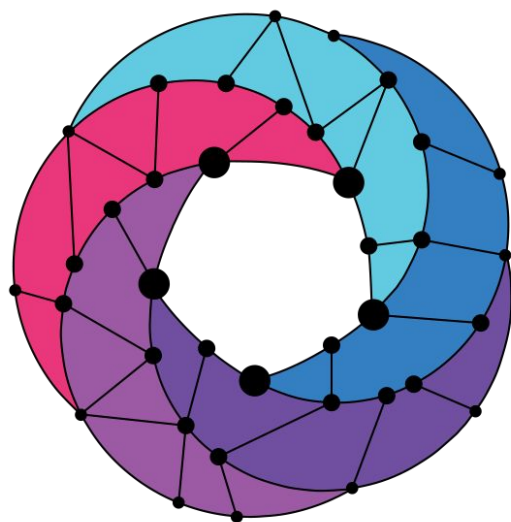




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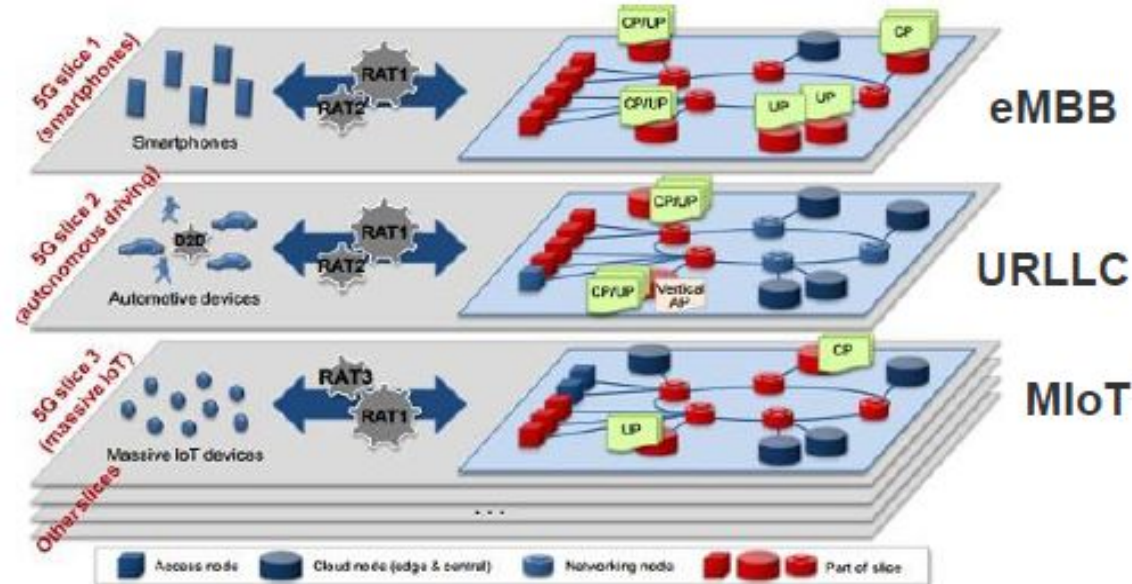
OSM Hackfest – Session 8 5G Network Slicing with OSM

Felipe Vicens (ATOS)
Guillermo Calviño (Altran)

Network Slicing Overview

In the scope of 5G, network slicing allows the network operator to deploy independent PLMNs with different capabilities

Different network slices addressing different types of usage requiring different levels of functionality, performance and reliability.



