

# Open Source MANO

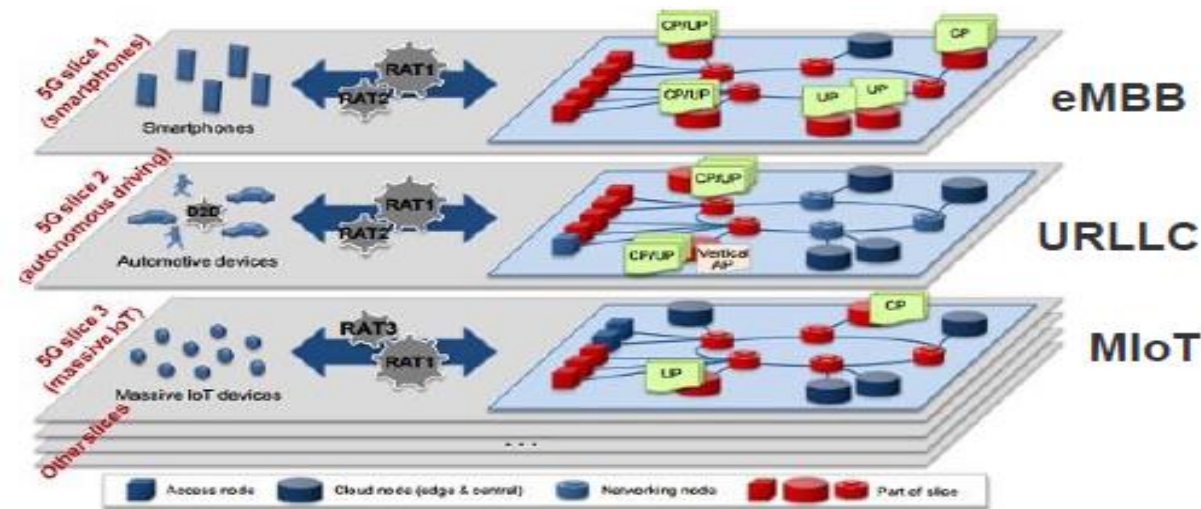
## OSM Hackfest – Session 8 5G Network Slicing with OSM

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# 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.



