Welcome to the World of Standards

ETSI

World Class Standards

COMMON APIs FOR NFV INTEROP

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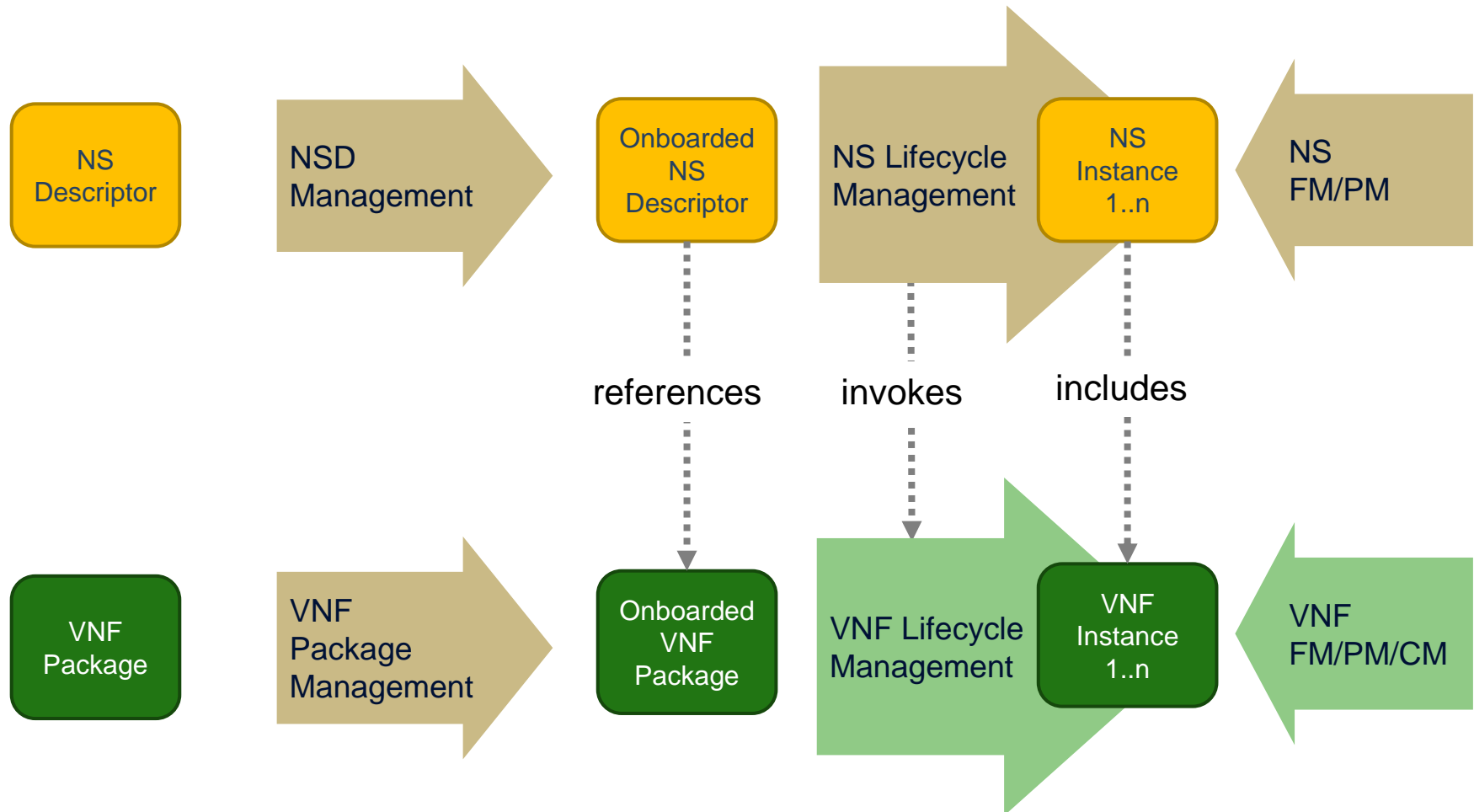**Rapporteurs: Uwe Rauschenbach (Nokia) | Jong-Hwa Yi (ETRI) | Ernie Bayha (Ericsson)**

V7

Outline

❶ Introduction and context

❷ **ETSI GS NFV-SOL 003**: Interfaces related to VNF Management towards NFV Orchestrator

