OSM#10 Hackfest – Day 2
Session 6. Orchestrating a CNF with Helm Charts - Magma Orch

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Context of this session
Magma Orchestrator CNF
Session topics
The details behind what you did yesterday

• Adding a K8s cluster (association to a VIM)

• Onboarding of NS and NF packages
  • Adding a repo for the VNF Catalog
  • Onboarding NF package
  • Onboarding NS package

• Structure of the packages
  • NS packages (fb_magma_ns)
  • VNF package (fb_magma_knf)
Session topics
The details behind what you did yesterday

- Helm charts
  - Intro
  - Structure of the magma/orc8r helm chart
  - Adding a Helm chart repo

- LCM of the NS
  - Instantiation
  - Operation
  - Termination
Adding a K8s cluster
Adding a K8s cluster

Your Kubernetes cluster needs to meet the following requirements:

- Kubernetes Load Balancer, to expose your CNFs to the network
- Kubernetes default Storage Class, to support persistent volumes.

A K8s cluster was already created for you! You just need to add it to OSM.
Association of K8s cluster to a 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: 1.18
  - VIM: osm_hackfest_1
  - K8s nets:
    - net1: osm-ext
  - ClusterName: hackfest
Let’s add your K8s cluster

• Add the VIM

```bash
osm vim-create --name osm_hackfest_1 --user ${OS_USERNAME} --password ${OS_PASSWORD} \
  --auth_url ${OS_AUTH_URL} --tenant ${OS_PROJECT_NAME} \
  --account_type openstack --config '{management_network_name: osm-ext}'

osm vim-list
```

• Add the cluster

```bash
osm k8scluster-add --creds ~/kube.yaml \ 
  --version '1.18' \ 
  --vim osm_hackfest_1 \ 
  --description "K8s cluster for user ${HACKFEST_TENANT}" \ 
  --k8s-nets '{"net1": "osm-ext"}' \ 
  hackfest

osm k8scluster-list
```
Services in the K8s cluster might be exposed in a single network, but maybe in two networks.
What if I have an isolated K8s cluster?

- Although these situations are discouraged (an isolated K8s cluster does not make sense in the context of an operator network), it is still possible by creating a dummy VIM target and associating the K8s cluster to that VIM target

```
    osm vim-create --name mylocation1 --user u --password p --tenant p --account_type dummy \
    --auth_url http://localhost/dummy

    osm k8scluster-add cluster --creds .kube/config --vim mylocation1 \
    --k8s-nets '{k8s_net1: null}' --version "1.18" \
    --description="Isolated K8s cluster in mylocation1"
```
Onboarding of NS and NF packages
Adding a VNF catalog

- Repo name: vnfrepo
- URI: https://osm.etsi.org/vnf-catalog/Testing/

osm repo-add vnfrepo https://osm.etsi.org/vnf-catalog/Testing/ \ --description "Repository for OSM VNF Catalog"
osm repo-list

- More info about OSM repositories here: https://osm.etsi.org/docs/user-guide/06-osm-platform-configuration.html#osm-repositories
Onboarding the VNF and NS packages

• Listing VNF and NS packages in the repo

  osm nfpkg-repo-list
  osm nspkg-repo-list

• Getting details of specific VNF and NS packages in the repo

  osm nfpkg-repo-show --repo vnfrepo fb_magma_knf
  osm nspkg-repo-show --repo vnfrepo fb_magma_ns

• Onboarding the VNF and NS packages (first the VNF, then NS)

  osm nfpkg-create --repo vnfrepo fb_magma_knf
  osm nspkg-create --repo vnfrepo fb_magma_ns
Structure of the packages
NS structure

