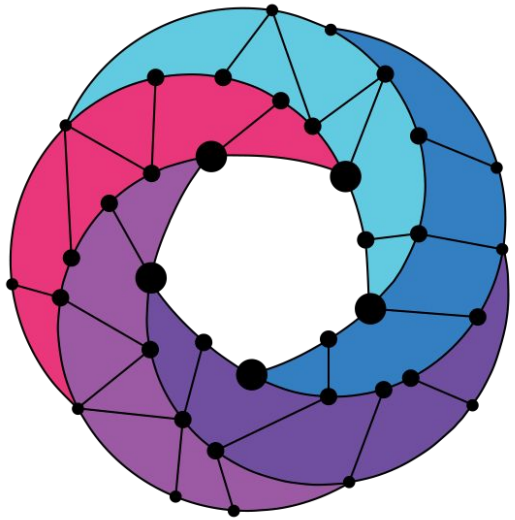

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OSM-MR#9 Hackfest

Building a Multi-VDU VNF with Day-0

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ETSI

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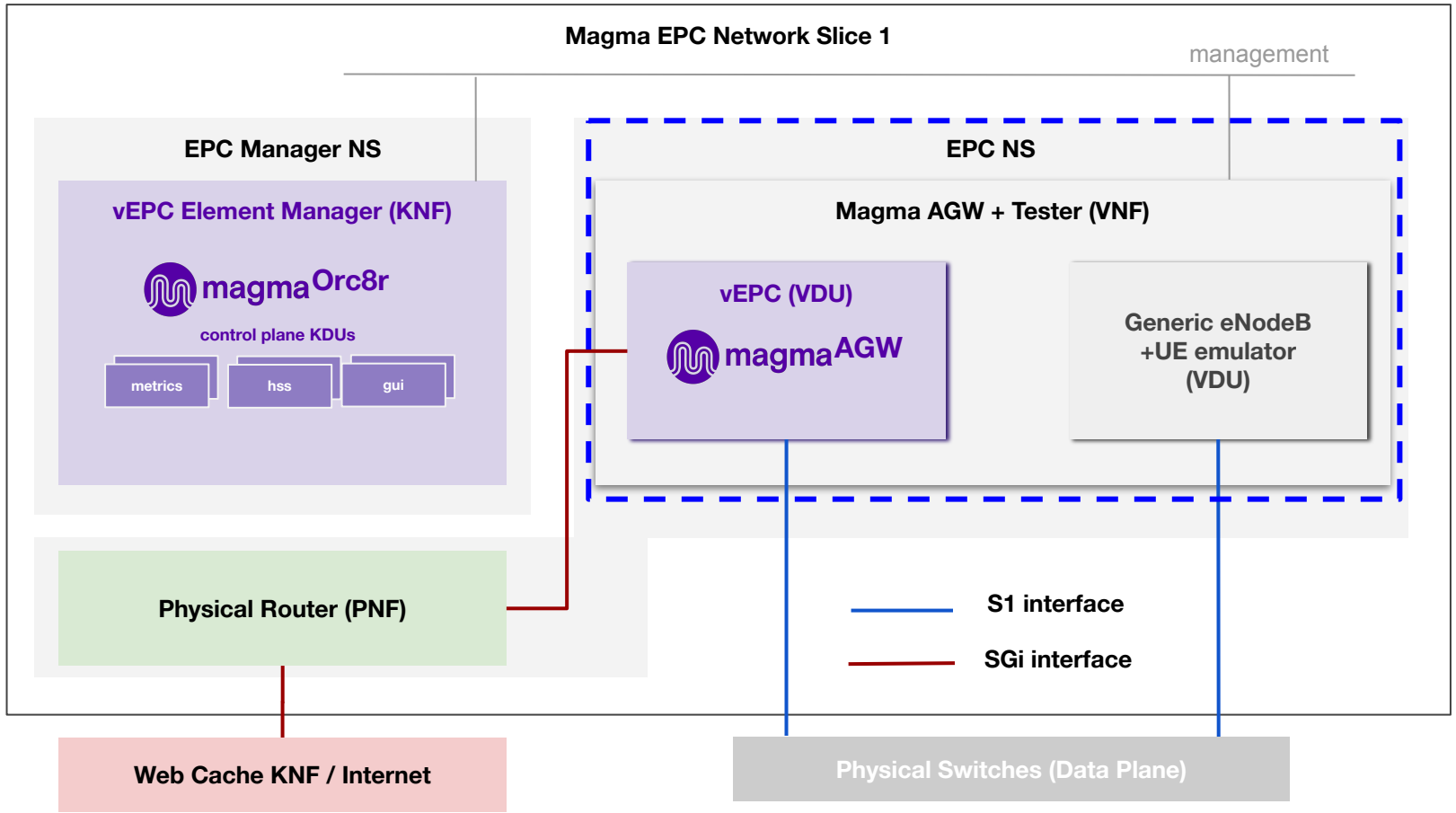
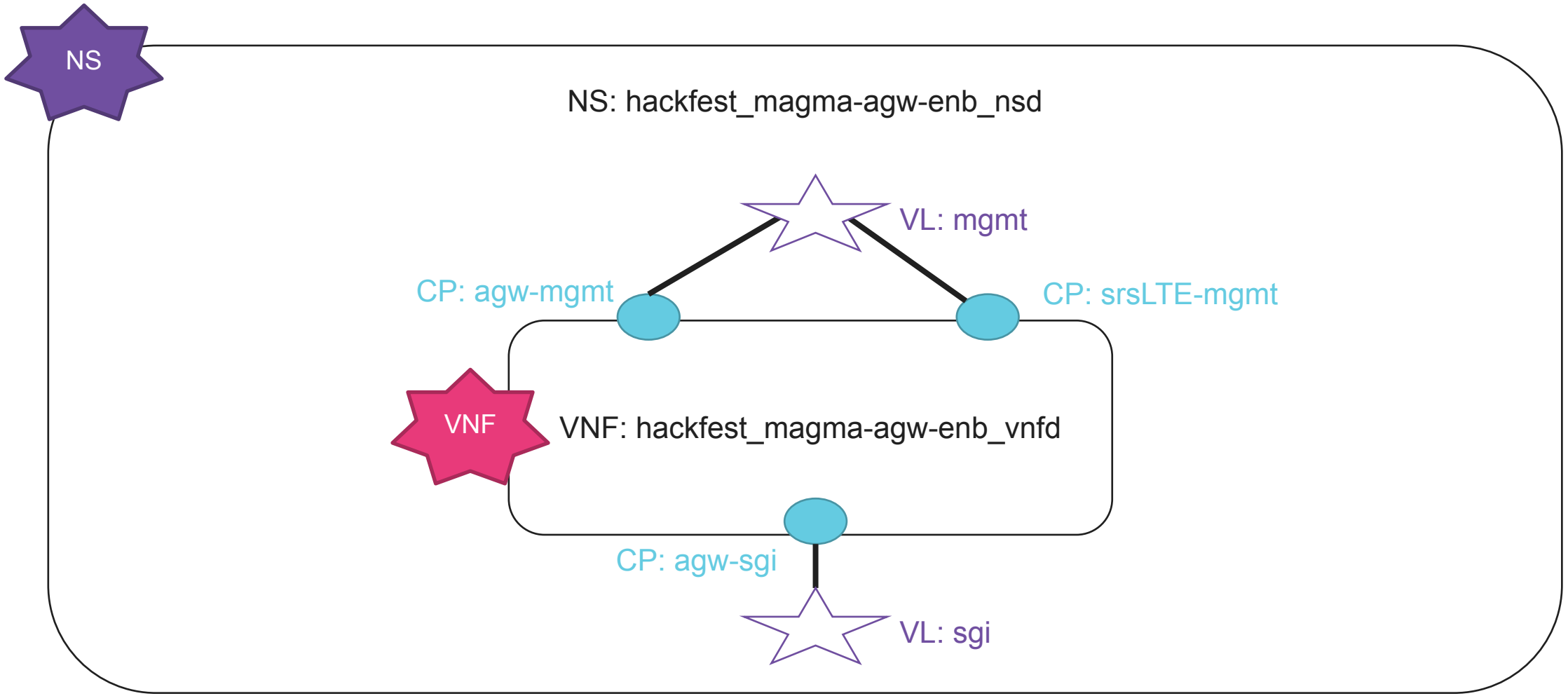
Building a Multi-VDU VNF