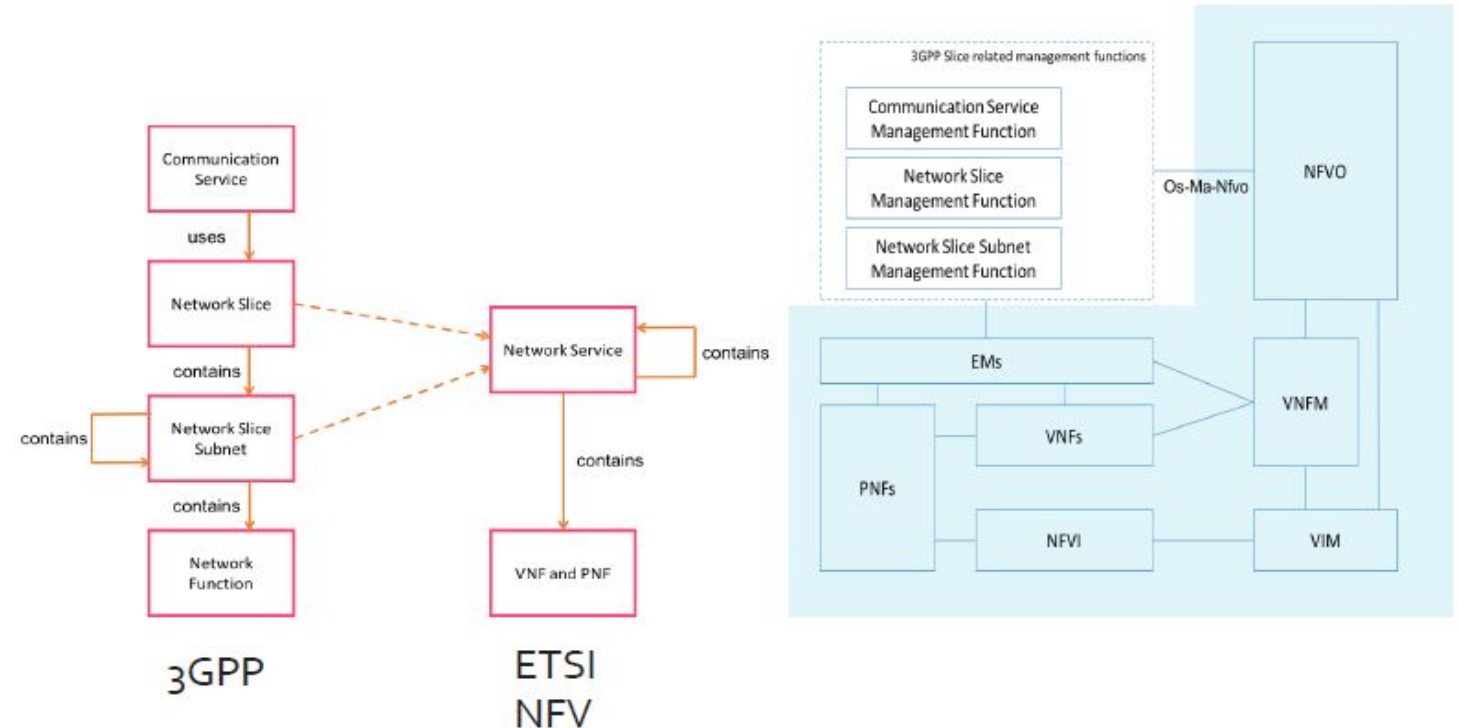
Source: NGMN

ETSI NFV Framework for Network Slicing

Analysis of 3GPP and alignment of NFV architecture in the ETSI GR NFV-EVE 012

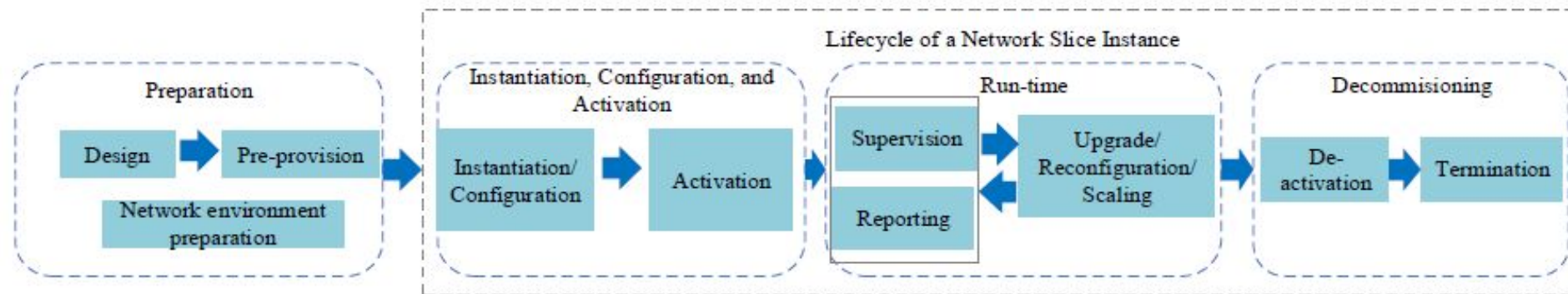
Considerations:

- Network Slice Subnet can be considered as an NFV Network Service.
- Network Functions can be described as VNF and PNF



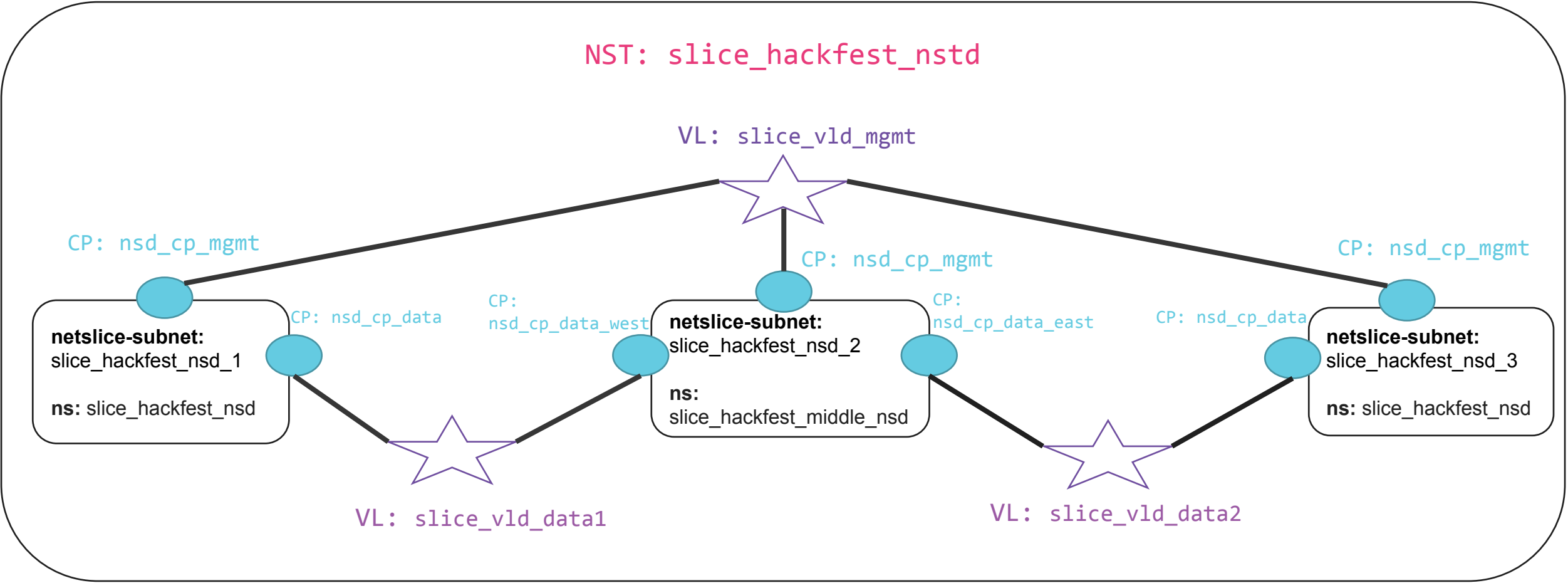
Network Slicing in OSM

- **Network slice instance:** a set of network functions and the resources for these network functions which are arranged and configured, forming a complete logical network to meet certain network characteristics.



- The NSI contains:
 - NFs (e.g. belonging to AN and CN)
 - Information relevant to the interconnections between these NFs like topology of connections.
 - Individual link requirements (e.g. QOS attributes)
 - **The NSI is defined by a Network Slice Template.**

NST diagram



Network Slice Template Requirements

VNFD:

- [slice_hackfest_vnfd.tar.gz](#)
- [slice_hackfest_middle_vnfd.tar.gz](#)

NSD:

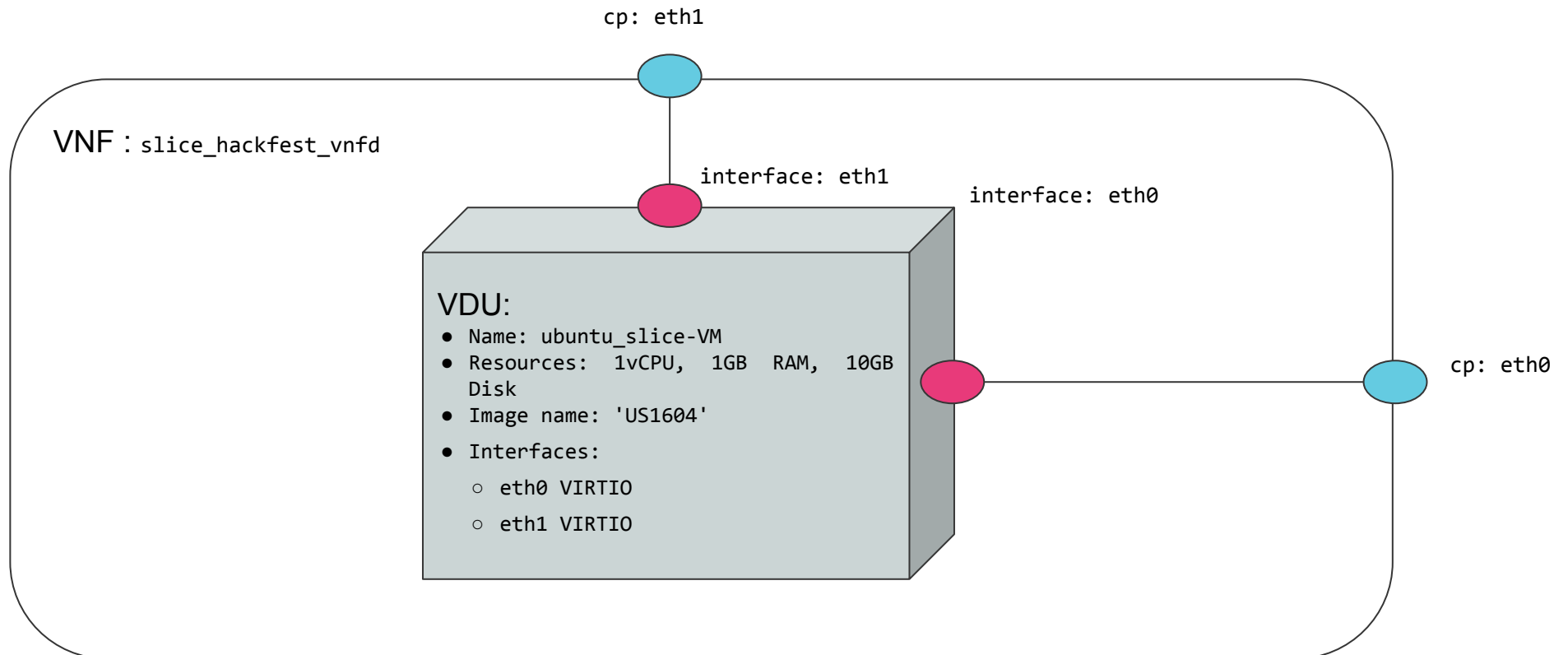
- [slice_hackfest_nsd.tar.gz](#)
- [slice_hackfest_middle_nsd.tar.gz](#)

NST:

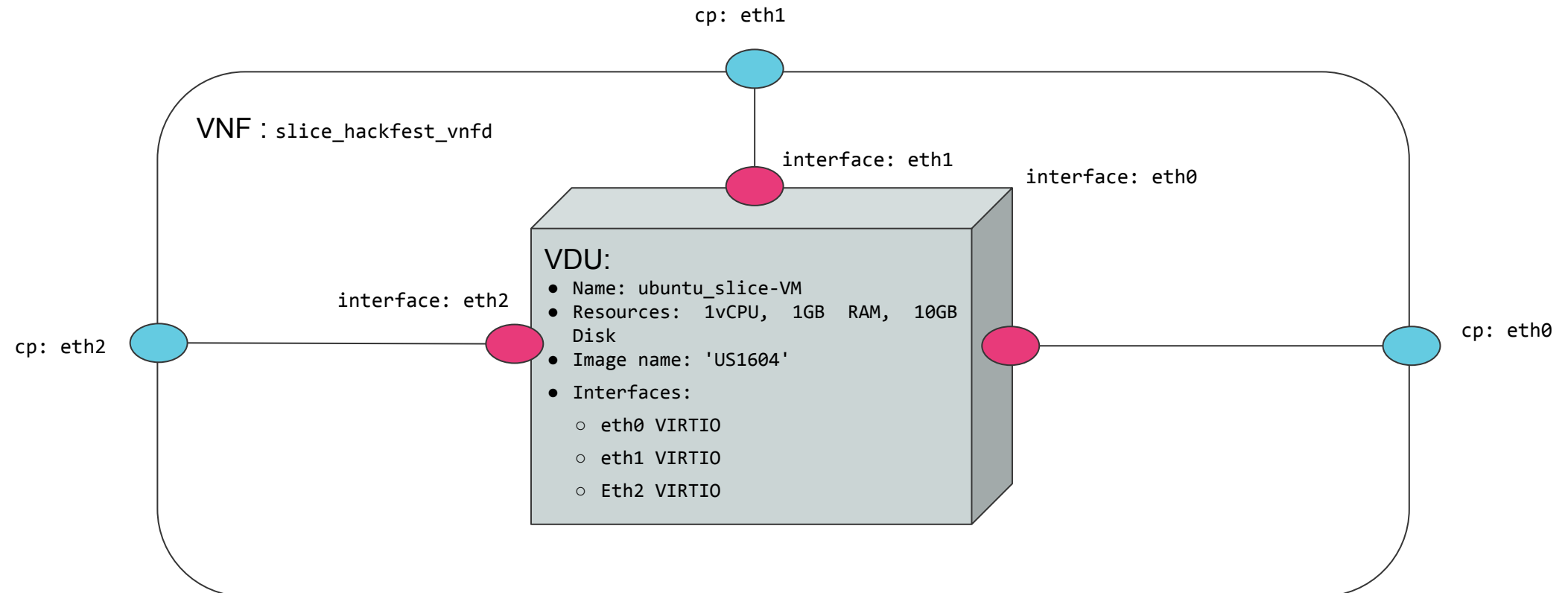
- [slice_hackfest_nstd.yaml](#)
- [slice_hackfest_nstd2.yaml](#)

- The descriptors for the slice hackfest session are available:
 - <https://osm-download.etsi.org/ftp/osm-6.0-six/7th-hackfest/packages/>

