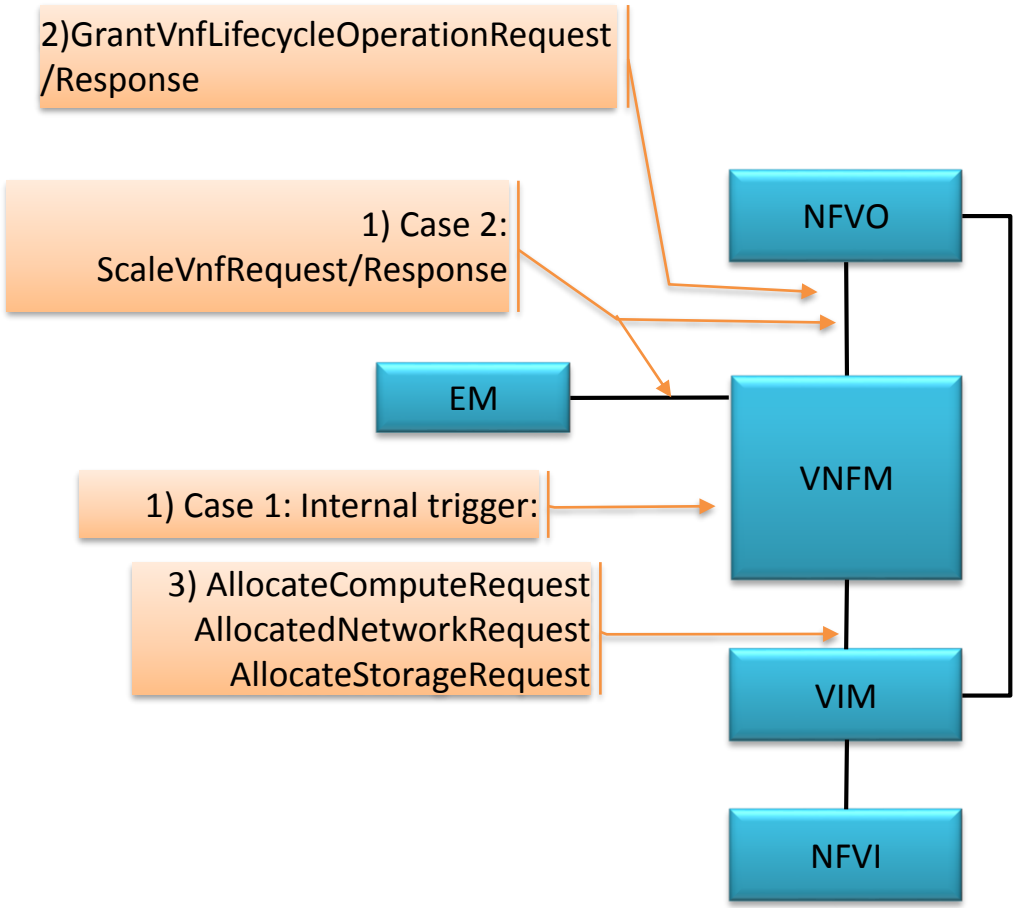
- Scaling triggers
  - on demand (Scale VNF LCM operations), and
  - automatically by the VNFM when certain performance figures cross a threshold.
- The scaling properties of a VNF are described in the VNFD

Use Case: Scaling a VNF (Scale-out): 2/2

1) Case 1: Automatic
When VNFM detects that the triggering condition required to perform scale-out has been met.
Case 2: On demand either by EM or NFVO
Scaling can be triggered on demand by invoking the ScaleVnfRequest/Response operation exchange

2) VNFM asks for scaling permission with NFVO, via GrantVnfLifecycleOperationRequest/Response operation exchange with input parameter {ScaleVnf}

3) VNFM requests VIM to allocate the required additional virtualized resources (compute, storage, networking), to scale out the next available increment of VNF.



Note: Rel. 2 specification do not specify the sequence of these operations. This use case example is only for illustration. Actual message(s) depend on the target deployment technology used in environment.