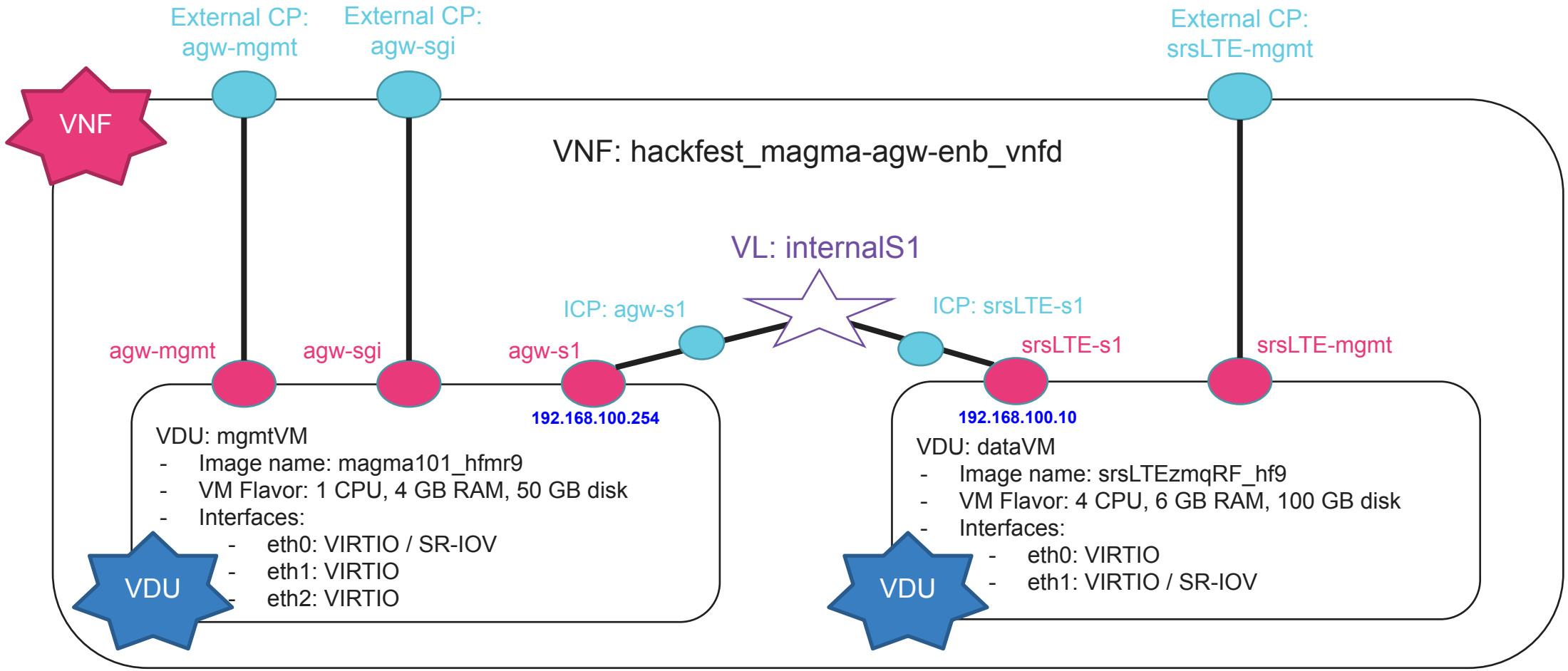
Let’s start with the VNF



NS diagram

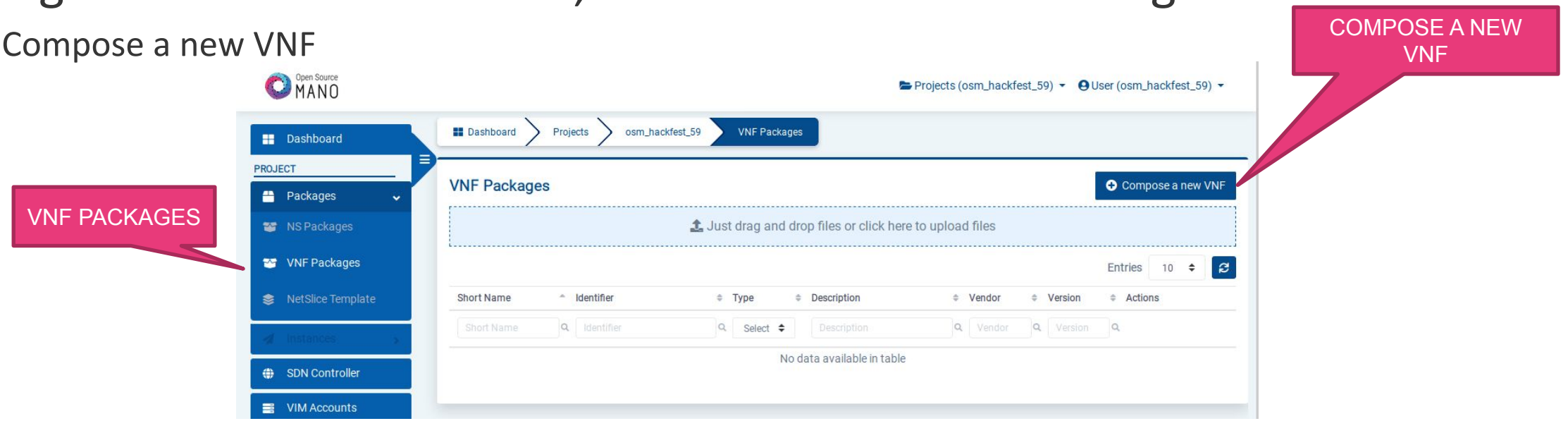


VNF diagram



Building a Multi-VDU VNF Package from scratch

- We can use the graphical composer for the VNFD, then download the package to add other artifacts, but it will be faster through the CLI.
  - Compose a new VNF



  - Create new Package

Creating a new VNF 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 --image magma101_hfmr9 --vcpu
1 --memory 4096 --storage 50 --interfaces 2 --vendor OSM vnf
hackfest_magma-agw-enb
```

- The final contents we need for this section are place in the following folder: /home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_vnfd/hackfest_magma-agw-enb_vnfd.yaml

Creating a new VNF Package from CLI

- Two options:

  1. View the desired contents and replace your hackfest_magma-agw-enb_vnfd.yaml file, section by section.

```
cat
/home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_vnfd/hackfest_magma-agw-enb_vnfd.yaml
```

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

```
cp -a /home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_vnfd/*
~/magma/hackfest_magma-agw-enb_vnf/
```

Creating a new VNF Package from CLI

- In our first VDU, interfaces section, we will make sure we have our internal “s1” interface first.

```
vdu:
-   id: magma-agw-vdu
    ...
    interface:
    -   name: eth0
        type: INTERNAL
        position: 1
        virtual-interface:
            type: PARAVIRT
        internal-connection-point-ref: agw-s1
    -   name: eth1
        type: EXTERNAL
        position: 2
        virtual-interface:
            type: PARAVIRT
        external-connection-point-ref: agw-sgi
    -   name: eth2
        type: EXTERNAL
        position: 3
        virtual-interface:
            type: PARAVIRT
        external-connection-point-ref: agw-mgmt
internal-connection-point:
-   id: agw-s1
    name: agw-s1
    short-name: agw-s1
    port-security-enabled: false
```

Creating a new VNF Package from CLI

- The management interface for our VNF will be the agw-mgmt CP.

