COMMON APIs FOR NFV INTEROP
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Outline

1. Introduction and context
2. ETSI GS NFV-SOL 003: Interfaces related to VNF Management towards NFV Orchestrator
3. ETSI GS NFV-SOL 002: Interfaces related to VNF Management towards EM/VNF
4. ETSI GS NFV-SOL 005: Interfaces related to Network Service Management and VNF onboarding towards OSS/BSS
5. 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
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
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 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

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Resource URI structure of the VNF Lifecycle Management Interface

{apiRoot}/vnflcm/v1

/vnf_instances
- /{vnfInstanceId}
  - /instantiate
  - /scale
  - /scale_to_level
  - /change_flavour
  - /terminate
  - /heal
  - /change_ext_conn
  - /operate

VNF Instances (POST | GET)
Individual VNF Instance (GET | PATCH | DELETE)

Task Resources for VNF lifecycle management (POST)

/vnf_lcm_op_occs
- /{vnfLcmOpOccId}
  - /retry
  - /rollback
  - /fail
  - /cancel

VNF LCM operation occurrences (GET)
Individual VNF LCM operation occurrence (GET)

Task Resources for LCM operation error handling (POST)

/subscriptions
- /{subscriptionId}

Subscriptions for VNF lifecycle notifications (POST | GET)
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

1. POST /vnf_instances/{vnfInstanceId}/<<Task>> (<<RequestStructure>>)
   - Create VNF LCM operation occurrence resource for this request

2. 202 Accepted ()

3. Send VnfLcmOperationOccurrenceNotification(STARTING)

4. Granting exchange

5. Send VnfLcmOperationOccurrenceNotification(PROCESSING)

6. Manage NFVI resources

7. Communicate with VNF/EM

<<Operation>> finished

8. Send VnfLcmOperationOccurrenceNotification(COMPLETED)

9. GET /vnf_lcm_op_occs/{vnfLcmOpOccId}

10. 200 OK (VnfLcmOpOcc:operationState=COMPLETED)

Poll the operation occurrence resource
PART 3: SOL 002

Interfaces related to VNF management towards EM/VNF
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

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The specifics of GS NFV-SOL 002

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

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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:

1. PATCH .../configuration (VnfConfigModifications)
2. Set the configuration of the VNF instance and/or its VNFC instances
3. 200 OK (VnfConfigModifications)
Postcondition: Configuration has been set
PART 4: GS NFV-SOL 005

Interfaces related to Network Service Management and VNF onboarding towards OSS/BSS
SOL005 defines RESTful APIs for the interfaces of the Os-Ma-nfvo reference point fulfilling the requirements defined in ETSI NFV IFA013.

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

**OSS/BSS**
- VNF Lifecycle Management
- VNF Performance Management
- VNF Fault Management

**NFVO**
- VNF Lifecycle Operation Granting
- VNF Lifecycle Management
- VNF Performance Management
- VNF Fault Management
- VNF Indicator

**VNFM**
- VNF Lifecycle Management
- VNF Performance Management
- VNF Fault Management
- VNF Indicator

**OSS/BSS** and **NFVO** are connected to **VNFM** via interfaces:
- Ve-Vnfm-em
- Ve-Vnfm-vnf

**VNFM** is connected to:
- Os-Ma-nfvo

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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
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