Overview of Network Service and Network Function models

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Network Functions

• One or many nodes in a Network Infrastructure that has well defined interfaces and functional networking capability.

• Examples: Firewall, Router, EPC, IMS, etc

• Different Flavours of Network Functions
  • Virtual Network Function
  • Cloud Native/Container Network Function
  • Physical Network Function
Network Service

• Network Service is one or more NFs which are cumulated, logically and structurally placed to provide a service.

• Example: LTE, VPN, LAN internet, etc.
How do NS deployment happen?

- In order to provision a End-to-End service the NFs are modelled together as a single Network Service.
- This NF modelling are often described in templating format.
- These templates are a primary input to any NS-Orchestrator to deploy and configure the service in any target VIM (Virtual Infrastructure Manager).
OSM – Information Model
What is OSM - IM

- Information model to define the NS and VNF topology template.
- OSM IM is YANG based modeling.
- OSM IM derived from IFA011 and IFA014.
- IFA011 describes the VNF descriptor specification whereas IFA014 on NS descriptor.
- #Work in progress – Sol006 alignment in OSM next release
OSM – IM continued..

Design Time

• Building VNF descriptor by referencing the OSM Information Model.

Run Time

• Onboarding phase: Descriptor syntax correction and onboarding.
• Deployment phase: See your VNFs in action.
OSM Network Service Modelling
VNF -> VNFD

- VNF instances are modelled in VNFD package.
- VNFD constitute of Deployment template with Day-0, 1, 2 configurations files.
- Deployment template can be defined in YAML or JSON formats.
- Descriptor contains deployment of VDU (virtual deployment unit) and inter-networking inside the VNFs.

```
vnfd-catalog:
  vnfd:
    - id: hackfest_magma-agw-enb_vnfd
      name: hackfest_magma-agw-enb_vnfd
      short-name: hackfest_magma-agw-enb_vnfd
      description: Magma AGW v1.0.0 with tools & srsLTE VDU
      vendor: Whitestack
      version: "1.0"
      mgmt-interface:
        cp: agw-mgmt
      vdu:
        - id: magma-agw-vdu
          name: magma-agw-vdu
          description: magma-agw-vdu
          count: 1
          cloud-init-file: magma-agw_init
          vm-flavor:
            vcpu-count: 1
            memory-mb: 4096
```
Package Structure

- A typical VNFD package looks like below,

```
/hackfest_magma-agw-enb_vnfd
  ├── charms
  │     ├── enodeb
  │     │     └── magmagw
  │     └── checksums.txt
  └── cloud_init
      ├── magmaagw_init
      │    └── srslte_init
      └── helm-charts
          └── eechart
               └── magma-agw-enb_vnfd.yaml
```
NS -> NSD

• An E2E network functions are modeled together in a Network Service Descriptor.
• NSD contains deployment information of its constituent VNFDs and inter-networking between the VNFs as well as to the external world.

```json
nsd-catalog:
  nsd:
    - id: hackfest_magma-agw-enb_nsd
      name: hackfest_magma-agw-enb_nsd
      short-name: hackfest_magma-agw-enb_nsd
      description: Magma AGW 1.0.0 with tools & srsLTE connected to PNF Gateway
      vendor: Whitestack
      version: '1.0'
    constituent-vnf:
      - member-vnf-index: 'MagmaAGWsrsLTE'
        vnfd-id-ref: hackfest_magma-agw-enb_vnfd
      - member-vnf-index: 'VYOS-PNF'
        vnfd-id-ref: hackfest_gateway_vnfd
    connection-point:
      - name: nsd_cp_mgmt
        vld-id-ref: mgmt
      - name: nsd_cp_sgi
        vld-id-ref: sgi
  vld:
```
Package Structure

• An NSD package would look like below,

```
/hackfest_magma-agw-enb_nsd
  ├── README
  └── magma-agw-enb_nsd.yaml
```

• Once packages are built then our Network Service is ready to be deployed.
KNF -> VNFD

- Kubernetes-based Network Functions are the cloud-native light weight network functions.
- KNF deployment will be done on operational K8s cluster.
- OSM does support both helm-chart or juju-bundles based KNF deployment.

```yaml
schema-version: '3.0'
vnfd:
  - id: fb_magma_knf
    name: fb_magma_knf
    short-name: fb_magma_knf
    description: KNF with KDU using a helm-chart for Facebook magma orc8r
    vendor: ATOS
    version: '1.0'
    mgmt-interface:
      cp: mgmt
    connection-point:
      - name: mgmt
    k8s-cluster:
      nets:
        - id: mgmtnet
          external-connection-point-ref: mgmt
    kdu:
      - name: orc8r
        helm-chart: magma/orc8r
```
PNF -> VNFD

- PNFs are Physically running NFs which were deployed outside the scope of an Orchestrator and managed as a NF in an E2E NS.
- PNFs are still modeled under the construct of VNFD.
- OSM does understand and react upon based on the inputs given as part of VNFD as either VNFs or PNFs or KNFs.

```
1  vnf-catalog:
2     vnf:
3       connection-point:
4         - name: gateway_public
5           type: VPORT
6           description: Gateway PNF
7           id: hackfest_gateway_vnfd
8           mgmt-interface:
9             cp: gateway_public
10            name: hackfest_gateway_vnfd
11           short-name: hackfest_gateway_vnfd
12           vdu:
13             description: gateway_pdu
14             id: gateway_pdu
15             interface:
16               - external-connection-point-ref: gateway_public
17                 name: eth0
18                 type: EXTERNAL
19                 pdu-type: gateway
```
Network Slice Modelling
Netslice -> NST

- Network Slicing is inevitable when we talk 5G.
- Just like VNF and NS, NetSlice can be modeled in Network Slicing Template (NST).
- NST does an internal reference to its constituent NSDs.

```yaml
nst:
  - id: magma_slice_hackfest_nst
    name: magma_slice_hackfest_nst
    SNSSAI-identifier:
      slice-service-type: eMBB
    quality-of-service:
      id: 1

  netslice-subnet:
  - id: slice_hackfest_nsd_epc
    is-shared-nss: false
    description: NetSlice Subnet (service) with magma agw
    nsd-ref: hackfest_magma-agw-enb_nsd
  - id: slice_hackfest_nsd_epcmgmt
    is-shared-nss: true
    description: NetSlice Subnet (service) with magma orchestration and NMS
    nsd-ref: fb_magma_nsd

netslice-vld:
```
Package Dev - Modes

• Packages can be developed in three different modes CLI, GUI, OSM

VS Code Extension .... You name it.

OSM CLI tool

NG-UI easy drag and drop
Thank you

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