```
mgmt-interface:
    cp: agw-mgmt
```

- Our Magma AGW VDU needs some information to be passed via a cloud-init file, which we will review later.

```
vdu:
-   id: magma-agw-vdu
     ...
    cloud-init-file: magmaagw_init
```

Creating a new VNF Package from CLI

- A second VDU is added, for the srsLTE eNodeB/UE emulator

```
vdu:
...
-   id: srsLTE-vdu
    name: srsLTE-vdu
    description: srsLTE-vdu
    count: 1
    cloud-init-file: srslte_init
    vm-flavor:
        vcpu-count: 4
        memory-mb: 6144
        storage-gb: 100
    image: 'srsLTEzmqRF_hf9'
```

```
    interface:
    -   name: eth0
        type: EXTERNAL
        virtual-interface:
            type: PARAVIRT
        external-connection-point-ref: srsLTE-mgmt
        mgmt-interface: true
    -   name: eth1
        type: INTERNAL
        virtual-interface:
            type: PARAVIRT
        internal-connection-point-ref: srsLTE-s1
    internal-connection-point:
    -   id: srsLTE-s1
        name: srsLTE-s1
        short-name: srsLTE-s1
```

Creating a new VNF Package from CLI

- The internal VLD, for the S1 network, must be defined in the VNFD. An IP Profile is used to force a specific IP addressing.

```
internal-vld:
-   id: internalS1
    name: internalS1
    short-name: internalS1
    type: ELAN
    ip-profile-ref: internalS1
    internal-connection-point:
    -   id-ref: agw-s1
        ip-address: 192.168.100.254
    -   id-ref: srsLTE-s1
        ip-address: 192.168.100.10
ip-profiles:
-  name: internalS1
   description: S1 test network
   ip-profile-params:
      ip-version: ipv4
      subnet-address: 192.168.100.0/24
      dhcp-params:
         enabled: true
```

Creating a new VNF Package from CLI

- Finally, the external connection points that the VNF will expose, are defined.

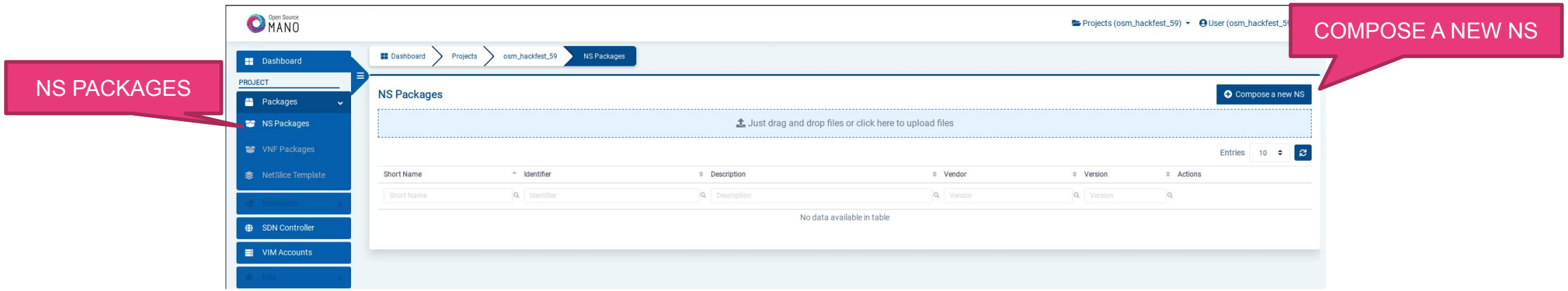
```
        connection-point:
        -   name: agw-mgmt
        -   name: agw-sgi
        -   name: srsLTE-mgmt
```

We are exposing the two management ports of both VDUs, and the SGi interface, to the Network Service.

Building a NS Package from scratch

We can use the graphical composer for the NSD, then download the package to add other artifacts, but it will be faster through the CLI.

- Compose a new NS



- Create new Package

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.

