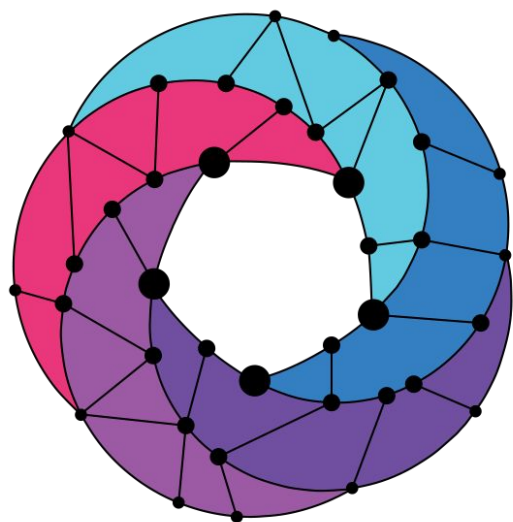




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OSM Hackfest – Session 4.1 Modeling EPA capabilities in VNF

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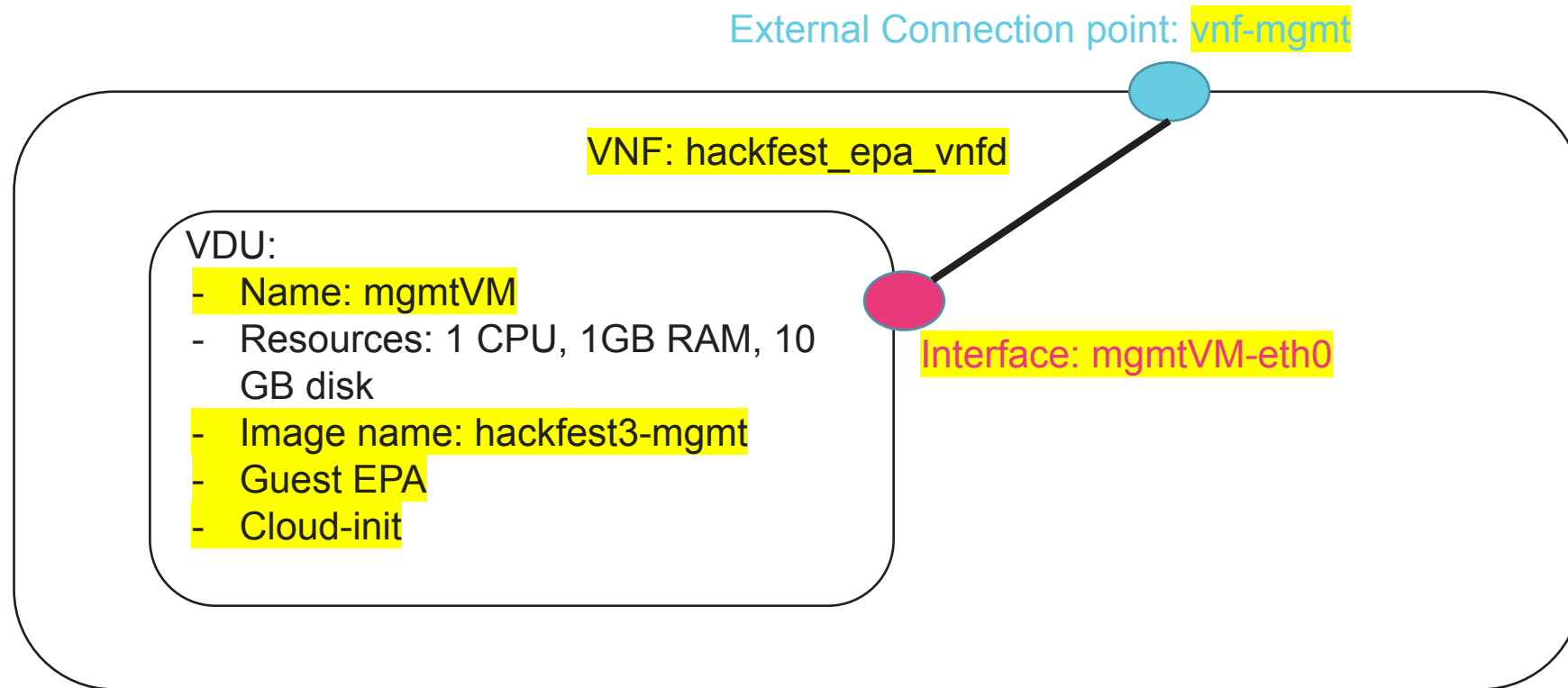
EPA (Enhanced Placement Awareness)