❸ **ETSI GS NFV-SOL 002**: Interfaces related to VNF Management towards EM/VNF

❹ **ETSI GS NFV-SOL 005**: Interfaces related to Network Service Management and VNF onboarding towards OSS/BSS
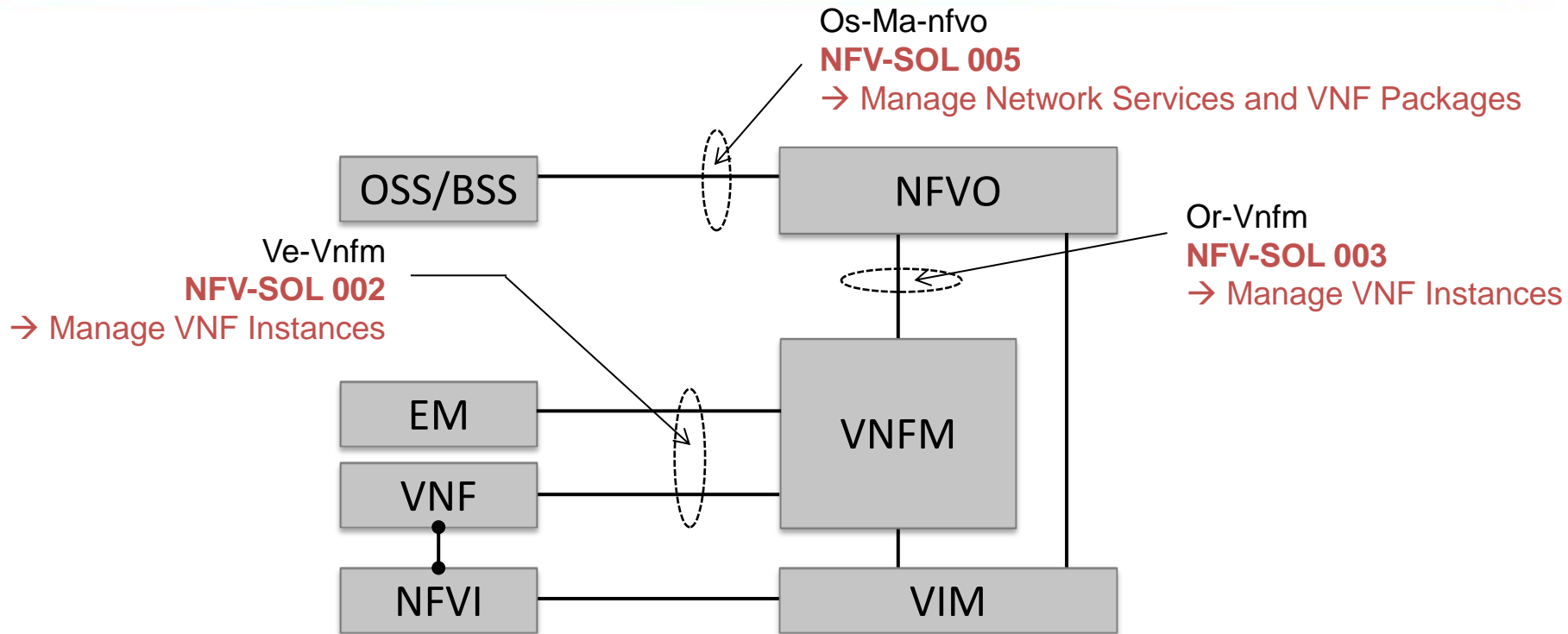
❺ Concluding remarks

PART 1

Introduction and context

Management and Orchestration (MANO) of Network Services and VNFs

NS Descriptor → NSD Management → Onboarded NS Descriptor → NS Lifecycle Management → NS Instance 1..n ← NS FM/PM

VNF Package → VNF Package Management → Onboarded VNF Package → VNF Lifecycle Management → VNF Instance 1..n ← VNF FM/PM/CM

references

invokes

includes

RESTful APIs
in the ETSI NFV MANO Architecture

Os-Ma-nfvo
NFV-SOL 005
→ Manage Network Services and VNF Packages

Ve-Vnfm
NFV-SOL 002
→ Manage VNF Instances

Or-Vnfm
NFV-SOL 003
→ Manage VNF Instances

```
OSS/BSS ───────────── NFVO

EM ─────────┐
            │    VNFM
VNF ────────┘
 │
NFVI ──────────────── VIM
```

- The ETSI architectural framework identifies a number of reference points, on which several interfaces are produced.

- The ETSI Group Specifications (GS) NFV-SOL 002, NFV-SOL 003 and NFV-SOL 005 define RESTful APIs for the interfaces produced on the Ve-Vnfm, Or-Vnfm, and Os-Ma-nfvo reference points, respectively. They enable multi-vendor integration on these reference points.

REST (Representational State Transfer) design applied to ETSI NFV

- **HTTP-based** incarnation of REST
- **JSON** used as the format for resource representations
- Manipulation of resources using **CRUD**(*) operations
  - POST – create resource
  - GET – read resource / query resources
  - PATCH – update resource
  - DELETE – delete resource
- **Special resources** for
  - notification management (notification endpoint)
  - complex operations (task resources).
  - Error handling   (*) CRUD = Create, Read, Update, Delete

TASK resources for ETSI NFV APIs

- Some operations (e.g. lifecycle management operations) are not a good fit to be modelled using CRUD operations.

- TASK resources provide a workaround.

- A TASK resource is a child of a resource which represents the task/operation to be executed.

  - E.g. vnf_instances/{vnfInstanceId}/scale_vnf

- The client POSTs a set of parameters to the TASK resource to execute the associated operation.

- The operation affects the state of the parent resource.