```
osm package-create --base-directory ~/magma --vendor OSM ns
hackfest_magma-agw-enb
```

- The final contents we need for this section are place in the following folder: /home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_nsd/hackfest_magma-agw-enb_nsd.yaml

Creating a new NS Package from CLI

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- Two options:

  1. View the desired contents and replace your hackfest_magma-agw-enb_nsd.yaml file, section by section.

```
cat
/home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_nsd/hackfest_magma-agw-enb_nsd.yaml
```

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

```
cp -a /home/ubuntu/examples/01-multivdu/hackfest_magma-agw-enb_nsd/*
~/magma/hackfest_magma-agw-enb_ns/
```

Creating a new NS Package from CLI

- The first important part is the ‘constituent-vnfd’ section, which will specify which VNFs form our NS.

```
        constituent-vnfd:
        -   member-vnf-index: 'MagmaAGW+srsLTE'
            vnfd-id-ref: hackfest_magma-agw-enb_vnfd
```

Creating a new NS Package from CLI

- Our management VLD will connect all the external management CPs exposed at our VNF

```
vld:
-   id: mgmt
    name: mgmt
    short-name: mgmt
    type: ELAN
    mgmt-network: true
    vnfd-connection-point-ref:
    -   member-vnf-index-ref: 'MagmaAGW+srsLTE'
        vnfd-id-ref: hackfest_magma-agw-enb_vnfd
        vnfd-connection-point-ref: agw-mgmt
    -   member-vnf-index-ref: 'MagmaAGW+srsLTE'
        vnfd-id-ref: hackfest_magma-agw-enb_vnfd
        vnfd-connection-point-ref: srsLTE-mgmt
```

Creating a new NS Package from CLI

- Finally, our SGi VLD will connect the Magma AGW VDU to a existing network called “sgi” in our VIM.

```
vld:
...
-   id: sgi
    name: sgi
    short-name: sgi
    type: ELAN
    mgmt-network: false
    vim-network-name: sgi
    vnfd-connection-point-ref:
    -   member-vnf-index-ref: 'MagmaAGW+srsLTE'
        vnfd-id-ref: hackfest_magma-agw-enb_vnfd
        vnfd-connection-point-ref: agw-sgi
```

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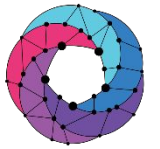
Automating Day-0 configuration through cloud-init

What is cloud-init and what can it be used for?



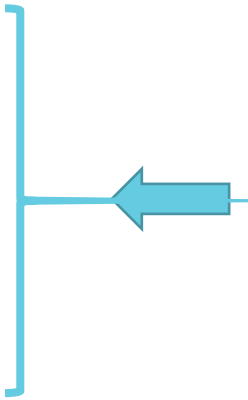
- It is a Linux package used to automate initial configuration of a VM
- VM requirements:
  - Cloud-init package
  - Cloud-init configuration (data source) via /etc/cloud/cloud.cfg
    - Config drive
    - Openstack metadata server
    - …
- What can be done?
  - Setting a default locale
  - Setting an instance hostname
  - Generating instance SSH private keys
  - Adding SSH keys to a user's .ssh/authorized_keys so they can log in
  - Setting up ephemeral mount points
  - Configuring network devices
  - Adding users and groups
  - Adding files
- Docs: http://cloudinit.readthedocs.io/en/latest/

- Cloud-init is available in Linux VMs and might be supported in other OS
- Not all VIMs support cloud-init via a metadata server

Let's explore the Cloud-init files

~/magma/hackfest_magma-agw-enb_vnf/cloud_init/magmaagw_init