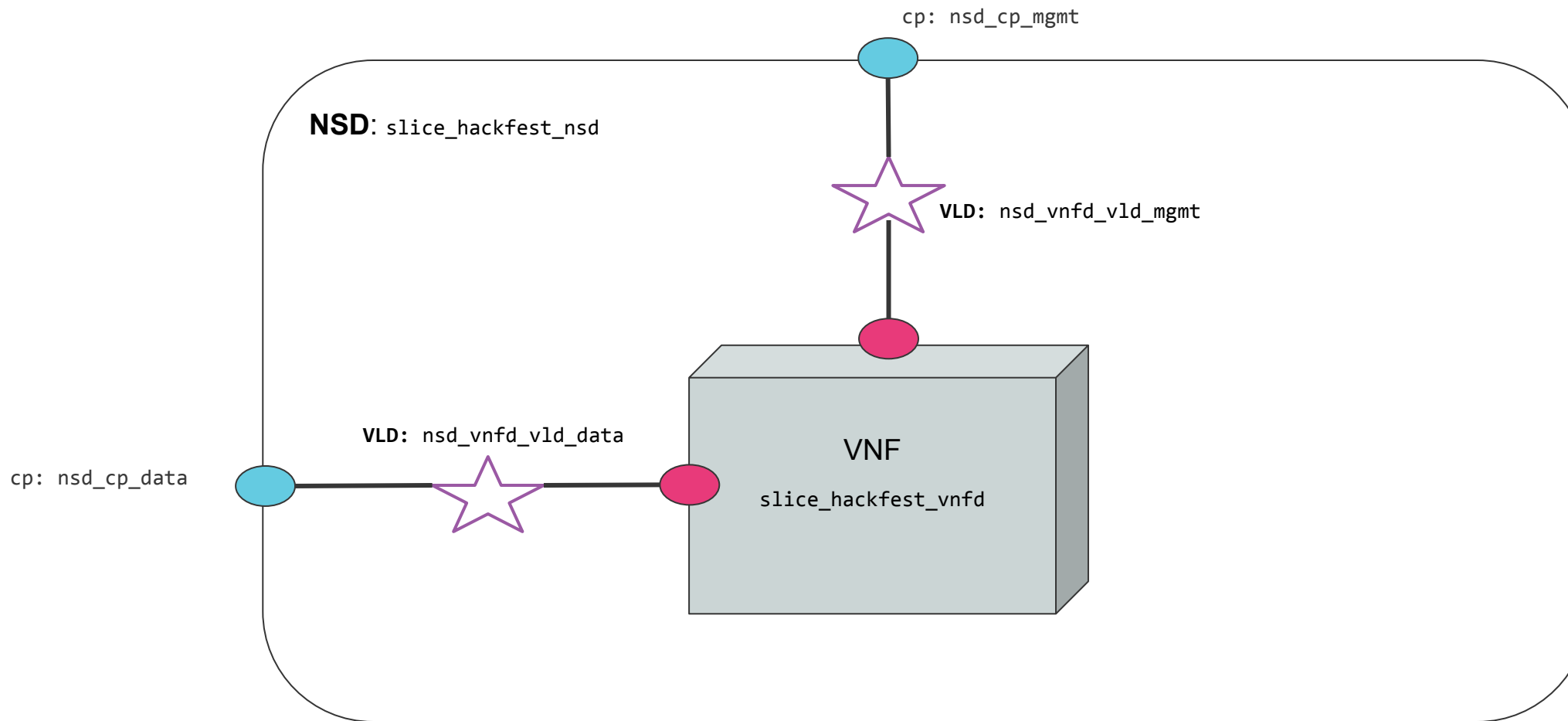
VNFD - slice_hackfest_vnfd



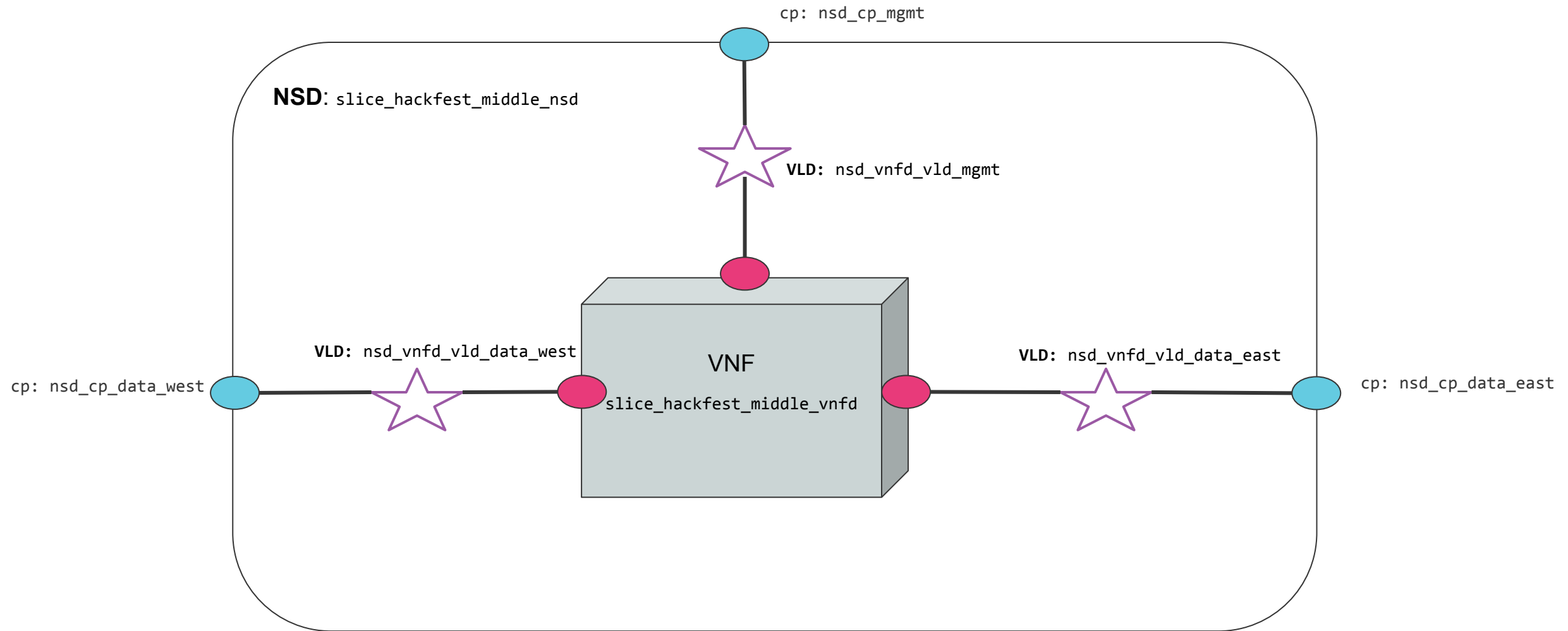
VNFD - slice_hackfest_vnfd



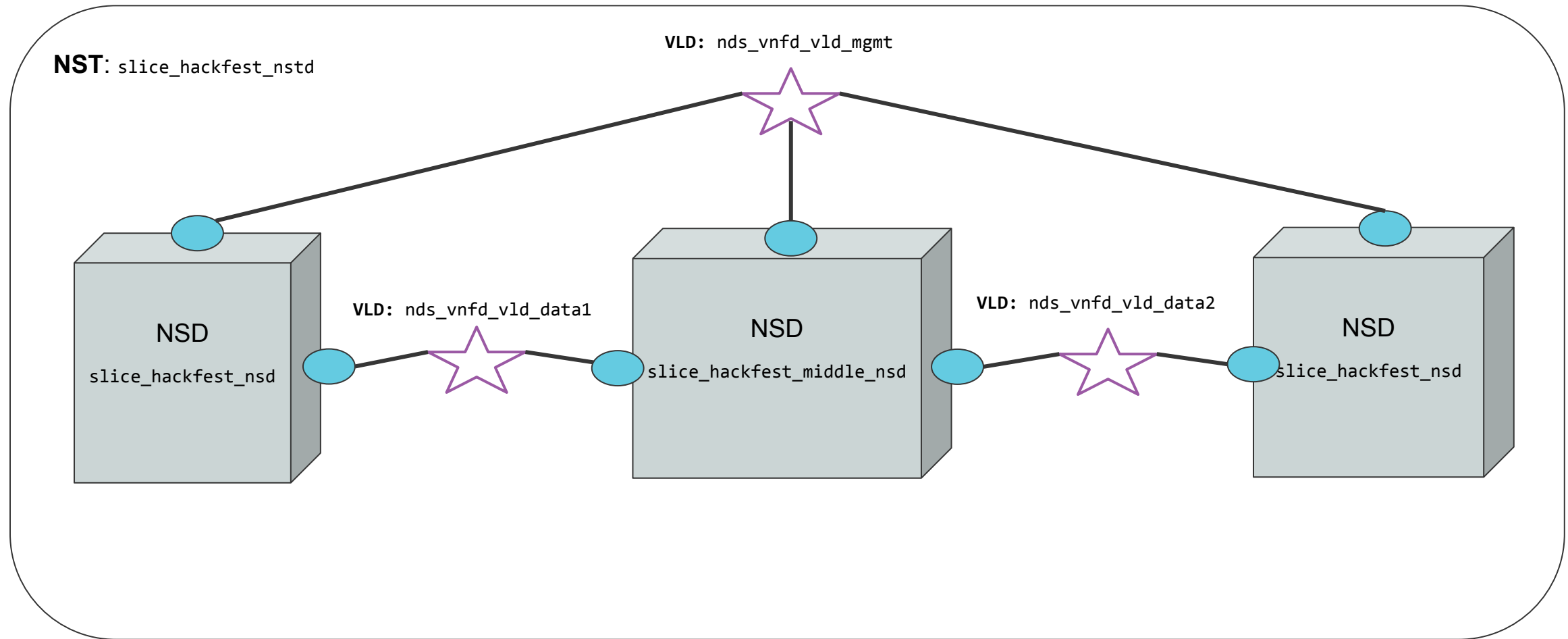
NSD - slice_hackfest_nsd



NSD - slice_hackfest_middle_nsd



NST - slice_hackfest_nst



Network Slice Template

nst:

- id: slice_hackfest_nstd
name: slice_hackfest_nstd
SNSSAI-identifier:
 slice-service-type: eMBB
quality-of-service:
 id: 1

netslice-subnet:

- id: slice_hackfest_nsd_1
is-shared-nss: 'false'
description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
nsd-ref: slice_hackfest_nsd
- id: slice_hackfest_nsd_2
is-shared-nss: 'true'
description: NetSlice Subnet (service) composed by 1 vnf with 3 cp
nsd-ref: slice_hackfest_middle_nsd
- id: slice_hackfest_nsd_3
is-shared-nss: 'false'
description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
nsd-ref: slice_hackfest_nsd

netslice-vld:

- id: slice_cirros_vld_mgmt
name: slice_cirros_vld_mgmt
type: ELAN
mgmt-network: 'true'
nss-connection-point-ref:
 - nss-ref: slice_hackfest_nsd_1
nsd-connection-point-ref: nsd_cp_mgmt
 - nss-ref: slice_hackfest_nsd_2
nsd-connection-point-ref: nsd_cp_mgmt
 - nss-ref: slice_hackfest_nsd_3
nsd-connection-point-ref: nsd_cp_mgmt.

- id: slice_cirros_vld_data1
name: slice_cirros_vld_data1
type: ELAN
nss-connection-point-ref:
 - nss-ref: slice_hackfest_nsd_1
nsd-connection-point-ref: nsd_cp_data
 - nss-ref: slice_hackfest_nsd_2
nsd-connection-point-ref: nsd_cp_data_east
- id: slice_cirros_vld_data2
name: slice_cirros_vld_data2
type: ELAN
nss-connection-point-ref:
 - nss-ref: slice_hackfest_nsd_2
nsd-connection-point-ref: nsd_cp_data_west
 - nss-ref: slice_hackfest_nsd_3
nsd-connection-point-ref: nsd_cp_data

Creating a Network Slice Template (NST)

Information Model

```
module: nst
+--rw nst* [id]
  +--rw id                               string