PART 2: GS NFV-SOL 003

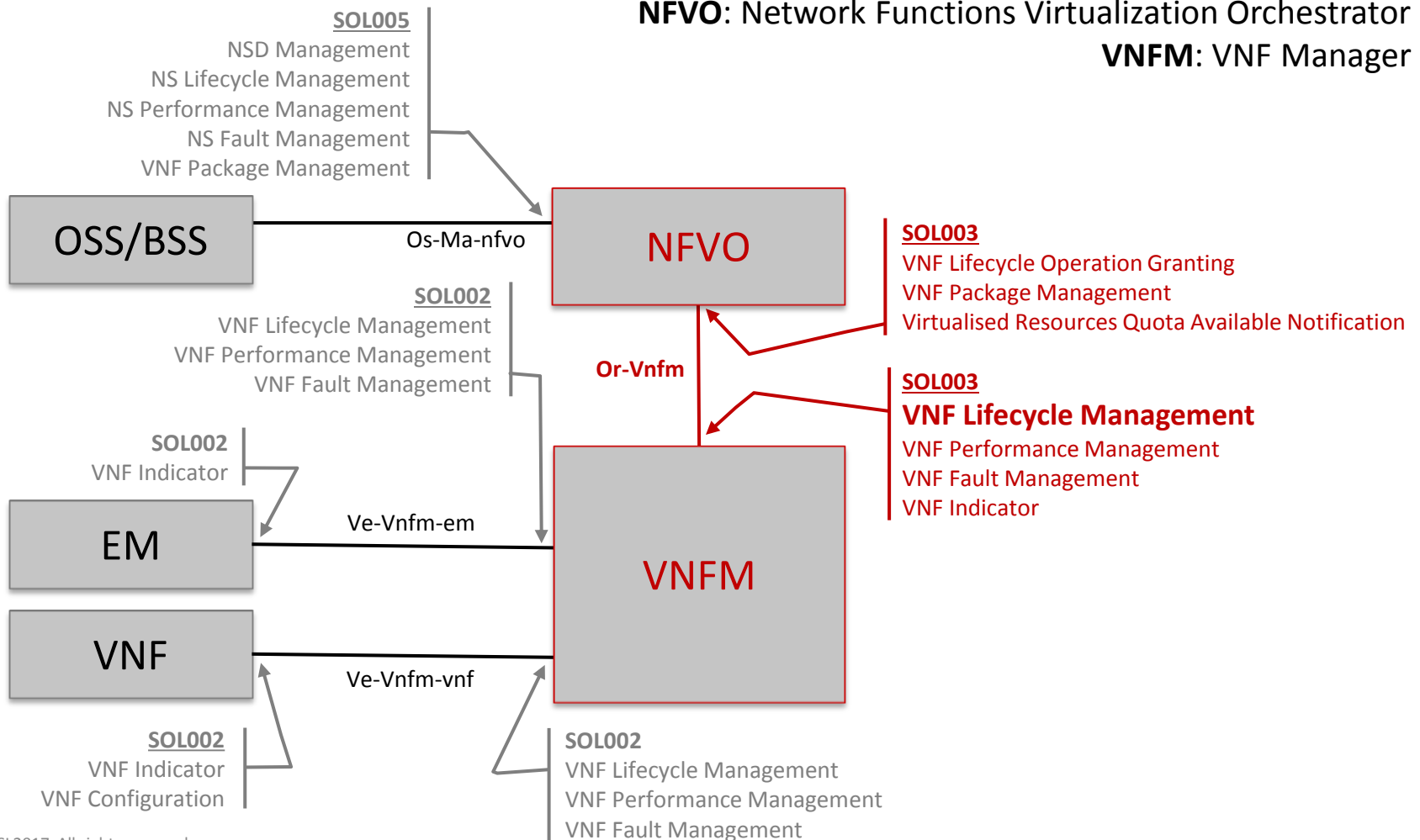**Interfaces related to VNF management towards NFVO**