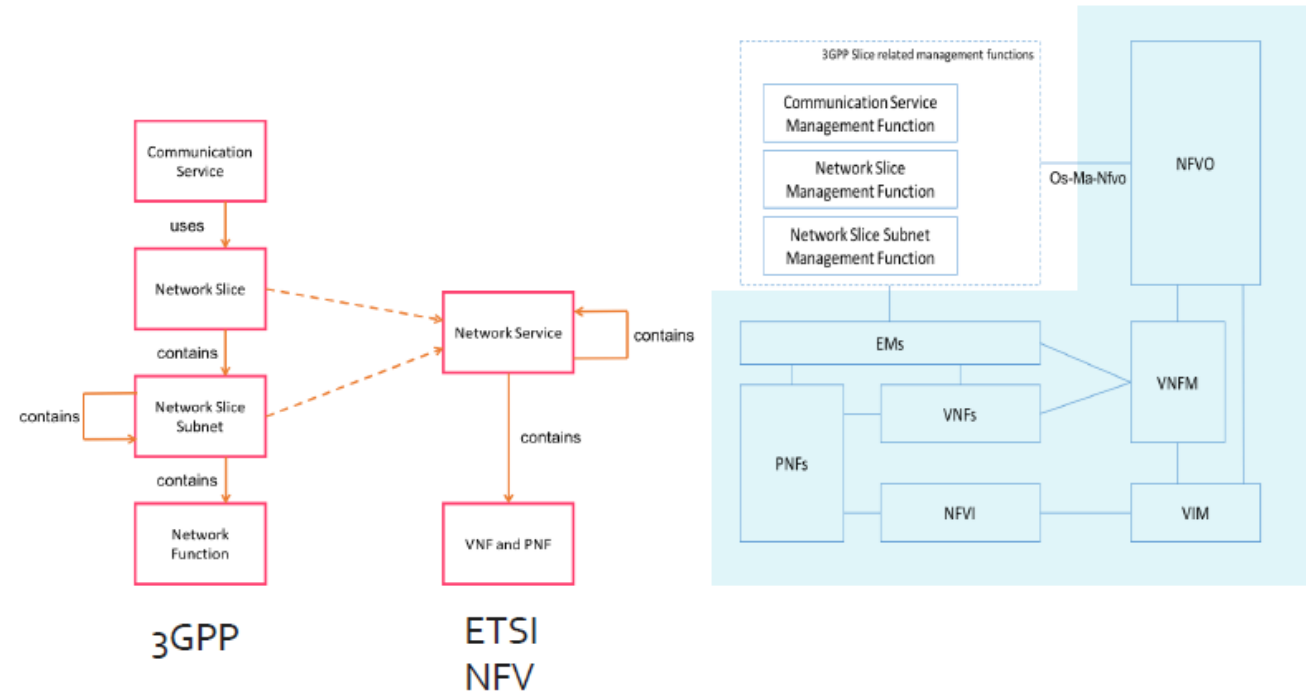
Source: NGMN

# ETSI NFV Framework for Network Slicing

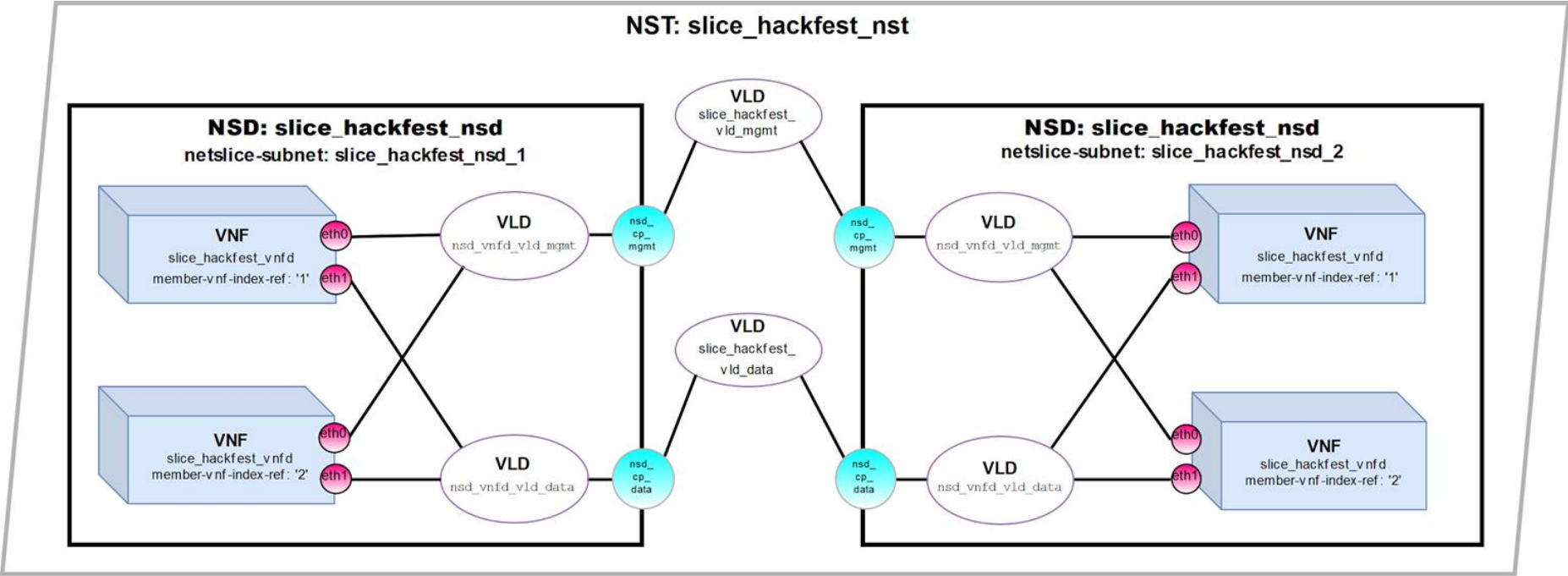
Analysis of 3GPP and alignment of NFV architecture in the ETSI GR NFV-EVE 012

Considerations:

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



# NST diagram



# Network Slice Template Requirements

## VNFD:

- slice\_hackfest\_vnfd.tar.gz

## NSD:

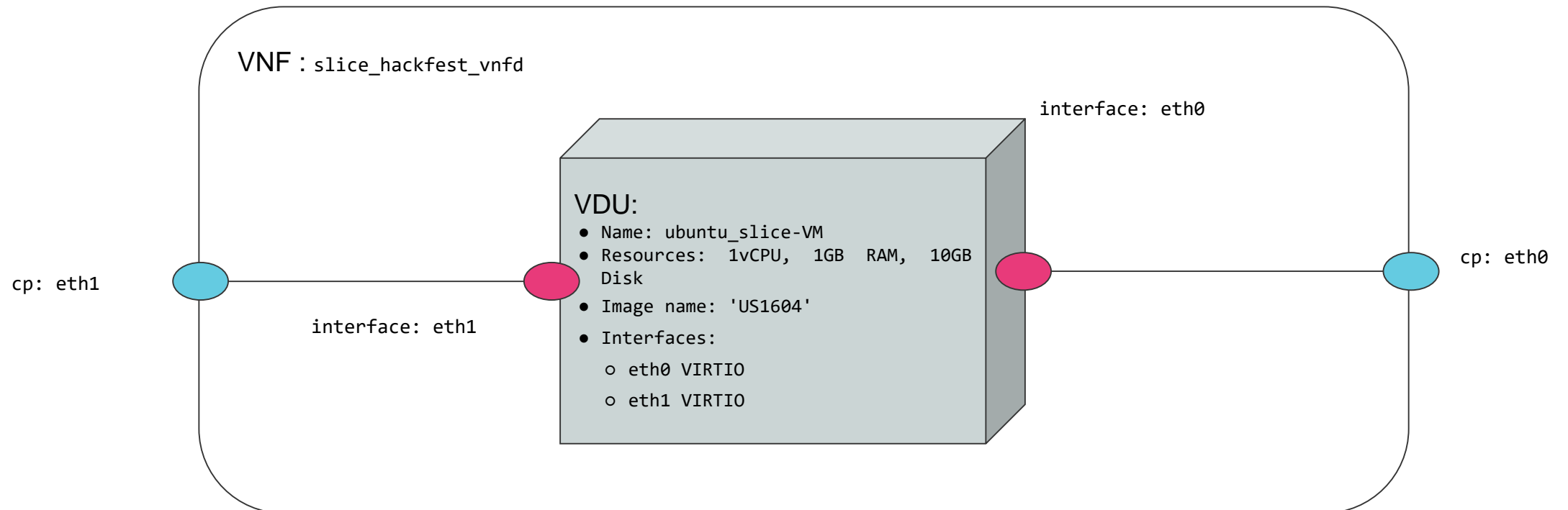
- slice\_hackfest\_nsd.tar.gz

## NST:

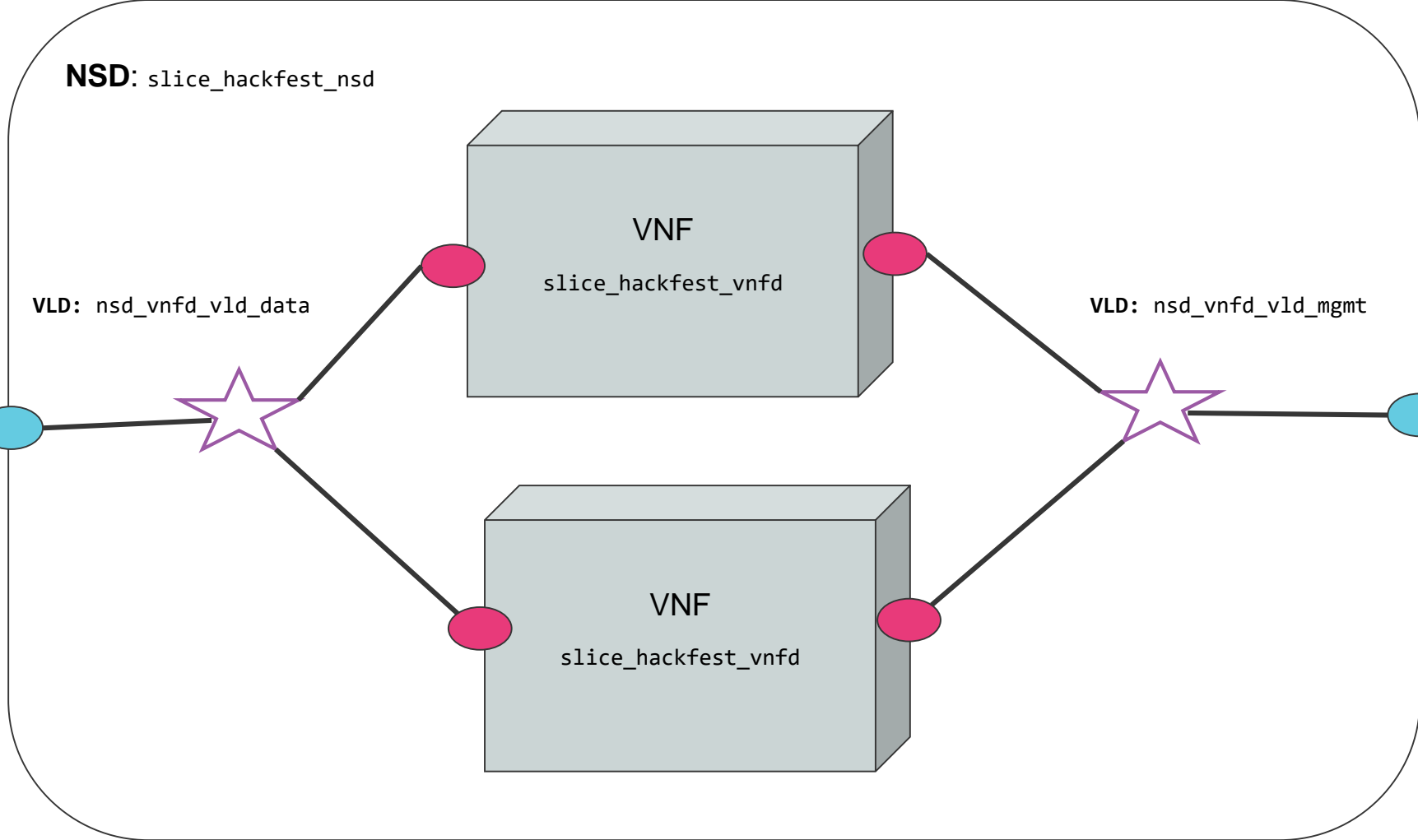
- slice\_hackfest\_nst.yaml

- The descriptors for the slice hackfest session are available:
  - <https://osm-download.etsi.org/ftp/osm-5.0-five/5th-hackfest/packages/>

