OSM#9 Hackfest – Day 2
Session 2. Orchestrating a KNF in OSM - Magma Orch

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We are using a shared OSM instance, leveraging the OSM RBAC capabilities.
Recap on the OSM environment
Accessing your OSM project

Two ways to interact with OSM:

- Dashboard
  
  http://172.21.248.35
  (user / pass: osm_hackfest_x)

- CLI, via SSH to the mgmt VM
  
  ssh osm_hackfest_x@172.21.248.4
  (user / pass: osm_hackfest_x)
Recap on the OSM environment
Accessing your K8 Cluster

- CLI via SSH to the mgmt VM

  ssh osm_hackfest_x@172.21.248.4
  (user / pass: osm_hackfest_x)

  # try a command using the credentials at your home dir
  kubectl --kubeconfig ~/kube.yaml get pods -A
Check that your VIM was added to OSM

Check that your VIM is there

```
-osm vim-list
```

Otherwise, add it following the instructions that were provided yesterday.
Hands-on session
Context of this hands-on session
Yesterday you covered the design of the AGW VNF
Context of this hands-on session
Today: Magma Orchestrator KNF

Magma EPC Network Slice 1

- EPC Manager NS
  - vEPC Element Manager (KNF)
    - magma Orc8r
      - control plane KDU
    - metrics
    - has
    - gui
  - vEPC (VDU)
    - magma AGW

- EPC NS
  - Magma AGW + Tester (VNF)
  - Generic eNodeB + UE emulator (VDU)

- Physical Router (PNF)

- Web Cache KNF / Internet

- Physical Switches (Data Plane)

- S1 interface
- SGi interface
The Magma Orchestrator helm chart

- Magma Orchestrator helm chart structure
Session schedule

• We will follow these guides:
  • User Guide - Using Kubernetes-based VNFs
  • VNF Onboarding Guidelines - KNF walkthrough

• Create and onboard KNF and NS packages
• Add a K8s cluster
• Instantiate and check status
• Running implicit primitives
• Terminate NS
• Instantiation parameters for the E2E demo
Creating and onboarding NF and NS packages
NS diagram

NS: fb_magma_ns

VL: mgmtnet

CP: nsd_cp_mgmt

NF: fb_magma_vnf

KNF
KNF diagram

NF: fb_magma_vnf

KDU: orc8r
- Helm-chart: magma/orc8r

External CP: mgmt
KNF diagram: K8s cluster requirements

- KNF
- NF: fb_magma_vnf
- External CP: mgmt
- Net 1: mgmtnet
- K8s cluster
  - Version: 1.15
NF Walkthrough
Creating a new NF Package from CLI

• Use the command line to create the complete structure of the package, modify as desired with an editor.

```
osm package-create --base-directory ~/magma --vendor OSM vnf fb_magma
```

• The final contents we need for this section are placed in the following folder:
  `/home/ubuntu/examples/03-orc8r-knf/fb_magma_vnf/fb_magma_vnfd.yaml`
NF Walkthrough
Creating the NF descriptor

• Two options:

1. View the desired contents and replace your `fb_magma_vnfd.yaml` file, section by section.

   ```bash
cat /home/ubuntu/examples/03-orc8r-knf(fb_magma_vnf/fb_magma_vnfd.yaml
```

2. [Faster] Copy all the contents from the examples directory into your VNF folder

   ```bash
cp -a /home/ubuntu/examples/03-orc8r-knf/fb_magma_vnf/* ~/magma/fb_magma_vnf/
```
NF Walkthrough
Creating the NF descriptor

• Remove the whole VDU section:

```yaml
vdu:
  - id: fb_magma_vnfd-VM
  - name: fb_magma_vnfd-VM
  - description: fb_magma_vnfd-VM
  - count: 1
  ...  # Flavour of the VM to be instantiated for the VDU
  vm-flavor:
```