```
#cloud-config
runcmd:
  # deleting default mgmt route to Internet
  - route delete -net 0.0.0.0/0 gw 172.21.251.254
  # adding specific ETSI HIVE mgmt segments through mgmt network
  - route add -net 10.100.0.0/16 gw 172.21.251.254
  - route add -net 10.101.0.0/16 172.21.251.254
  - route add -net 172.21.0.0/16 gw 172.21.251.254
  - route add -net 172.22.0.0/16 gw 172.21.251.254
  - route add -net 192.168.170.0/24 gw 172.21.251.254
  # adding specific ORCH_IP through mgmt network
  - route add -host {{ orch_ip }}/32 gw 172.21.251.254
  # adding new default route to VyOS PNF
  - route add -net 0.0.0.0/0 gw 192.168.239.7
  # adding new specific routes to reach MetalLB ranges (Squid and other svcs) through VyOS PNF
  - route add -net 172.21.250.0/24 gw 192.168.239.7
  - route add -net 172.21.251.0/24 gw 192.168.239.7
```

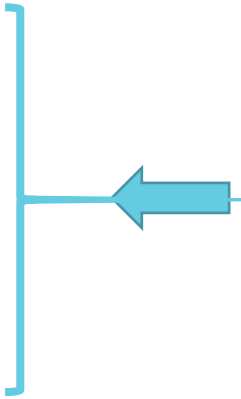


- From the AGW, we are removing the default route and pointing it towards the data plane interface (router at the SGI, at 192.168.239.7)
- We are also passing a route towards the Magma Orc8r, through the management port, the IP is parametrized!.

Let's explore the Cloud-init files

~/magma/hackfest_magma-agw-enb_vnf/cloud_init/srslte_init

```
#cloud-config
password: osm2020
chpasswd: { expire: False }
ssh_pwauth: True
runcmd:
  - route add -net 10.0.0.0/8 gw 172.21.251.254
  - route add -net 172.21.0.0/16 gw 172.21.251.254
  - route add -net 172.22.0.0/16 gw 172.21.251.254
  - route add -net 192.168.170.0/24 gw 172.21.251.254
```



- From the srsLTE emulator, we are adding some specific management routes towards the management network, as we will remove the default route in a later stage (Day-1 primitive)
- We are also setting a fixed password, ‘osm2020’, for the default ‘ubuntu’ user.

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Packaging and instantiation

Building, validating and uploading packages

- Once finished, you can build and upload the NS/VNF Package to OSM with the following commands.

```
osm nfpkg-create ~/magma/hackfest_magma-agw-enb_vnf
osm nspkg-create ~/magma/hackfest_magma-agw-enb_ns
```

  - This single command will:
    - **Validate** the package according to the Information Model.
    - **Build** the package.
    - **Upload** the package to OSM.