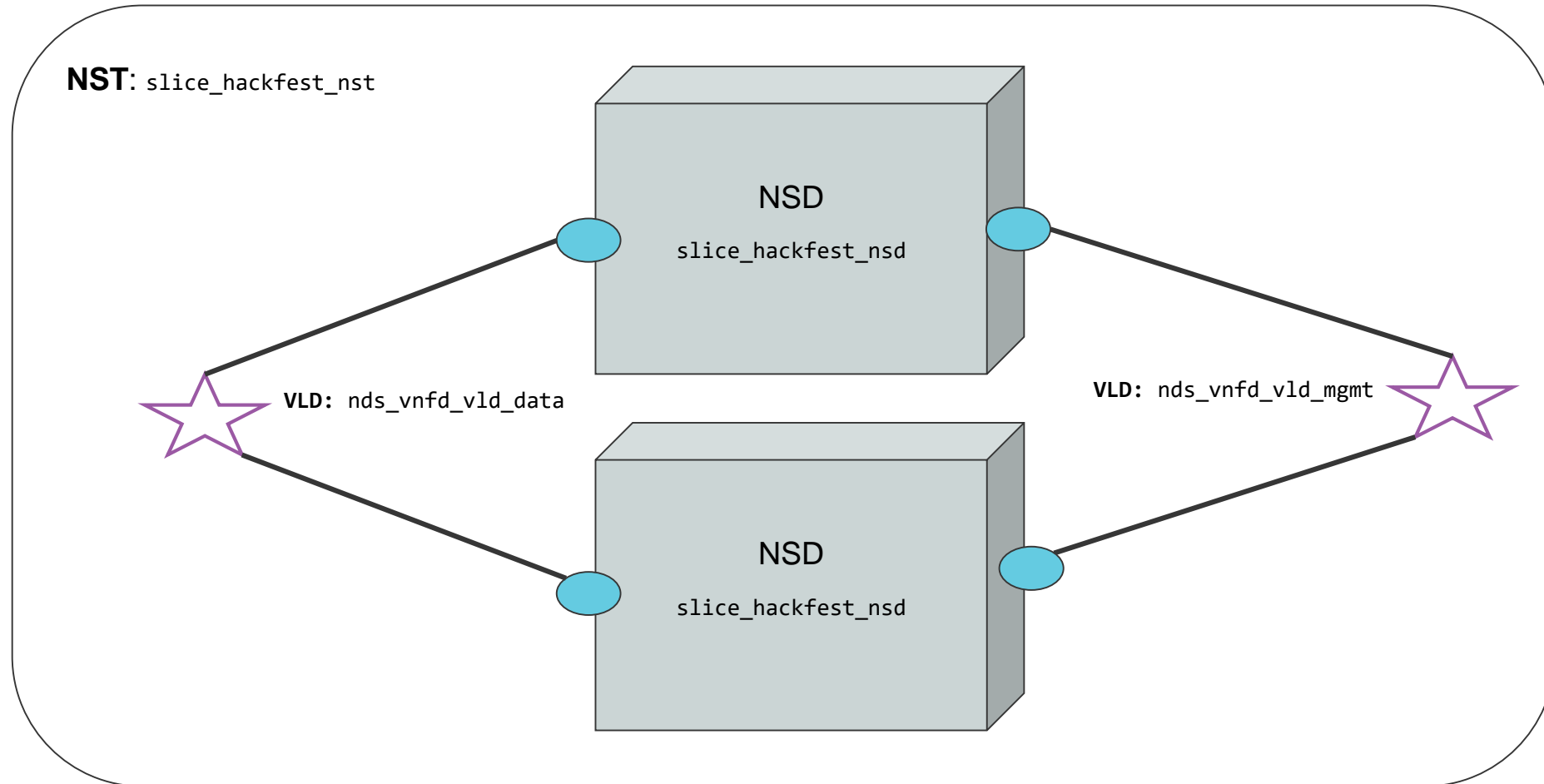
# VNFD - slice\_hackfest\_vnfd



# NSD - slice\_hackfest\_nsd



# NST - slice\_hackfest\_nst





# Network Slice Template

```
nst:
- id: slice_hackfest_nst
  name: slice_hackfest_nst
  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 2 vnfs and 4 cp (2 mgmt and 2 data)
  nsd-ref: slice_hackfest_nsd
- id: slice_hackfest_nsd_2
  is-shared-nss: 'false'
  description: NetSlice Subnet (service) composed by 2 vnfs and 4 cp (2 mgmt and 2 data)
  nsd-ref: slice_hackfest_nsd

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
  - nss-ref: slice_hackfest_nsd_2
    nsd-connection-point-ref: nsd_cp_mgmt
- id: slice_hackfest_vld_data
  name: slice_hackfest_vld_data
  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
```