• Add KDU section whose helm chart is magma/orc8r (repo: magma; chart: orc8r)

```yaml
kdu:
  - name: orc8r
    helm-chart: magma/orc8r
```
NF Walkthrough
Creating the NF descriptor

• Connection points:

```
connection-point:
  - name: mgmt
```

• Management interface:

```
mgmt-interface:
  cp: mgmt
```
NF Walkthrough
Creating the NF descriptor

• K8s cluster requirements:

```yaml
k8s-cluster:
  nets:
  - external-connection-point-ref: mgmt
    id: mgmtnet
```
NS Walkthrough
Creating a new NS Package from CLI

• Use the command line to create the complete structure of the package, modify as desired with an editor.

```bash
osm package-create --base-directory ~/magma --vendor OSM ns fb_magma
```

• The final contents we need for this section are placed in the following folder:
  `/home/ubuntu/examples/03-orc8r-knf/fb_magma_ns/fb_magma_nsd.yaml`
NS Walkthrough
Creating NS descriptor

• Two options:

1. View the desired contents and replace your `fb_magma_nsd.yaml` file, section by section.

   ```bash
   cat /home/ubuntu/examples/03-orc8r-knf/fb_magma_ns/fb_magma_nsd.yaml
   ```

2. [Faster] Copy all the contents from the examples directory into your NS folder

   ```bash
   cp -a /home/ubuntu/examples/03-orc8r-knf/fb_magma_ns/* ~/magma/fb_magma_ns/
   ```
NS Walkthrough
Creating NS descriptor

• Constituent-vnfd section (what NFs are part of the NS)

  constituent-vnfd:
  - member-vnf-index: orc8r
  vnfd-id-ref: fb_magma_vnf

• Management VLD

  vld:
  - id: mgmtnet
    name: mgmtnet
    type: ELAN
    mgmt-network: true
    vnfd-connection-point-ref:
    - member-vnf-index-ref: orc8r
      vnfd-id-ref: fb_magma_vnf
      vnfd-connection-point-ref: mgmt
Validating, building and uploading packages

- NF onboarding:
  - Validate the package according to the Information model:
    ```
    osm package-validate fb_magma_vnf
    ```
  - Build:
    ```
    osm package-build fb_magma_vnf
    ```
  - Upload:
    ```
    osm nfpkg-create fb_magma_vnf.tar.gz
    ```
  - One-shot command (validate, build and upload)
    ```
    osm nfpkg-create fb_magma_vnf
    ```
Validating, building and uploading packages

- **NS onboarding:**
  - Validate the package according to the Information model:
    
    ```
    osm package-validate fb_magma_ns
    ```
  - Build:
    
    ```
    osm package-build fb_magma_ns
    ```
  - Upload:
    
    ```
    osm nspkg-create fb_magma_ns.tar.gz
    ```
  - One-shot command (validate, build and upload)
    
    ```
    osm nspkg-create fb_magma_ns
    ```
Adding a K8s cluster and a helm-chart repo
Now, we need a K8s cluster

Your Kubernetes cluster needs to meet the following requirements:

• Kubernetes Loadbalancer, to expose your KNFs to the network
• Kubernetes default Storageclass, to support persistent volumes.

A K8s cluster has already been created for you!
Association of K8s cluster to VIM
A K8s cluster is expected to be connected

K8s cluster deployed inside a VIM

K8s cluster deployed outside a VIM, connected to a VIM network
Adding a K8s cluster

• Information to create the cluster:
  • Credentials file: kube.yaml
  • Version: 1.15
  • VIM: etsi-openstack-X
  • K8s nets:
    • net1: osm-ext
  • ClusterName: etsi-cluster-X
Let's add your K8s cluster

• Add the cluster

```bash
osm k8scluster-add --creds ~/kube.yaml \
    --version '1.15' \
    --vim etsi-openstack-${HACKFEST_TENANT} \
    --description "K8s cluster for user ${HACKFEST_TENANT}" \
    --k8s-nets '{"net1": "osm-ext"}' \
    etsi-cluster-${HACKFEST_TENANT}
```