GS NFV-SOL 003 in the ETSI NFV MANO architecture
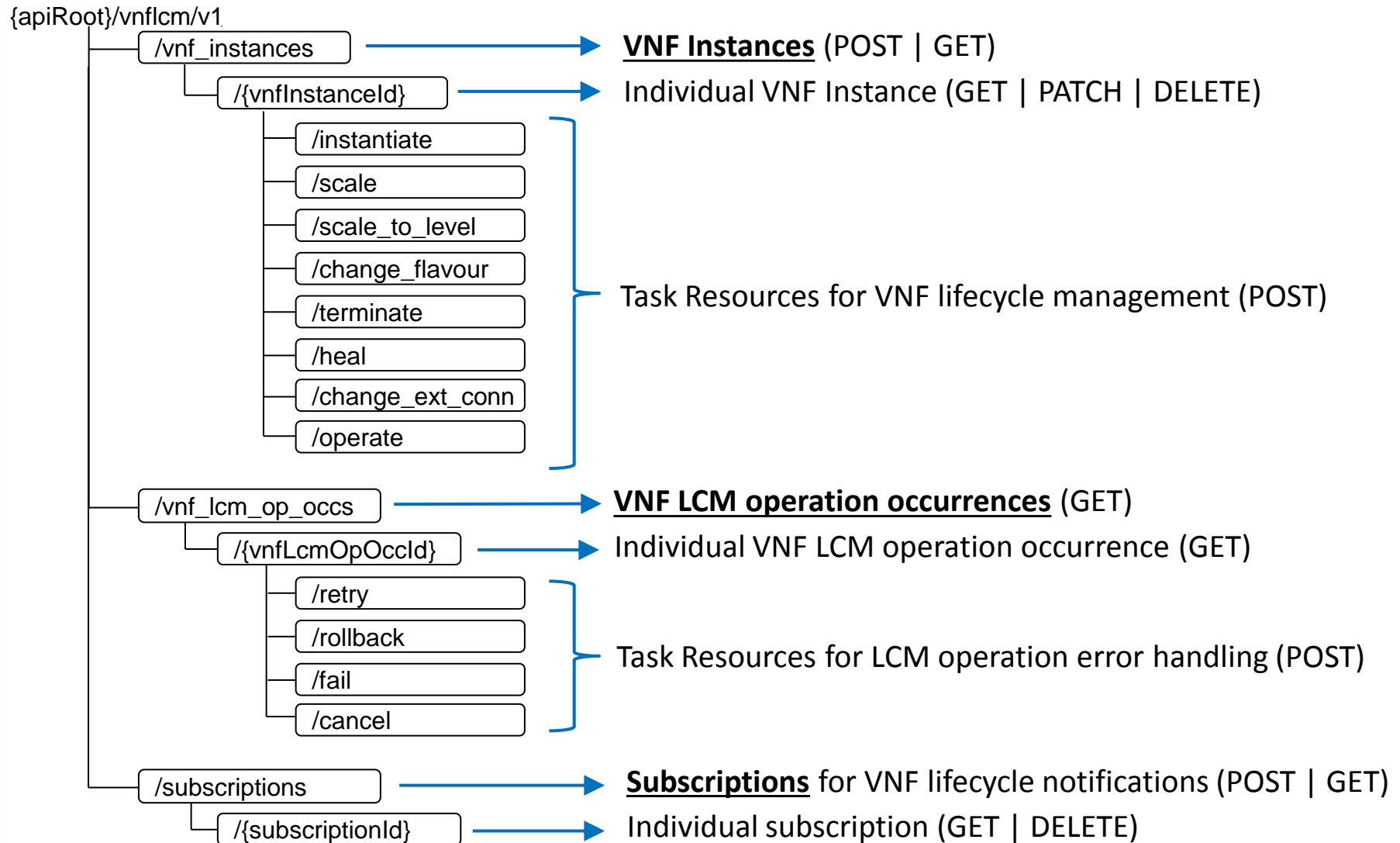
GS NFV-SOL 003 defines RESTful APIs for the interfaces of the Or-Vnfm reference point fulfilling the requirements defined in ETSI NFV IFA007.

NFVO: Network Functions Virtualization Orchestrator
VNFM: VNF Manager

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

OSS/BSS

Os-Ma-nfvo

NFVO

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

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

Or-Vnfm

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

SOL002
VNF Indicator

EM

Ve-Vnfm-em

VNFM

VNF

Ve-Vnfm-vnf

SOL002
VNF Indicator
VNF Configuration

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

Resource URI structure of the VNF Lifecycle Management Interface

```
{apiRoot}/vnflcm/v1
        /vnf_instances ──────────────────►  VNF Instances (POST | GET)
              /{vnfInstanceId} ───────────►  Individual VNF Instance (GET | PATCH | DELETE)
                    /instantiate ─┐
                    /scale        │
                    /scale_to_level│
                    /change_flavour│
                    /terminate     ├──  Task Resources for VNF lifecycle management (POST)
                    /heal          │
                    /change_ext_conn│
                    /operate      ─┘

        /vnf_lcm_op_occs ────────────────►  VNF LCM operation occurrences (GET)
              /{vnfLcmOpOccId} ───────────►  Individual VNF LCM operation occurrence (GET)
                    /retry    ─┐
                    /rollback  │
                    /fail      ├──  Task Resources for LCM operation error handling (POST)
                    /cancel   ─┘

        /subscriptions ──────────────────►  Subscriptions for VNF lifecycle notifications (POST | GET)
              /{subscriptionId} ──────────►  Individual subscription (GET | DELETE)
```

Use case
VNF LCM: Flow of a VNF LCM operation

Operations:

- Instantiate VNF
- Scale VNF
- Scale VNF to Level
- Change VNF Flavour
- Operate VNF
- Heal VNF
- Change External VNF Connectivity
- Terminate VNF