# 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/ReleaseFIVE/docs/osm-im/osm\\_im\\_trees/nst.html](http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/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 2 vnfs and 4 cp
(2 mgmt and 2 data)
  nsd-ref: slice_hackfest_nsd
- id: slice_hackfest_nsd_2
  is-shared-nss: 'false'
  description: NetSlice Subnet (service) composed by 2 vnfs and 4 cp
(2 mgmt and 2 data)
  nsd-ref: slice_hackfest_nsd
```

- The Information model for the NST is available:
  - [http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/docs/osm-im/osm\\_im\\_trees/nst.html](http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/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 2 vnfs and 4 cp (2  
mgmt and 2 data)  
  nsd-ref: slice_hackfest_nsd  
- id: slice_hackfest_nsd_2  
  is-shared-nss: 'false'  
  description: NetSlice Subnet (service) composed by 2 vnfs and 4 cp (2  
mgmt and 2 data)  
  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/ReleaseFIVE/docs/osm-im/osm\\_im\\_trees/nst.html](http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/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_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
  - nss-ref: slice_hackfest_nsd_2
    nsd-connection-point-ref: nsd_cp_mgmt
- id: slice_hackfest_vld_data
  name: slice_hackfest_vld_data
  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
```

- The Information model for the NST is available:
  - [http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/docs/osm-im/osm\\_im\\_trees/nst.html](http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/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/ReleaseFIVE/docs/osm-im/osm\\_im\\_trees/nst.html](http://osm-download.etsi.org/repository/osm/debian/ReleaseFIVE/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 hackfest_slice_vnfd.tar.gz`
  - `osm vnfd-show hackfest_slice_vnfd`
  
- NS package:
  - `osm nsd-list`
  - `osm nsd-create hackfest_slice_nsd.tar.gz`
  - `osm nsd-show hackfest_slice_nsd`
  
- NST:
  - `osm nst-list`
  - `osm nst-create hackfest_slice_nst.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:

```
--nsi_name TEXT      name of the Network Slice Instance
--nst_name TEXT      name of the Network Slice Template
--vim_account TEXT    default VIM account id or name for the deployment
--ssh_keys TEXT       comma separated list of keys to inject to vnfs
--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]
--config_file TEXT   nsi specific yaml configuration file
--help               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)

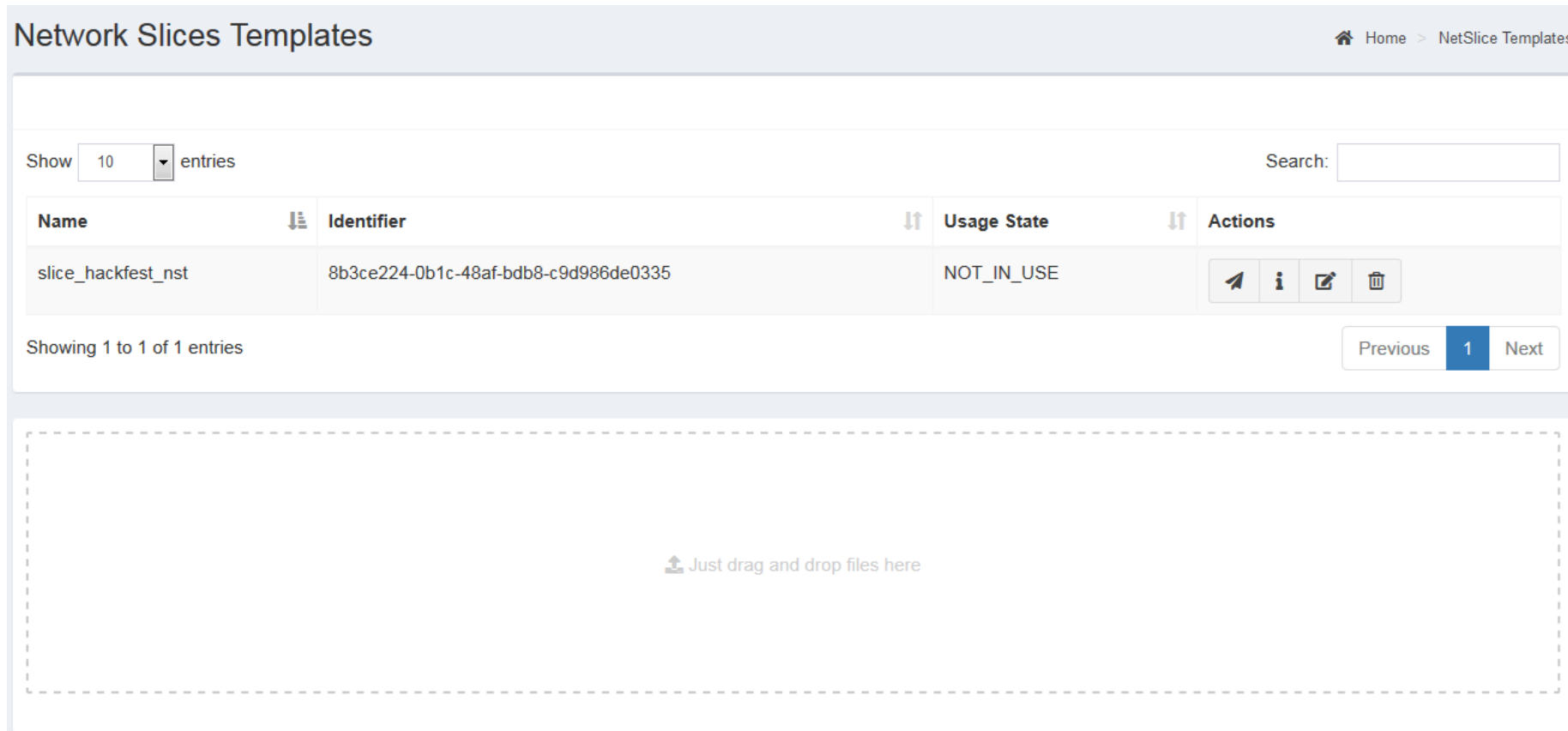
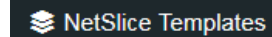
Using `--config` option to set the vim-network-id for a netslice-vld:

```
--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_second_slice --nst_name slice_hackfest_nst --vim_account <replace_vim_account_name> --config 'netslice-vld: [{name: slice_hackfest_vld_data, vim-network-name: <replace_vim_network_name>}]'`




# Creating a Network Slice Instance (UI)

- List Network Slice Templates
  - In the left panel, click on the Netslice Templates icon




Network Slices Templates Home > NetSlice Templates

Show  entries Search:

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

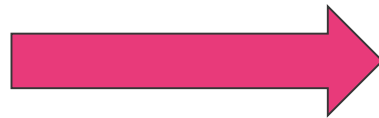
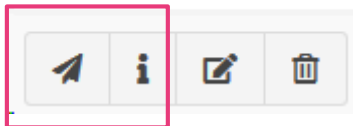
Showing 1 to 1 of 1 entries Previous **1** Next

 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 \***

**Description \***

**Nst Id \***

**Vim Account Id \***

**SSH Key**

**Config**

# 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`

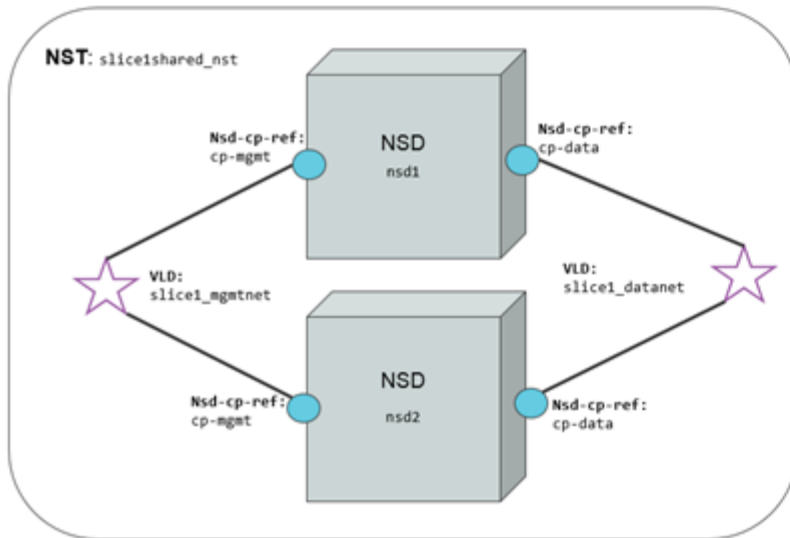
# Managing Network Slice Instances (via CLI)