NS: fb_magma_ns

NF: fb_magma_knf

VL: mgmtnet

CP: nsd_cp_mgmt
NS descriptor

```
$ osm nspkg-repo-show --repo vnfrepo fb_magma_ns --literal
nsd-catalog:
  nsd:
    - connection-point:
      - name: nsd_cp_mgmt
        vld-id-ref: mgmtnet
    constituent-vnfd:
      - member-vnf-index: orc8r
        vnfdf-id-ref: fb_magma_knf
    description: NS consisting of a CNF fb_magma_knf connected to mgmt network
    id: fb_magma_ns
    name: fb_magma_ns
    short-name: fb_magma_ns
  vld:
    - id: mgmtnet
      mgmt-network: true
      name: mgmtnet
      type: ELAN
      vnfd-connection-point-ref:
        - member-vnf-index-ref: orc8r
          vnfd-connection-point-ref: mgmt
          vnfdf-id-ref: fb_magma_knf
```

Connection to other NSS in the Network Slice

One CNF: fb_magma_knf

One VL where the CNF will expose its services
CNF structure
The CNF consists of a single KDU (a helm chart)

KDU: orc8r
- Helm-chart: magma/orc8r

NF: fb_magma_knf

External CP: mgmt
CNF structure
K8s cluster requirements: services exposed by single network

- **Net 1**: mgmtnet
- **External CP**: mgmt
- **NF**: fb_magma_knf
$ osm nfpkg-repo-show --repo vnfrepo fb_magma_knf --literal

vnfd-catalog:
   schema-version: '3.0'
   vnfd:
     - connection-point:
       - name: mgmt
         description: CNF with KDU using a helm-chart for Facebook magma orc8r
         id: fb_magma_knf

k8s-cluster:
   nets:
     - external-connection-point-ref: mgmt
       id: mgmtnet

kdu:
   - helm-chart: magma/orc8r
     name: orc8r

mgmt-interface:
   cp: mgmt
   name: fb_magma_knf
   short-name: fb_magma_knf

K8s cluster requirements: 1 network to expose services

One KDU based on helm chart magma/orc8r (repo:magma)
Intro to helm charts

• Concepts:
  • Helm-chart: a packaged format for deploying K8s applications
  • Helm: a package manager

• Documentation:
  • Helm: https://helm.sh/
  • Charts: https://helm.sh/docs/topics/charts/

• Well known repos bringing access to more than 20,000 K8s applications:
  • Stable: https://charts.helm.sh/stable
  • Incubator: https://charts.helm.sh/incubator
  • Bitnami: https://charts.bitnami.com/bitnami
Helm chart structure
Chart File Structure

```markdown
wordpress/
  Chart.yaml  # A YAML file containing information about the chart
  LICENSE     # OPTIONAL: A plain text file containing the license for the chart
  README.md   # OPTIONAL: A human-readable README file
  values.yaml # The default configuration values for this chart
  values.schema.json # OPTIONAL: A JSON Schema for imposing a structure on the values.yaml file
  charts/     # A directory containing any charts upon which this chart depends.
  crds/       # Custom Resource Definitions
  templates/  # A directory of templates that, when combined with values,
               # will generate valid Kubernetes manifest files.
  templates/NOTES.txt # OPTIONAL: A plain text file containing short usage notes
```
Helm chart structure
Template files (K8s manifest files + Go)

```yaml
apiVersion: v1
kind: ReplicationController
metadata:
  name: deis-database
  namespace: deis
  labels:
    app.kubernetes.io/managed-by: deis
spec:
  replicas: 1
  selector:
    app.kubernetes.io/name: deis-database
  template:
    metadata:
      labels:
        app.kubernetes.io/name: deis-database
    spec:
      serviceAccount: deis-database
      containers:
        - name: deis-database
          image: {{ .Values.imageRegistry }}/postgres:{{ .Values.dockerTag }}
          imagePullPolicy: {{ .Values.pullPolicy }}
          ports:
            - containerPort: 5432
          env:
            - name: DATABASE_STORAGE
              value: {{ default "minio" .Values.storage }}
```