PART 3: SOL 002

Interfaces related to VNF management towards EM/VNF

GS NFV-SOL 002 in the ETSI NFV MANO architecture

GS NFV-SOL 002 specifies a set of RESTful protocols fulfilling the requirements specified in GS NFV-IFA 008 for the interfaces used over the Ve-Vnfm reference point.
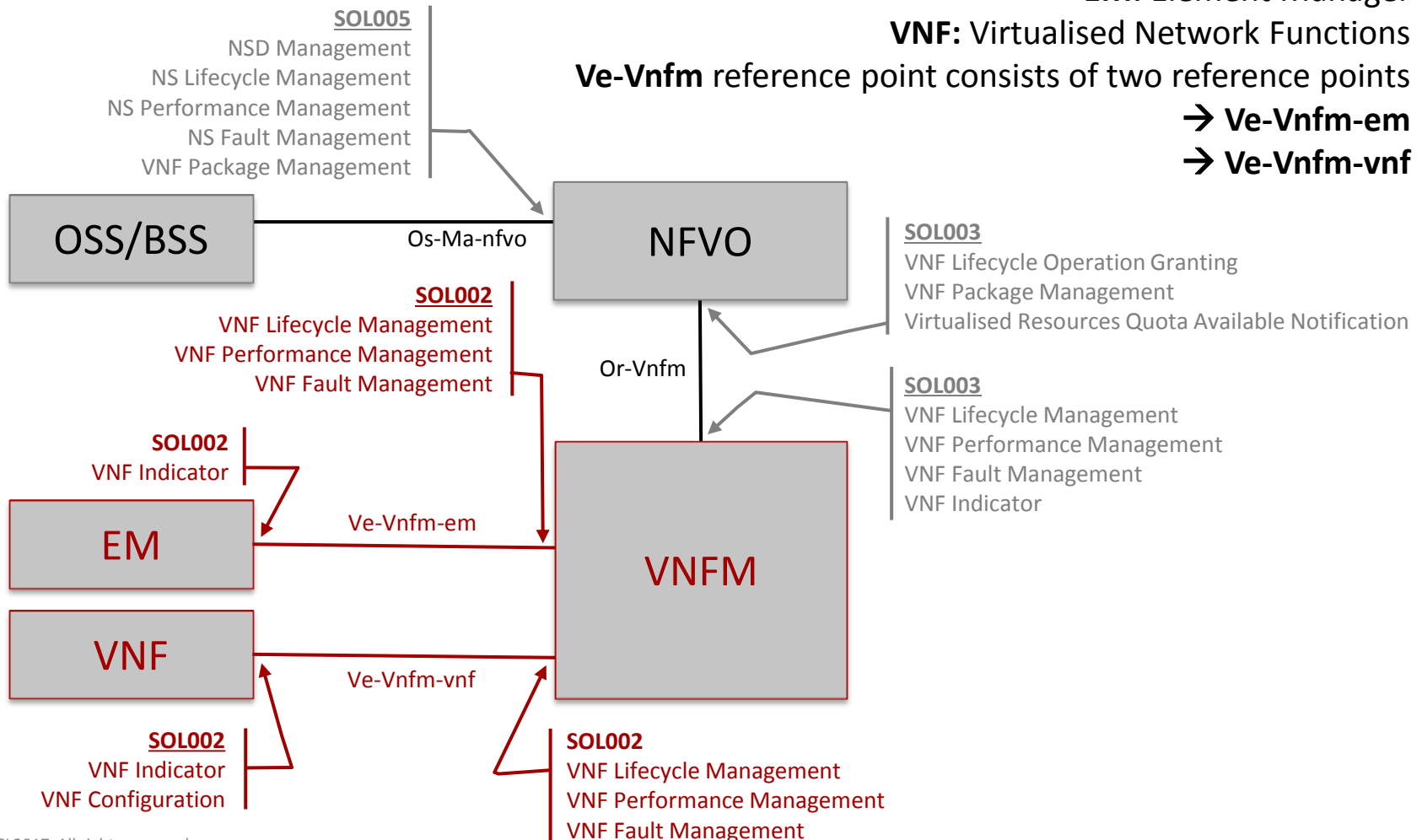
EM: Element Manager
VNF: Virtualised Network Functions
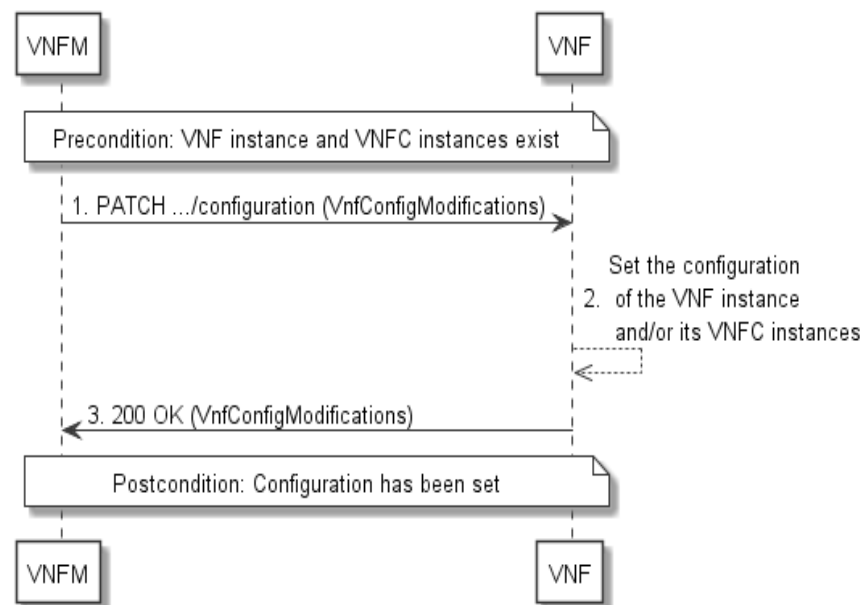**Ve-Vnfm** reference point consists of two reference points
→ **Ve-Vnfm-em**
→ **Ve-Vnfm-vnf**