- 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`

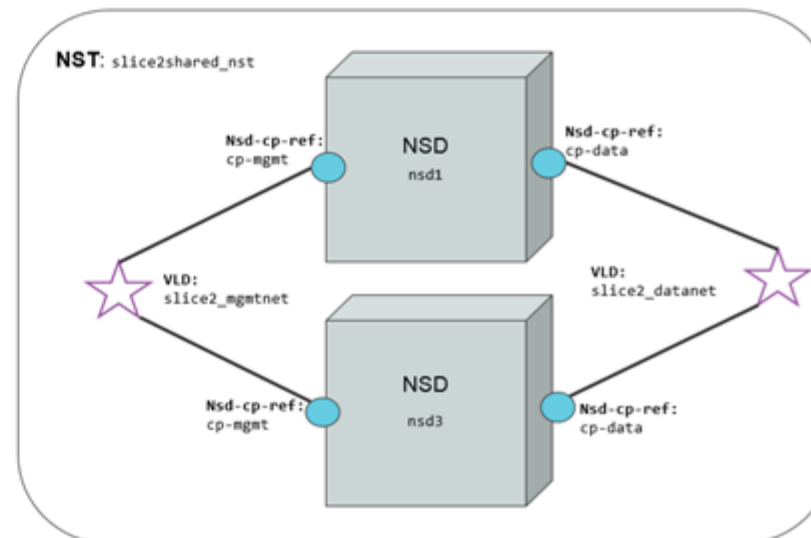
# Demo: Shared Network Slices

- Create two NSTs

- First NST

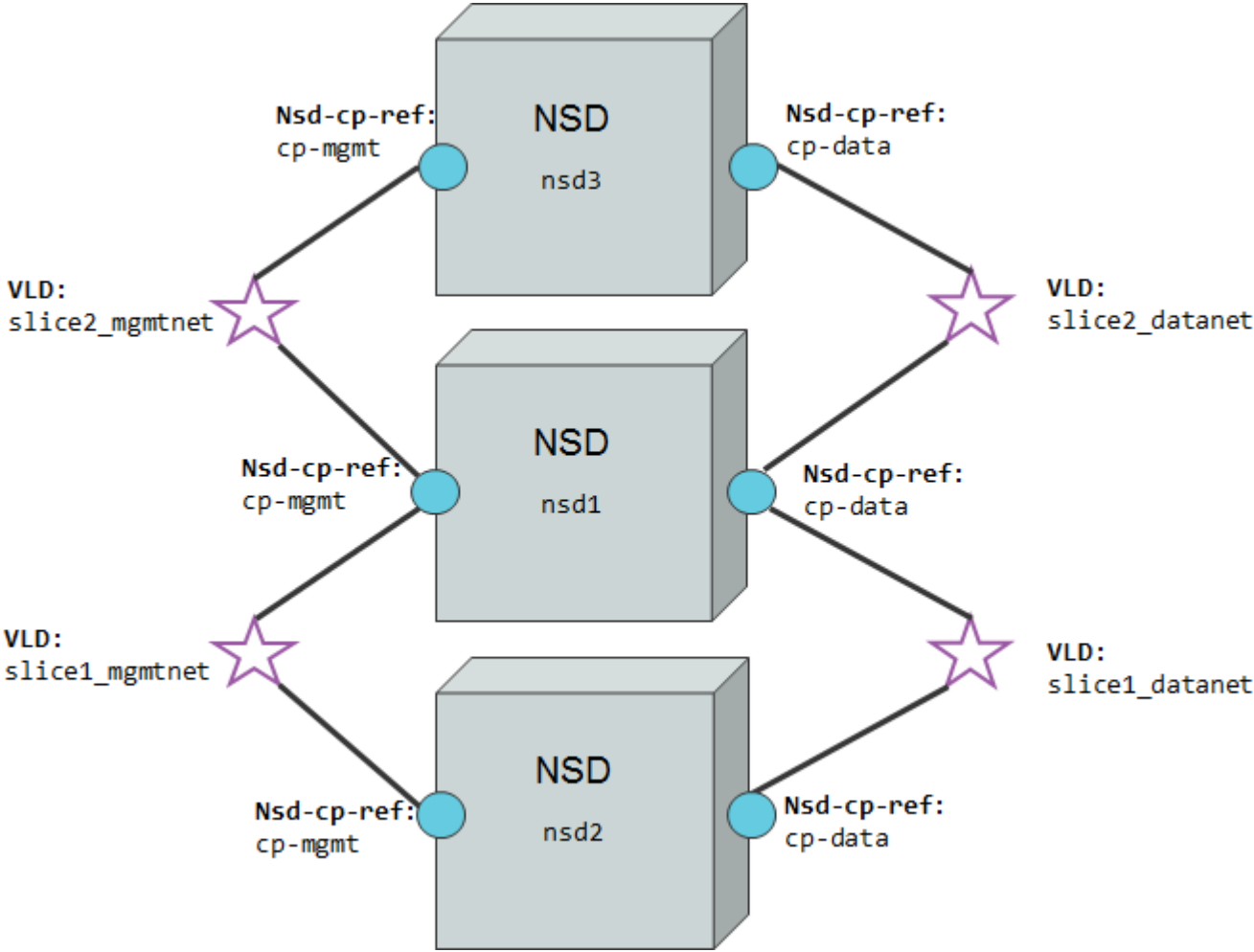


- Second NST



```
netslice-subnet:  
- id: slice_subnet_1  
  is-shared-nss: 'true'  
  description: NetSlice Subnet (service)  
  nsd-ref: nsd1
```