```
osm nfpkg-list
osm nspkg-list
```

Instantiation parameters

- Prepare any parameter you want to pass during instantiation.

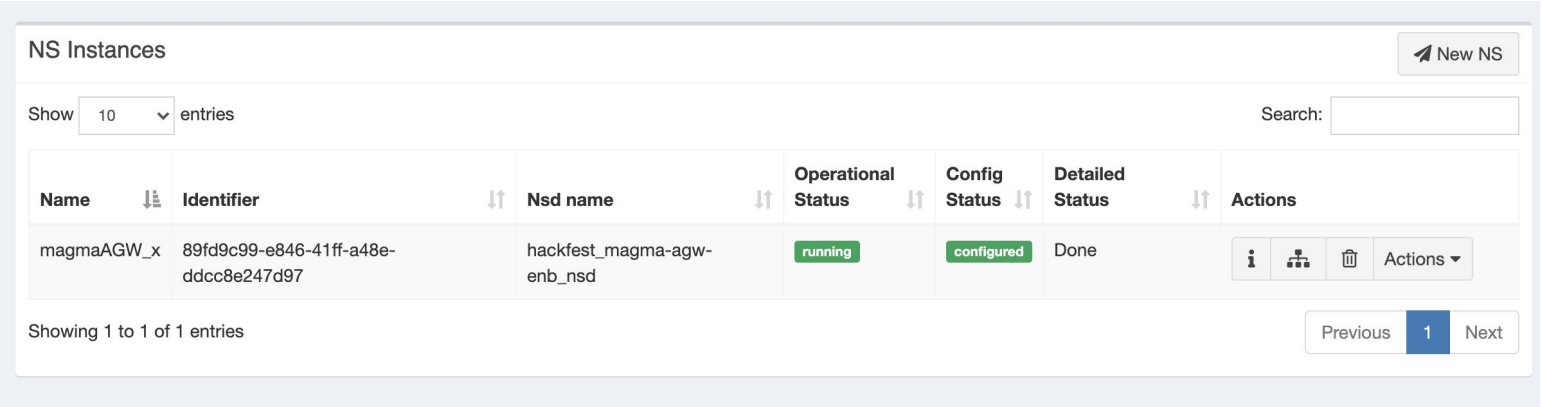
  In this case, we will prepare a '**params.yaml**' file that will pass some parameters we will need during the following tests.

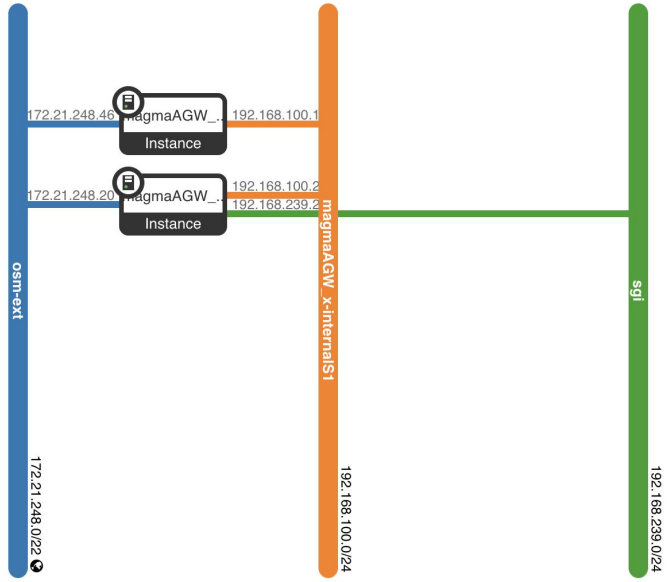
```
additionalParamsForVnf:
- member-vnf-index: 'MagmaAGW+srsLTE'
  additionalParams:
    agw_id: 'agw_01'
    agw_name: 'AGW1'
    orch_ip: '172.21.251.x'  ## change this to your assigned address
    orch_net: 'osmnet'
```

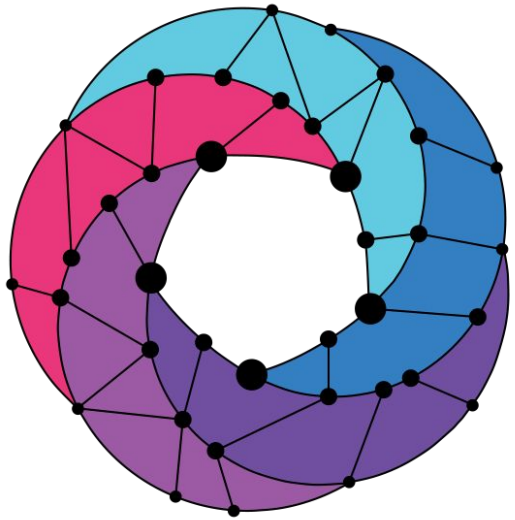
Launch your first instance

- With your NS and VNF package ready, you can proceed to instantiation.

```
osm ns-create --ns_name magmaAGW_x --nsd_name hackfest_magma-agw-enb_nsd
--vim_account etsi-openstack-x --config_file params.yaml
```







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