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

OSS/BSS

Os-Ma-nfvo

NFVO

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

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

Or-Vnfm

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

SOL002
VNF Indicator

EM

Ve-Vnfm-em

VNFM

VNF

Ve-Vnfm-vnf

SOL002
VNF Indicator
VNF Configuration

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

The specifics of GS NFV-SOL 002

GS NFV-SOL 002 vs GS NFV-SOL 003 supported interfaces

GS NFV-SOL 002	GS NFV-SOL 003
VNF Lifecycle Management interface	VNF Lifecycle Management interface
VNF Performance Management interface	VNF Performance Management interface
VNF Fault Management interface	VNF Fault Management interface
VNF Indicator interface	VNF Indicator interface
VNF Configuration interface	VNF Lifecycle Operation Granting interface
	VNF Package Management interface
	Virtualised Resources Quota Available Notification interface

✎ GS NFV- SOL 002 provides internal details of the VNF (e.g. VNFCs, internal CPs) to the EM that are not provided to the NFVO using GS NFV-SOL 003 APIs.

Flow of a Set Configuration operation

PART 4: GS NFV-SOL 005

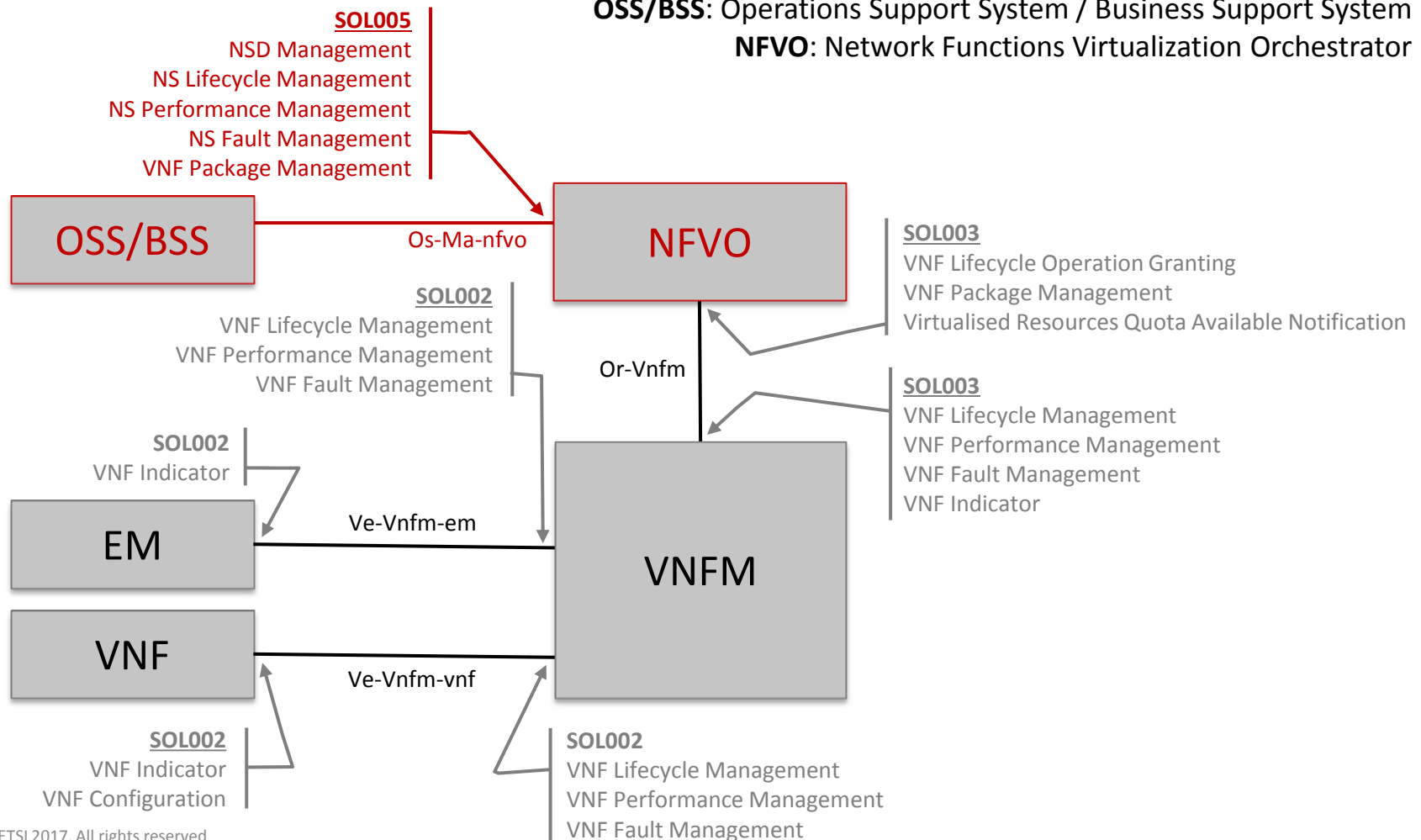**Interfaces related to Network Service Management and VNF onboarding towards OSS/BSS**
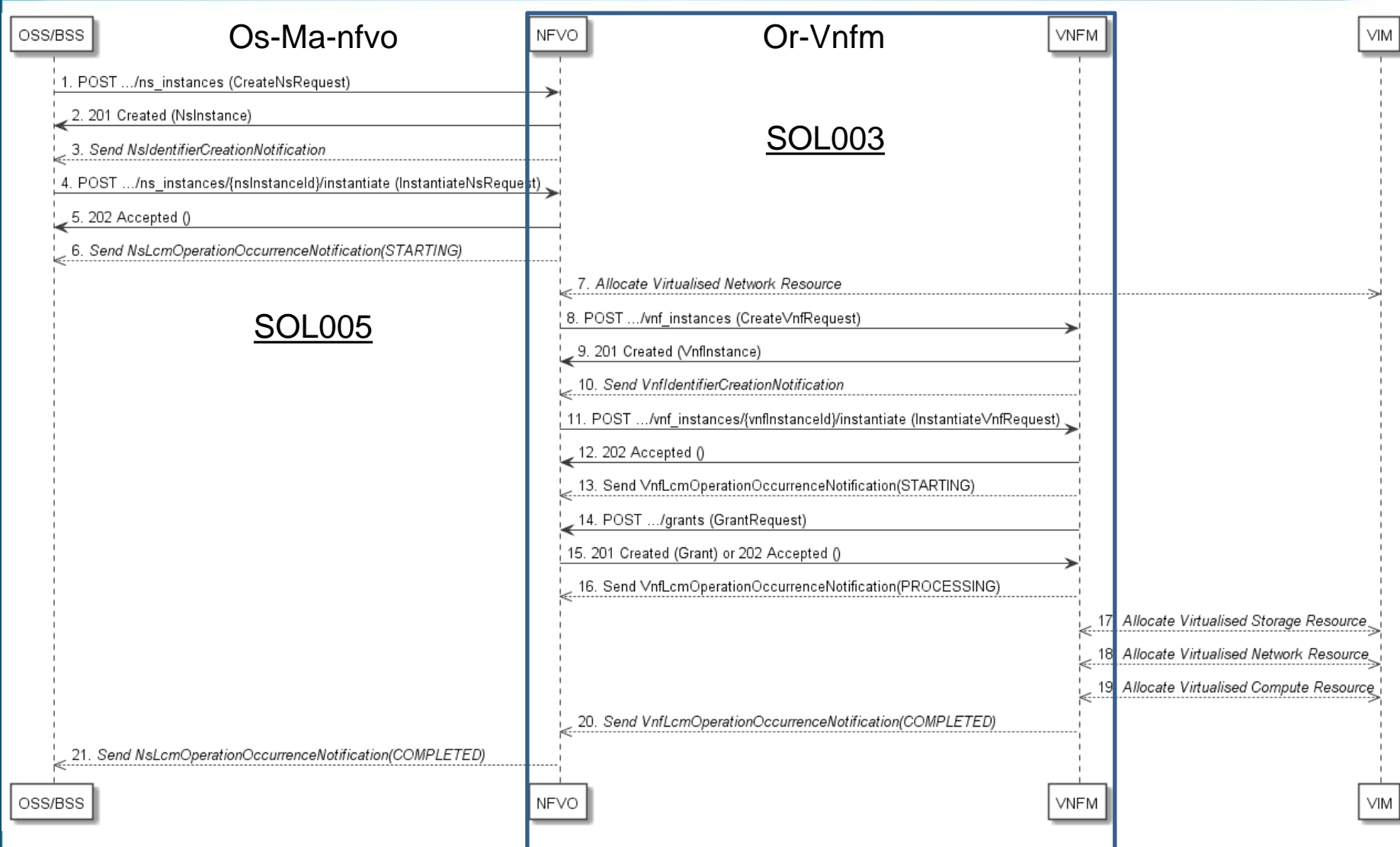
SOL005 in the ETSI NFV MANO architecture

SOL005 defines RESTful APIs for the interfaces of the Os-Ma-nfvo reference point fulfilling the requirements defined in ETSI NFV IFA013.