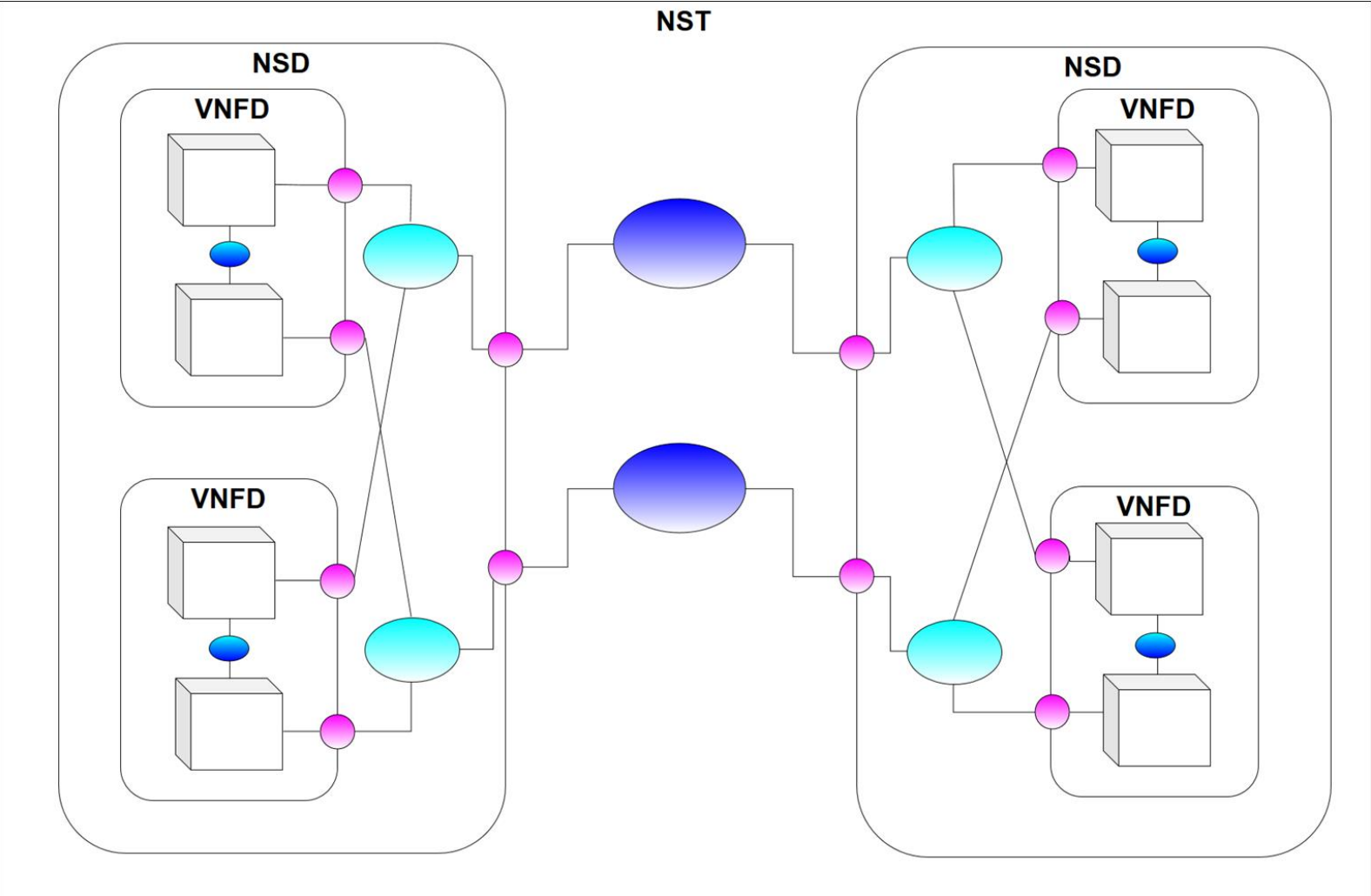
# Final shared scenario

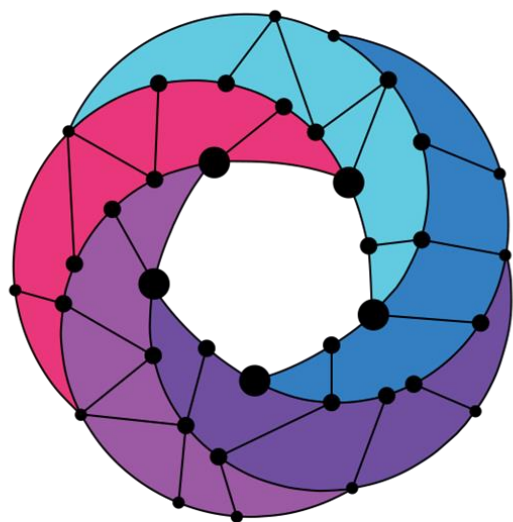




# NST Bonus - From multi-vdu session 3

NSD: [hackfest\\_multivdu\\_ns.tar.gz](http://hackfest_multivdu_ns.tar.gz) VNFD: [hackfest\\_multivdu\\_vnf.tar.gz](http://hackfest_multivdu_vnf.tar.gz)





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