  +--rw name                             string
  +--rw SNSSAI-identifier
    | +--rw slice-service-type           network-slice-type
    | +--rw slice-differentiator?       string
  +--rw quality-of-service
    | +--rw id                           uint16
    | +--rw resource-type?               resource-type
    | +--rw priority-level?              uint16
    | +--rw packet-delay-budget?         uint16
    | +--rw packet-error-rate?           uint16
    | +--rw default-max-data-burst?      uint16
```



NST - id, name, and slice parameters section

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

• The Information model for the NST is available:
http://osm-download.etsi.org/repository/osm/debian/ReleaseSIX/docs/osm-im/osm_im_trees/nst.html

Creating a Network Slice Template (NST)

Information Model

```
+--rw netslice-subnet*      [id]
| +--rw id                  string
| +--rw description?        string
| +--rw is-shared-nss?      boolean
| +--rw nsd-ref              -> /nsd:nsd-catalog/nsd/id
| +--rw instantiation-parameters
| +--.....
```



NST - netslice-subnet section

```
netslice-subnet:
- id: slice_hackfest_nsd_1
  is-shared-nss: 'false'
  description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
  nsd-ref: slice_hackfest_nsd

- id: slice_hackfest_nsd_2
  is-shared-nss: 'true'
  description: NetSlice Subnet (service) composed by 1 vnf with 3 cp
  nsd-ref: slice_hackfest_middle_nsd

- id: slice_hackfest_nsd_3
  is-shared-nss: 'false'
  description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
  nsd-ref: slice_hackfest_nsd
```

• The Information model for the NST is available:
http://osm-download.etsi.org/repository/osm/debian/ReleaseSIX/docs/osm-im/osm_im_trees/nst.html

Creating a Network Slice Template (NST)

NST - netslice-subnet section

netslice-subnet:

- id: **slice_hackfest_nsd_1**
is-shared-nss: 'false'
description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
nsd-ref: **slice_hackfest_nsd**
- id: **slice_hackfest_nsd_2**
is-shared-nss: 'true'
description: NetSlice Subnet (service) composed by 1 vnf with 3 cp
nsd-ref: **slice_hackfest_middle_nsd**
- id: **slice_hackfest_nsd_3**
is-shared-nss: 'false'
description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
nsd-ref: **slice_hackfest_nsd**

NSD - id, name, and NS parameters section

nsd-catalog:

nsd:

id: **slice_hackfest_nsd**
name: slice_hackfest_nsd
short-name: slice_hackfest_ns
description: NetServiceDescriptor with 2 vnfs and 2 vld (mgmt and data networks)
vendor: OSM
version: '1.0'
logo: osm_2x.png

• The Information model for the NST is available:
http://osm-download.etsi.org/repository/osm/debian/ReleaseSIX/docs/osm-im/osm_im_trees/nst.html

Creating a Network Slice Template (NST)

Information Model

```
+--rw netslice-vld* [id]
|   +--rw id                string
|   +--rw name?             string
|   +--rw short-name?       string
|   +--rw vendor?           string
|   +--rw description?       string
|   +--rw version?          string
|   +--rw type?              manotypes:virtual-link-type
|   +--rw root-bandwidth?   uint64
|   +--rw leaf-bandwidth?   uint64
|   +--rw provider-network
|   |   +--rw physical-network? string
|   |   +--rw segmentation_id? uint32
|   +--rw mgmt-network?     boolean
|   +--rw nss-connection-point-ref* [nss-ref nsd-connection-point-ref]
|   |   +--rw nss-ref        -> /nst/netslice-subnet/id
|   |   +--rw nsd-connection-point-ref -> /nsd:nsd-catalog/
|   |                                   nsd/connection-point/name
|   +--rw ip-address?       inet:ip-address
```



NST - netslice-vld section

```
netslice-vld:
- id: slice_cirros_vld_mgmt
  name: slice_cirros_vld_mgmt
  type: ELAN
  mgmt-network: 'true'
  nss-connection-point-ref:
  - nss-ref: slice_hackfest_nsd_1
    nsd-connection-point-ref: nsd_cp_mgmt
  - nss-ref: slice_hackfest_nsd_2
    nsd-connection-point-ref: nsd_cp_mgmt
  - nss-ref: slice_hackfest_nsd_3
    nsd-connection-point-ref: nsd_cp_mgmt
- id: slice_cirros_vld_data1
  name: slice_cirros_vld_data1
  type: ELAN
  nss-connection-point-ref:
  - nss-ref: slice_hackfest_nsd_1
    nsd-connection-point-ref: nsd_cp_data
  - nss-ref: slice_hackfest_nsd_2
    nsd-connection-point-ref: nsd_cp_data_east
```

• The Information model for the NST is available:
http://osm-download.etsi.org/repository/osm/debian/ReleaseSIX/docs/osm-im/osm_im_trees/nst.html

Creating a Network Slice Template (NST)

NST - netslice-subnet section

```
netslice-subnet:  
  id: slice_hackfest_nsd_1  
  nsd-ref: slice_hackfest_nsd
```

NSD - id, name, and NS parameters section

```
nsd-catalog:  
  nsd:  
    - id: slice_hackfest_nsd  
      name: slice_hackfest_nsd  
      short-name: slice_hackfest_ns
```

NST - netslice-vld

```
netslice-vld:  
- id: slice_hackfest_vld_mgmt  
  name: slice_hackfest_vld_mgmt  
  type: ELAN  
  mgmt-network: 'true'  
  nss-connection-point-ref:  
    - nss-ref: slice_hackfest_nsd_1  
      nsd-connection-point-ref: nsd_cp_mgmt
```

NSD - connection-point section

```
connection-point:  
- name: nsd_cp_mgmt  
  vld-id-ref: nsd_vnfd_vld_mgmt
```

• The Information model for the NST is available:
http://osm-download.etsi.org/repository/osm/debian/ReleaseSIX/docs/osm-im/osm_im_trees/nst.html

Before the netslice instantiation, Adding VNF, NS packages and NST

- VNF package:
 - `osm vnfd-list`
 - `osm vnfd-create slice_hackfest_vnfd.tar.gz`
 - `osm vnfd-create slice_hackfest_middle_vnfd.tar.gz`
 - `osm vnfd-show hackfest_slice_vnfd`
- NS package:
 - `osm nsd-list`
 - `osm nsd-create slice_hackfest_nsd.tar.gz`
 - `osm nsd-create slice_hackfest_middle_nsd.tar.gz`
 - `osm nsd-show hackfest_slice_nsd`
- NST:
 - `osm nst-list`
 - `osm nst-create slice_hackfest_nstd.yaml`
 - `osm nst-create slice_hackfest_nstd2.yaml`
 - `osm nst-show hackfest_slice_nst`

Creating a Network Slice Instance (CLI)

- `osm nsi-create --help`

Usage: `osm nsi-create [OPTIONS]`
creates a new Network Slice Instance (NSI)

Options:

<code>--nsi_name TEXT</code>	name of the Network Slice Instance
<code>--nst_name TEXT</code>	name of the Network Slice Template
<code>--vim_account TEXT</code>	default VIM account id or name for the deployment
<code>--ssh_keys TEXT</code>	comma separated list of keys to inject to vnfs
<code>--config TEXT</code>	Netslice specific yaml configuration: netslice_subnet: [id: TEXT, vim_account: TEXT, vnf: [member-vnf-index: TEXT, vim_account: TEXT] vld: [name: TEXT, vim-network- name: TEXT or DICT with vim_account, vim_net entries]], netslice-vld: [name: TEXT, vim-network-name: TEXT or DICT with vim_account, vim_net entries]
<code>--config_file TEXT</code>	nsi specific yaml configuration file
<code>--help</code>	Show this message and exit.