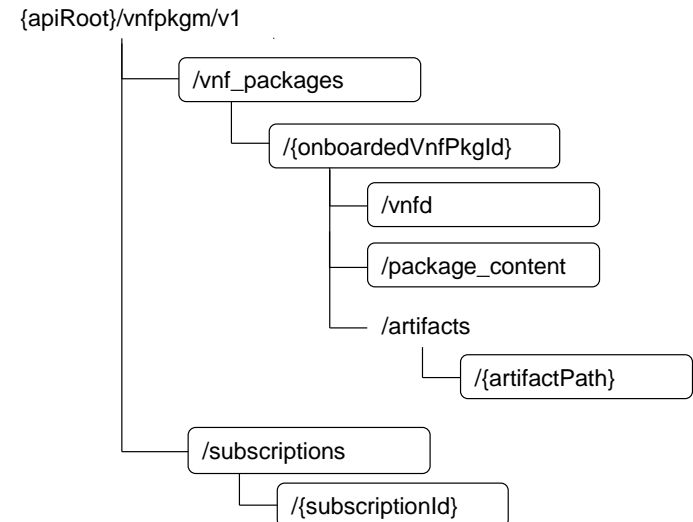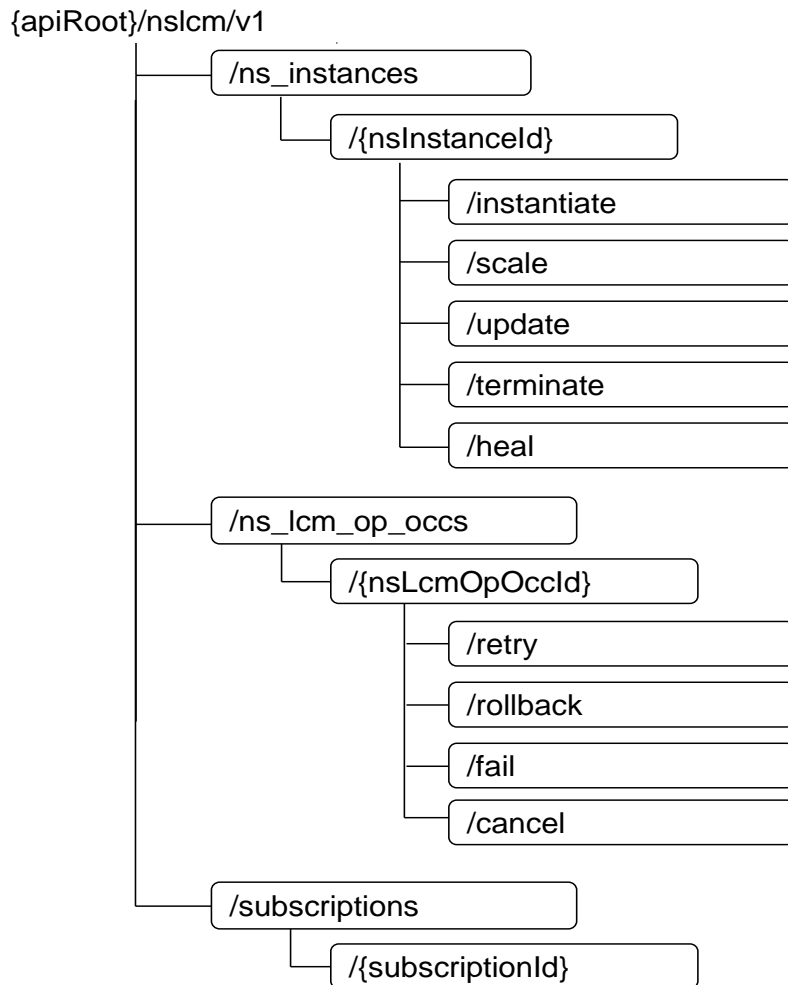**OSS/BSS**: Operations Support System / Business Support System
NFVO: Network Functions Virtualization Orchestrator

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

OSS/BSS

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Or-Vnfm

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

SOL002
VNF Indicator

EM

Ve-Vnfm-em

VNFM

VNF

Ve-Vnfm-vnf

SOL002
VNF Indicator
VNF Configuration

SOL002
VNF Lifecycle Management
VNF Performance Management
VNF Fault Management

Network Service Lifecycle Management (example)

Resource URI structure of the
NS LCM and VNF Package management interfaces

{apiRoot}/nslcm/v1

```
├── /ns_instances
│   └── /{nsInstanceId}
│       ├── /instantiate
│       ├── /scale
│       ├── /update
│       ├── /terminate
│       └── /heal
├── /ns_lcm_op_occs
│   └── /{nsLcmOpOccId}
│       ├── /retry
│       ├── /rollback
│       ├── /fail
│       └── /cancel
└── /subscriptions
    └── /{subscriptionId}
```

{apiRoot}/vnfpkgm/v1

```
├── /vnf_packages
│   └── /{onboardedVnfPkgId}
│       ├── /vnfd
│       ├── /package_content
│       └── /artifacts
│           └── /{artifactPath}
└── /subscriptions
    └── /{subscriptionId}
```

CONCLUDING REMARKS

Conclusion and outlook

- ETSI NFV SOL specifications provide standardized APIs for implementing NFV management and orchestration interfaces
  - The API specifications use REST techniques to ease adoption

- Delivery Schedule:

  - GS NFV-SOL 002 and 003: Published

  - GS NFV-SOL 005: To be approved end of Dec 2017 (many parts already stable)

- Future work
  - OpenAPI support: ETSI ISG NFV will provide OpenAPI (a.k.a. Swagger) definition files for these APIs to ease adoption
  - Specification maintenance: Bug fixing, addressing feedback from the developers' community
  - Considerations for the addition of new features (based on ETSI GS NFV-IFA specs)
  - Considerations for developing test specifications

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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

Access to specifications and feedback:
Drafts in Open Area: http://docbox.etsi.org/ISG/NFV/Open/Drafts/
Published specifications: http://www.etsi.org/standards-search
Issue tracker http://nfvwiki.etsi.org/index.php?title=NFV_Issue_Tracker