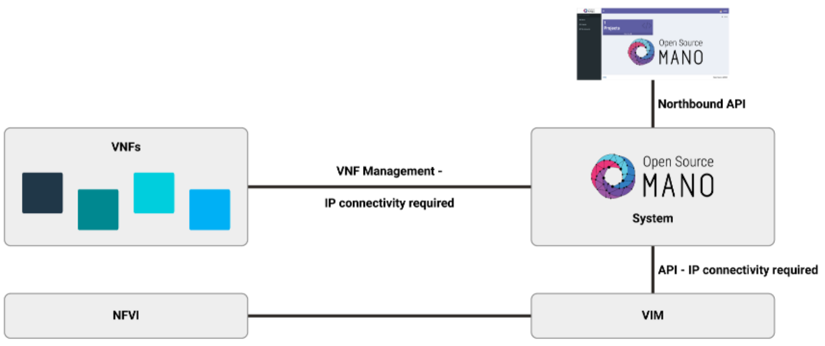
Build your VNF from sratch

Basic Architecture

- Open Source MANO (OSM - version 10.0.3)
- OpenStack (version wallaby stable)

The OSM interaction with VIMs and VNFs



OSM requirements

- 2CPUs
- 6GB RAM (8 recommended)
- 40GB Disk space
- Single interface with internet access
- Ubuntu20.04 (64-bit)

Installing OSM

```
$ wget https://osm-download.etsi.org/ftp/osm-10.0-ten/install_osm.sh
$ chmod +x install_osm.sh
$ ./install_osm.sh
$ ./install_osm.sh --k8s_monitor (install OSM with an add-on to monitor the Kubernetes cluster)
```

Check the installation in the browser by accessing your host IP (by default user and password are admin).

Adding a VIM account

```
$ osm vim-create --name openstack-site --user admin --password userpwd \
--auth_url http://10.10.10.11:5000/v2.0 --tenant admin --account_type openstack
```

It is also possible to add the VIm through the OSM GUI:

```
Dashboard > Projects > admin > VIM Accounts > New VIM
```

What is a Virtual Deployment Unit (VDU)

VDU is a basic part of a VNF. It is the VM that hosts the network function and its properties are described in the VNF descriptor.

Creating the VNF

Create VNF packages

```
$ osm package-create --base-directory ~/tutorial vnf tutorial
```

This command creates the base package for our VNF.

We are defining the **directory**, package **type** and package **name**.

Change the VNF descriptor (VNFD)

You can find the descriptor in:

```
~/tutorial/tutorial_vnf/tutorial_vnfd.yaml
```

We will start by adding the basic info tou our desciptor:

```
vnfd:
  id: tutorial_vnf
  description: A basic VNF descriptor with one VDU
  product-name: tutorial_vnf
  version: "1.0"
```

As you can see, we are defining an **id**, **description**, **product name** and **version**.

Next, we want to add our deployment flavour:

```
  df:
  - id: default-df
  instantiation-level:
  - id: default-instantiation-level
    vdu-level:
    - number-of-instances: "1"
      vdu-id: tutorial
  vdu-profile:
  - id: tutorial
    min-number-of-instances: "1"
```

This block of code defines a default instatiation level, with **1 VDU instance** and with id as tutorial.

```
  ext-cpd:
  - id: vnf-cp0-ext
    int-cpd:
      cpd: vdu-eth0-int
      vdu-id: tutorial
  mgmt-cp: vnf-cp0-ext
```

Here we are defining the connection points:

- The **external** will connect the VNF to the exterior, so it can be accessible by the Network Service.
- The **internal** will create the connection point to the VDU.

Next, we will define the **image** to be used. Keep in mind that it **needs to exist in your VIM account**.

```
  sw-image-desc:
  - id: "Ubuntu Server 20.04"
    image: "Ubuntu Server 20.04"
    name: "Ubuntu Server 20.04"
```

Now, we have the **VDU specifications**:

```
  virtual-compute-desc:
  - id: tutorial-compute
    virtual-cpu:
      num-virtual-cpu: "1"
    virtual-memory:
      size: "1.0"
  virtual-storage-desc:
  - id: tutorial-storage
    size-of-storage: "10"
```

As you can see, we are defining the CPU, memory and storage for the VDU.