Reference:
ETSI GS NFV-IFA 007
ETSI GS NFV-SOL 003

ETSI

World Class Standards

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

ETSI

World Class Standards

ADDITIONAL SLIDES

Release 2 ongoing Stage 3 work

IFA015 (NFV Information Model Report)

+

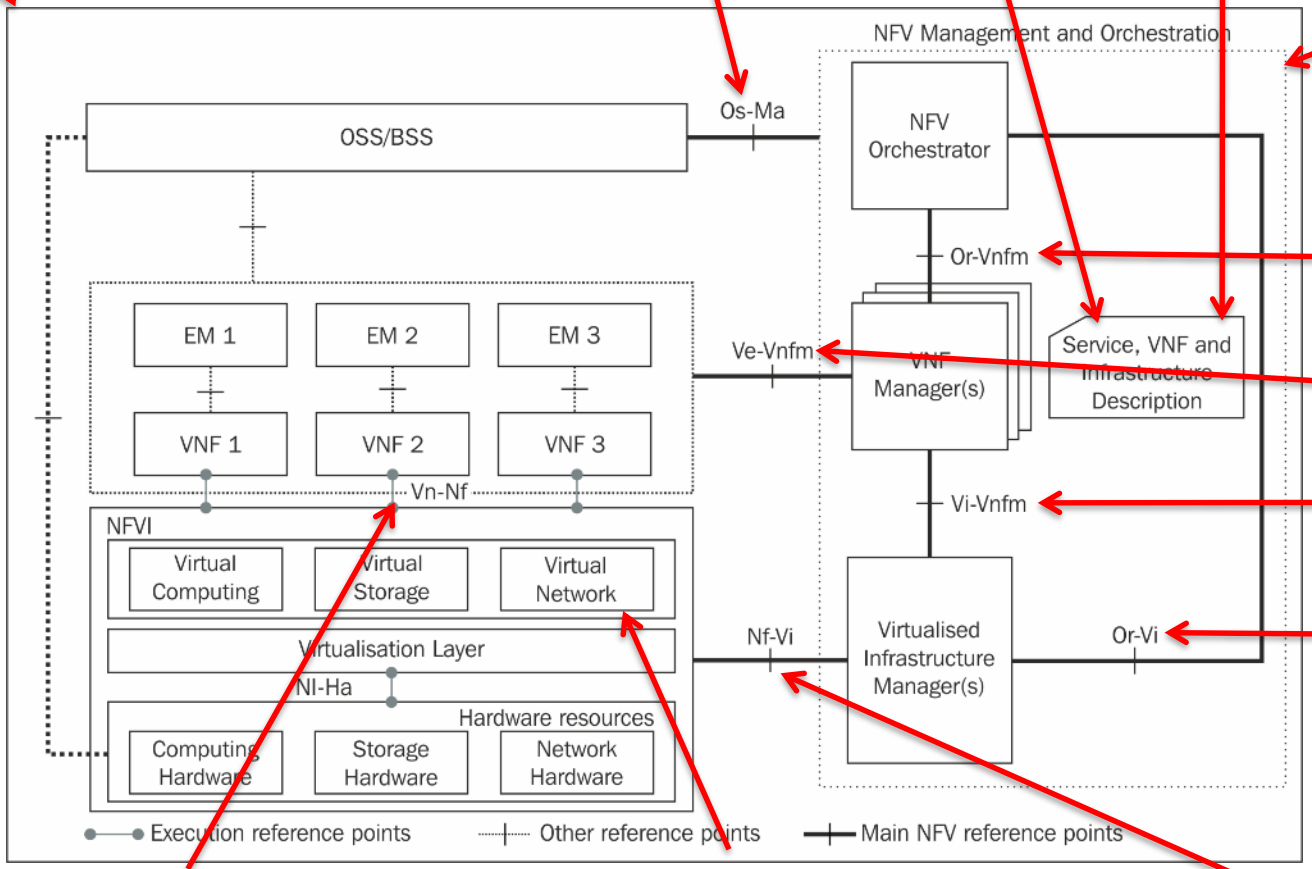
- **IFA016 (Papyrus Guidelines),**
- **IFA017 (UML Modeling Guidelines),**
- **IFA024 (NFV Information Model External Touchpoints)**

(*) Release 2 Stage 3 work items in **"green"**

SOL005 IFA013

SOL004 (VNF Packaging) IFA011 (VNF Pkg)

SOL001 (VNF and NS Descriptors) IFA014 (NS templates)



IFA010 (MANO Functional Reqs)

IFA007 SOL003

IFA008 SOL002

IFA006

IFA005

IFA002 (Acceleration)

IFA003 (Acceleration)

IFA004 (Acceleration)