• Check that the cluster was added and is marked as ENABLED

```bash
osm k8scluster-list
```
Adding a helm-chart repo

- OSM needs to know where to obtain the ‘orc8r’ helm chart from:
  - Repo name: magma
  - URI: https://felipevicens.github.io/fb-magma-helm-chart/

    `osm repo-add --type helm-chart \
    --description "Repository for Facebook Magma helm Chart" \
    magma "https://felipevicens.github.io/fb-magma-helm-chart/"

- When the KNF is deployed, its helm chart will be downloaded from the repo
Launch the NS
Instantiating the NS and checking status of the KDU instance

- **Launch the NS**

  ```
  osm ns-create --ns_name magma_orc8r --nsd_name fb_magma_ns \
  --vim_account etsi-openstack-${HACKFEST_TENANT}
  ```

- **Check status of NS in OSM**

  ```
  osm ns-list
  ```
Instantiating the NS and checking status of the KDU instance

• Once ready, get the details of the KDU

```bash
osm vnf-list --ns magma_orc8r
VNF_ID=`osm vnf-list --ns magma_orc8r | grep orc8r | awk '{print $2}'`

osm vnf-show $VNF_ID --kdu orc8r
# Not all K8s objects are ready. Some are missing
```
Running implicit primitives in KDUs
Running implicit primitives in KDUs

• Upgrade your KDU to use the IP address assigned to your tenant in the Resources Spreadsheet (172.21.251.X)

```bash
osm ns-action magma_orc8r --vrf_name magma_orc8r --kdu_name orc8r \
   --action_name upgrade \
   --params '{"proxyserviceloadBalancerIP": "172.21.251.X"}'

osm ns-op-list magma_orc8r
```

• Once completed, check that the IP address was updated

```bash
osm vnf-list --ns magma_orc8r
VNF_ID=`osm vnf-list --ns magma_orc8r | grep orc8r | awk '{print $2}'`

osm vnf-show $VNF_ID --kdu orc8r

osm vnf-show $VNF_ID --kdu orc8r | grep ^orc8r-proxy | grep LoadBalancer
```
Terminate previous NS and launch a new NS with instantiation parameters.
Terminate the previous NS

- Delete the NS

```
osm ns-delete magma_orc8r
osm ns-list```


Prepare a file with instantiation parameters

• Copy the file `config_magma_orc8r.yaml` from the examples directory to your magma folder

```bash
cp /home/ubuntu/examples/03-orc8r-knf/config_magma_orc8r.yaml ~/magma
```

• Edit the file to use the IP address assigned to your tenant in the Resources Spreadsheet (172.21.251.X)

```yaml
additionalParamsForVnf:
  - member-vnf-index: 'orc8r'

additionalParamsForKdu:
  - kdu_name: orc8r

additionalParams:
  proxyserviceloadBalancerIP: '172.21.251.X' # MetalLB IP Address
```
Launch again the NS

- Use the option --config_file to feed the instantiation parameters:

```bash
osm ns-create --ns_name magma_orc8r --nsd_name fb_magma_ns \ 
   --vim_account etsi-openstack-{$HACKFEST_TENANT} \ 
   --config_file config_magma_orc8r.yaml

osm ns-list
```

- Once ready, get the status of the KDU and check that the IP address was properly assigned

```bash
osm vnf-list --ns magma_orc8r
VNF_ID=`osm vnf-list --ns magma_orc8r | grep orc8r | awk '{print $2}'`

osm vnf-show $VNF_ID --kdu orc8r
osm vnf-show $VNF_ID --kdu orc8r|grep ^orc8r-proxy|grep LoadBalancer
```
Finally terminate the NS to clean resources

• Delete the NS

  osm ns-delete magma_orc8r
  osm ns-list