- `osm nsi-create --nsi_name my_first_slice --nst_name slice_hackfest_nst --vim_account <replace_vim_account_name>`

Listing and Deleting a Network Slice Instance (CLI)

- List Network Slice Instances
 - `osm nsi-list`
- Delete Network Slice Instance
 - `osm nsi-delete <nsi_name> or <nsi_id>`

Creating a Network Slice Instance using config (CLI)

Using --config option to set the vim-network-name for a netslice-vld:

```
--config TEXT      Netslice specific yaml configuration:
                    netslice_subnet: [
                        id: TEXT, vim_account: TEXT,
                        vnf: [member-vnf-index:
                            TEXT, vim_account: TEXT]
                        vld: [name: TEXT, vim-network-
                            name: TEXT or DICT with vim_account, vim_net entries]],
                    netslice-vld: [name: TEXT, vim-network-name: TEXT or
                                    DICT with vim_account, vim_net entries]
```

- `osm nsi-create --nsi_name my_first_slice --nst_name slice_hackfest_nstd --vim_account <replace_vim_account_name> --config 'netslice-vld: [{name: slice_cirros_vld_mgmt, vim-network-name: <replace_vim_network_name>}]'`

Managing Network Slice Templates (via CLI)

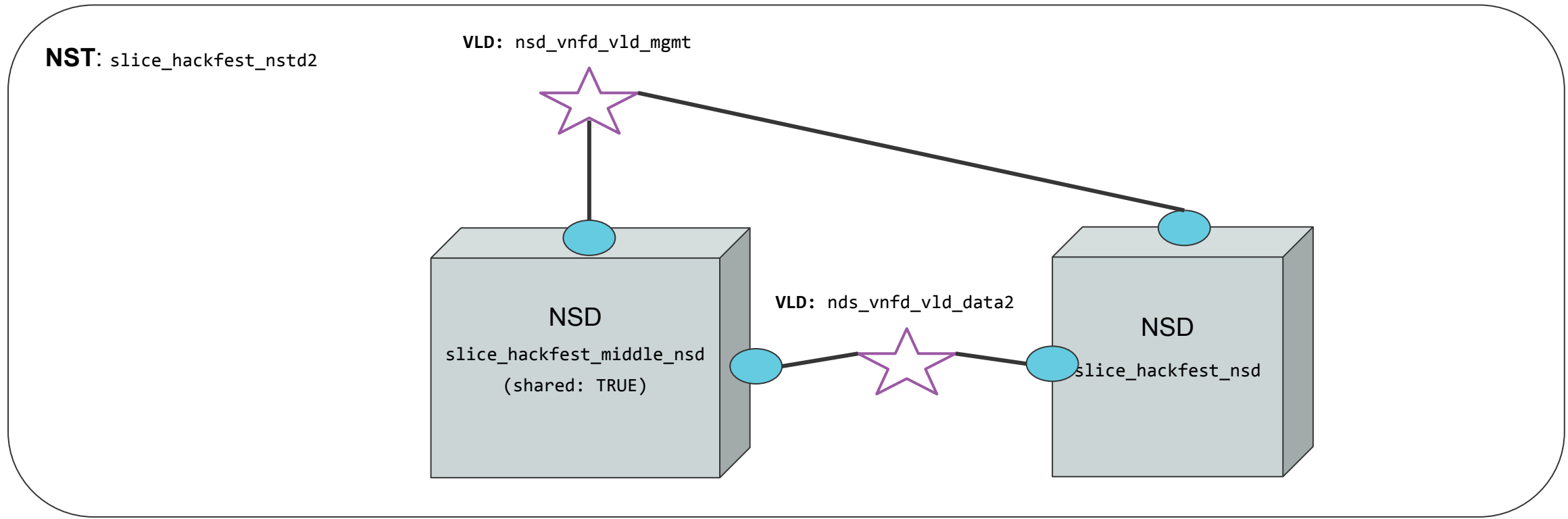
- Creates a new Network Slice Template
 - `netslice-template-create / nst-create`
- Deletes a Network Slice Template
 - `netslice-template-delete / nst-delete`
- List all Network Slice Templates
 - `netslice-template-list / nst-list`
- Shows the content of a Network Slice Template
 - `netslice-template-show / nst-show`
- Updates a Network Slice Template
 - `netslice-template-update / nst-update`

Managing Network Slice Instances (via CLI)

- Creates a new Network Slice Instance
 - `netslice-instance-create / nsi-create`
- Deletes a Network Slice Instance
 - `netslice-instance-delete / nsi-delete`
- List all Network Slice Instances (NSI)
 - `netslice-instance-list / nsi-list`
- Shows the history of operations over a
 - `netslice-instance-op-list / nsi-op-list`
- Shows the info of an operation over a Network Slice Instance(NSI)
 - `netslice-instance-op-show / nsi-op-show`
- Shows the content of a Network Slice Instance (NSI)
 - `netslice-instance-show / nsi-show`

Shared Network Slices

- Let's share the middle NS using a new NST



Network Slice Template 2

nst:

- id: slice_hackfest_nstd2
name: slice_hackfest_nstd2
SNSSAI-identifier:
 slice-service-type: eMBB
quality-of-service:
 id: 1

netslice-subnet:

- id: slice_hackfest_nsd_2
is-shared-nss: 'true'
description: NetSlice Subnet (service) composed by 1 vnf with 3 cp
nsd-ref: slice_hackfest_middle_nsd
- id: slice_hackfest_nsd_3
is-shared-nss: 'false'
description: NetSlice Subnet (service) composed by 1 vnf with 2 cp
nsd-ref: slice_hackfest_nsd

netslice-vld:

- id: slice_cirros_vld_mgmt
name: slice_cirros_vld_mgmt
type: ELAN
mgmt-network: 'true'
nss-connection-point-ref:
 - nss-ref: slice_hackfest_nsd_2
nsd-connection-point-ref: nsd_cp_mgmt
 - nss-ref: slice_hackfest_nsd_3
nsd-connection-point-ref: nsd_cp_mgmt.

- id: slice_cirros_vld_data2
name: slice_cirros_vld_data2
type: ELAN
nss-connection-point-ref:
 - nss-ref: slice_hackfest_nsd_2
nsd-connection-point-ref: nsd_cp_data_west
 - nss-ref: slice_hackfest_nsd_3
nsd-connection-point-ref: nsd_cp_data

Creating a Network Slice Instance (UI)

- List Network Slice Templates

- In the left panel, click on the Netslice Templates icon

 NetSlice Templates

Network Slices Templates Home > NetSlice Templates

Show 10 entries Search:

Name	Identifier	Usage State	Actions
slice_hackfest_nst	8b3ce224-0b1c-48af-bdb8-c9d986de0335	NOT_IN_USE	   

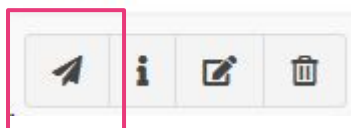
Showing 1 to 1 of 1 entries Previous 1 Next

 Just drag and drop files here

Creating a Network Slice Instance (UI)

- Create Network Slice Template
 - In the Netslice Template view, click on the Instantiate NST icon

Actions



New NSI

Name *

my_netslice

Description *

Description

Nst Id *

slice_hackfest_nst

Vim Account Id *

Openstack_7.18

SSH Key

Paste your key here...