Finally, the VDU configuration:

```
  vdu:
  - cloud-init-file: cloud-init.cfg
    id: tutorial
    int-cpd:
    - id: vdu-eth0-int
      virtual-network-interface-requirement:
      - name: vdu-eth0
        virtual-interface:
          type: PARAVIRT
    name: tutorial
    sw-image-desc: "Ubuntu Server 20.04"
    virtual-compute-desc: tutorial-compute
    virtual-storage-desc: tutorial-storage
```

We are giving it a **cloud-init** file that will be explained later.
We also refering the **already created** connection points, image, storage and IDs.

Cloud-init file

You can find it in:

```
~/tutorial/tutorial_vnf/cloud_init/cloud_init.cfg
```

This file has the basic initial configurations in the VM:

```
#cloud-config
password: tutorial
chpasswd: { expire: False }
ssh_pwauth: True
package_update: true
packages:
  - nmap
```

We are **changing the password**, allowing **ssh connections** with credentials and installing the **nmap** package.

Validate and Upload the VNF package

```
$ osm nfpkg-create ~/tutorial/tutorial_vnf
```

This command validates and uploads the package to OSM. Make sure you input the correct VNF directory.

Creating the NS

Create NS packages

```
$ osm package-create --base-directory ~/tutorial ns tutorial
```

This command creates the base package for our NS.

We are defining the **directory**, package **type** and package **name**.

Change the NS descriptor (NSD)

You can find the descriptor in:

```
~/tutorial/tutorial_ns/tutorial_nsd.yaml
```

We will start by adding the basic info tou our desciptor:

```
nsd:
  nsd:
  - id: tutorial_ns
    name: tutorial_ns
    version: "1.0"
    description: Simple NS with one VNF and a single Virtual Link
```

As you can see, we are defining an **id**, **name**, **version** and **description**.

Next, we need to create a **Virtual Link**. This link will connect our Network Service to our VIM Network:

```
    virtual-link-desc:
    - id: mgmtnet_2
      mgmt-network: true
      vim-network-name: proj_net
```

In our case, the VIM Network is called **proj_net**.

We also need to connect the NS to our VNF created before:

```
    vnfd-id:
    - tutorial_vnf
```

Make sure that the id is the same as the VNF.

Next, we need to establish the connections between the VNF and the VIM:

```
    df:
    - id: default-df
      vnf-profile:
      - id: "1"
        virtual-link-connectivity:
        - constituent-cpd-id:
          - constituent-base-element-id: "1"
            constituent-cpd-id: vnf-cp0-ext
          virtual-link-profile-id: mgmtnet_2
        vnfd-id: tutorial_vnf
```

Notice that the **constituent-cpd-id** is the same as the **external connection point** defined in the **VNF descriptor**.
Also, the **virtual-link-profile-id** has to be the sameas the one created.

Validate and Upload the NS package

```
$ osm nspkg-create ~/tutorial/tutorial_ns
```

This command validates and uploads the package to OSM. Make sure you input the correct NS directory.

NS instantiation

```
$ osm ns-create --ns_name tutorial_ns --nsd_name tutorial_ns --vim_account Tron
```

This command creates the instance of the network service. Notice that the **--nsd_name** option has to be the name of the ns package. In our case, the VIM account is called **Tron**. Make sure that you input **your VIM account**.

If all goes accordingly, you should be able to see in the OSM interface that your instance is running and active.

You can also check if your instance is running in the VIM account.

Check the cloud init file

With the VMup and running, you can check if the cloud-init file worked:

```
$ ssh ubuntu@<your_machine_ip>
$ nmap
```

By connecting to your machine using ssh and checking the nmap package, you ensure that it worked as expected.

Video

For a better description of the tutorial, you can check our video here