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Helm chart structure
Values.yaml

```yaml
imageRegistry: "quay.io/deis"
dockerTag: "latest"
pullPolicy: "Always"
storage: "s3"
```
The Magma Orchestrator helm chart

- **Magma Orchestrator helm chart structure**
Do you remember our VNF descriptor?

```bash
$ osm nfpkg-repo-show --repo vnfrepo fb_magma_knf --literal

vnfd-catalog:
  schema-version: '3.0'
  vnfd:
    connection-point:
      name: mgmt
      description: CNF with KDU using a helm-chart for Facebook magma orc8r
      id: fb_magma_knf
      k8s-cluster:
        nets:
          external-connection-point-ref: mgmt
          id: mgmtnet
      kdu:
        helm-chart: magma/orc8r
        name: orc8r
      mgmt-interface:
        cp: mgmt
        name: fb_magma_knf
        short-name: fb_magma_knf
```

One KDU based on helm chart magma/orc8r (repo:magma)
Adding a helm-chart repo

• OSM needs to know where to obtain the ‘orc8r’ helm chart from:
  • Repo name: magma
  • URI: http://osm-download.etsi.org/ftp/Packages/vnf-onboarding-tf/helm/

```bash
osm repo-add --type helm-chart \
  --description "Repository for Facebook Magma helm Chart" \
magma \n  http://osm-download.etsi.org/ftp/Packages/vnf-onboarding-tf/helm/
```

• When the CNF is deployed, its helm chart will be downloaded from the repo
Open Source MANO

Life Cycle Management of the NS
Instantiating the Network Slice
What you did yesterday

• Launch the Network Slice Instance

osm nsi-create --nsi-name magma_slice_${OSM_USER} \
--nst-name magma_slice_hackfest_nst \
--vim-account osm_hackfest_1 \
--config-file params.yaml

• Instantiation parameters (params.yaml)

netslice-subnet:
- id: slice_hackfest_nsd_epc
  additionalParamsForVnf:
  - member-vnf-index: 'MagmaAGWsrsLTE'
    additionalParams:
      agw_id: 'agw_100'
      agw_name: 'AGW100'
      orch_ip: '172.21.251.XX'
      orch_net: 'osmnet'

- id: slice_hackfest_nsd_epcmgmt
  additionalParamsForVnf:
  - member-vnf-index: 'orc8r'
    additionalParamsForKdu:
    - kdu_name: orc8r
      additionalParams:
      proxyserviceloadBalancerIP: '172.21.251.XX'

Params related to the CNF
Instantiating the NS alone

• Launch the NS

```bash
osm ns-create --ns_name magma_orc8r \ 
    --nsd_name fb_magma_ns \ 
    --vim_account osm_hackfest_1 \ 
    --config_file params.yaml
```

• Instantiation parameters (params.yaml)

```yaml
additionalParamsForVnf:
- member-vnf-index: 'orc8r'
additionalParamsForKdu:
- kdu_name: orc8r
additionalParams:
  proxyserviceloadBalancerIP: '172.21.251.X' # orc8r-proxy IP Address
```
Checking status of the KDU instance

• Check status of NS in OSM

```
osm ns-list
```

• Once ready, get the details of the KDU

```
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
```

• You can also check the status of the deployment in K8s (one namespace per OSM project):

```
osm project-list
kubectl -n <PROJECT_ID> --kubeconfig ~/kube.yaml get all
kubectl -n <PROJECT_ID> --kubeconfig ~/kube.yaml get svc/orc8r-proxy
```
Running implicit primitives in KDUs
(ONLY AN EXAMPLE, FOR ILLUSTRATIVE PURPOSES)

• You could upgrade your KDU to use a different IP address
  (172.21.251.X)

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

• Once completed, you can 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
```
Terminating the NS

- **Delete the NS**

```
osm ns-delete magma_orc8r
osm ns-list
```
More information

• **User Guide - Using Kubernetes-based VNFs**

• **VNF Onboarding Guidelines - KNF walkthrough**