Config

Yaml config

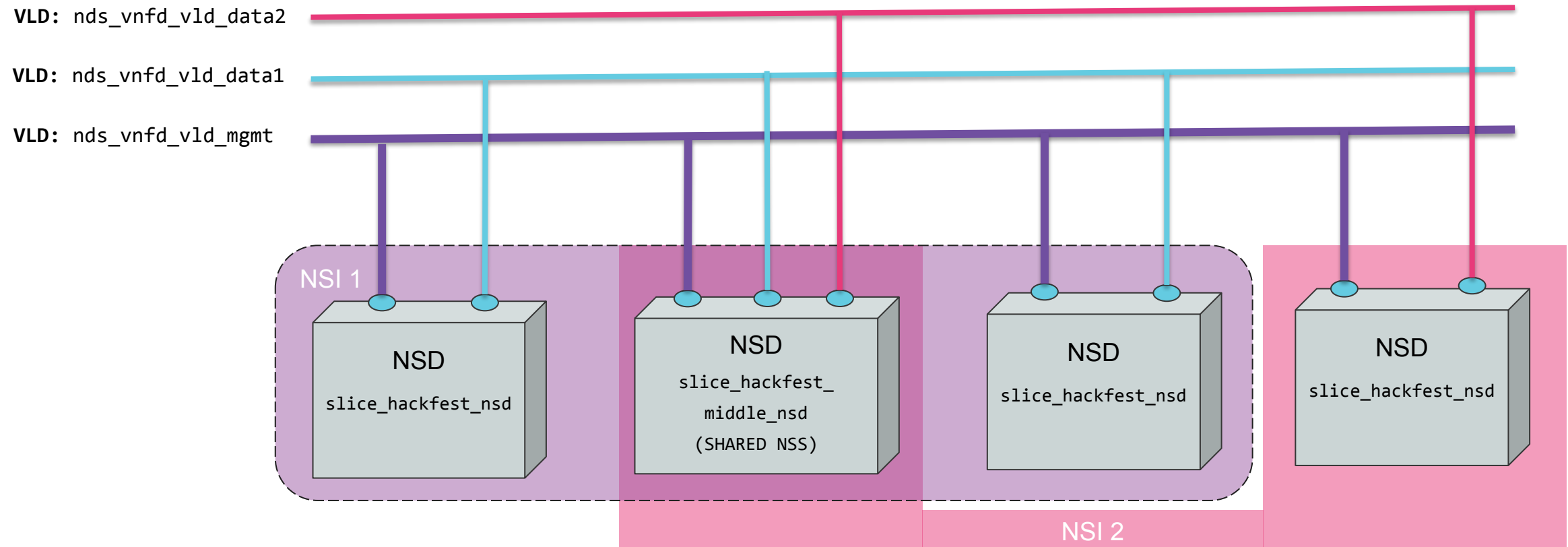
netslice-vld:
- name: slice_cirros_vld_mgmt
vim-network-name: osm-ext

Cancel

Create

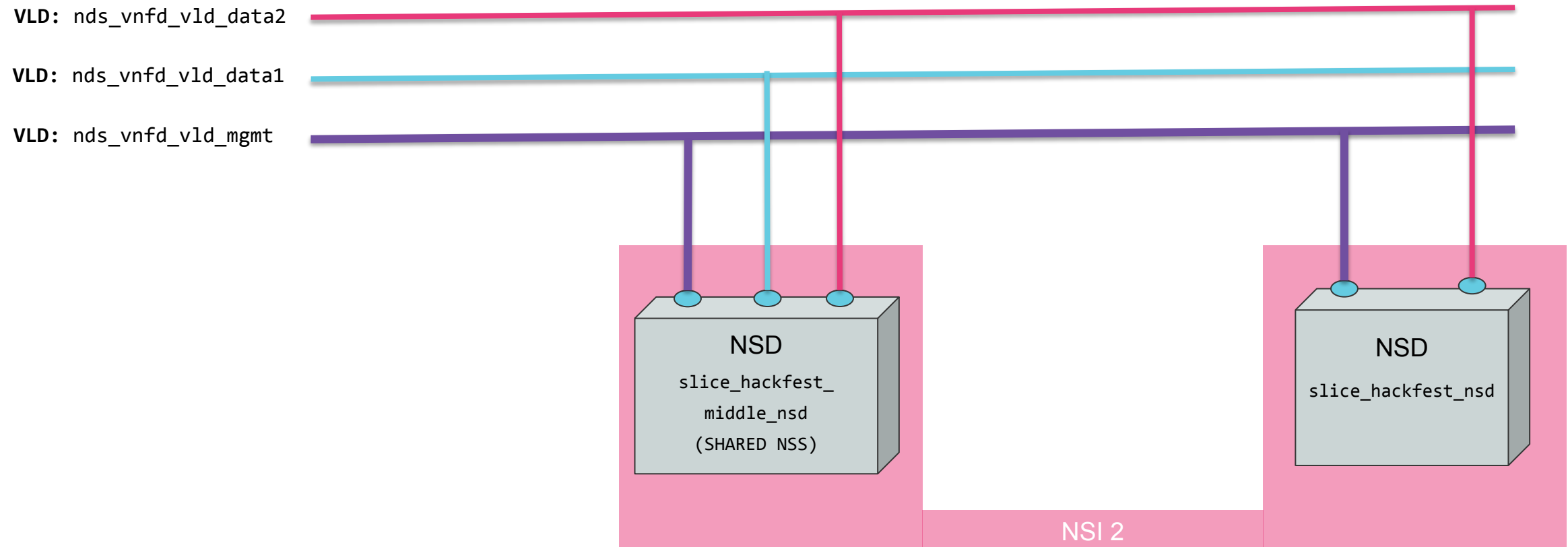
Shared Network Slices

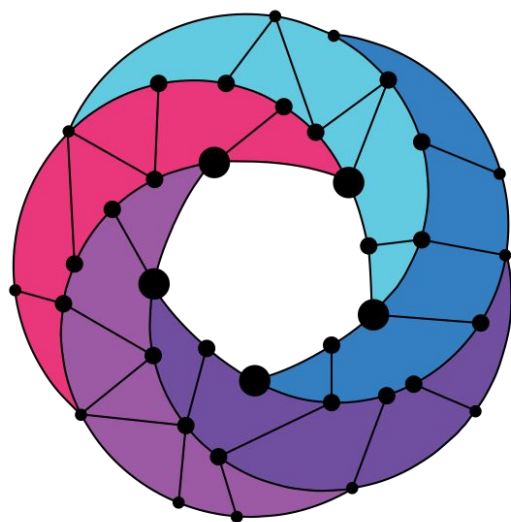
- Final deployment



Shared Network Slices

- Result of deleting NSI 1





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