- **EPA features** like the use of large hugepages memory, dedicated CPUs, strict NUMA node placement, the use of passthrough and SR-IOV interfaces, **can be used in OSM's VNF descriptors since Rel ZERO.**
- If your VIM supports EPA, then you don't need to do anything extra to use it from OSM. VIM connectors in OSM take advantage of EPA capabilities if the VIM supports it. All you need to do is build your descriptors and deploy.
- Openstack configuration for EPA ([reference guide](#))

- **Huge pages:** allocates big chunks of memory to avoid having too many entries to look up.
- **CPU Pinning:** binds a set of CPUs to a VM, improving the performance by avoiding degrading events such as cache misses.
- **NUMA (Non-Uniform Memory Access):** it provides separate memory for each processor to avoid the decrease on performance when several processors attempt to address the same memory.
- **SR-IOV (Single Root Input/Output Virtualization):** specification that allows the isolation of a PCI Express resource (e.g. a network interface) for manageability and performance reasons.

VNF EPA diagram

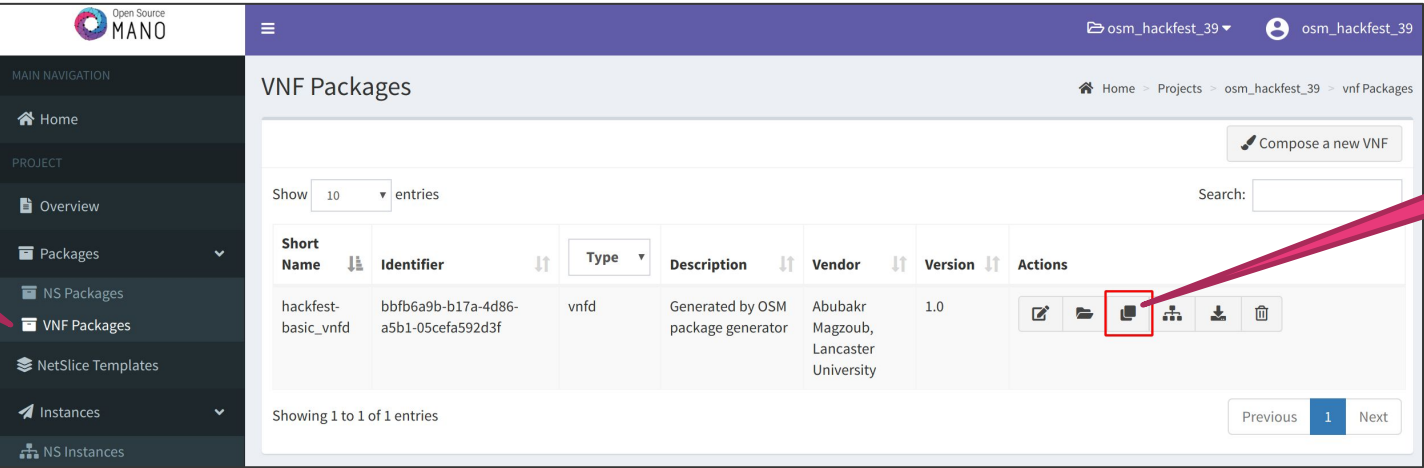
- Starting from `hackfest_basic_vnfd` we can build the following VNF:



Note: changes highlighted in yellow

Clone a VNF package in the UI

- Clone hackfest_basic_vnfd in the user interface



- A new hackfest_basic_vnfd appears:

Short Name	Identifier	Type	Description	Vendor	Version	Actions
clone_hackfest-basic_vnfd	46441fdb-fe29-44a9-9652-07594a54ad2d	vnfd	Generated by OSM package generator	Abubakr Magzoub, Lancaster University	1.0	     
hackfest-basic_vnfd	bbfb6a9b-b17a-4d86-a5b1-05cefa592d3f	vnfd	Generated by OSM package generator	Abubakr Magzoub, Lancaster University	1.0	     

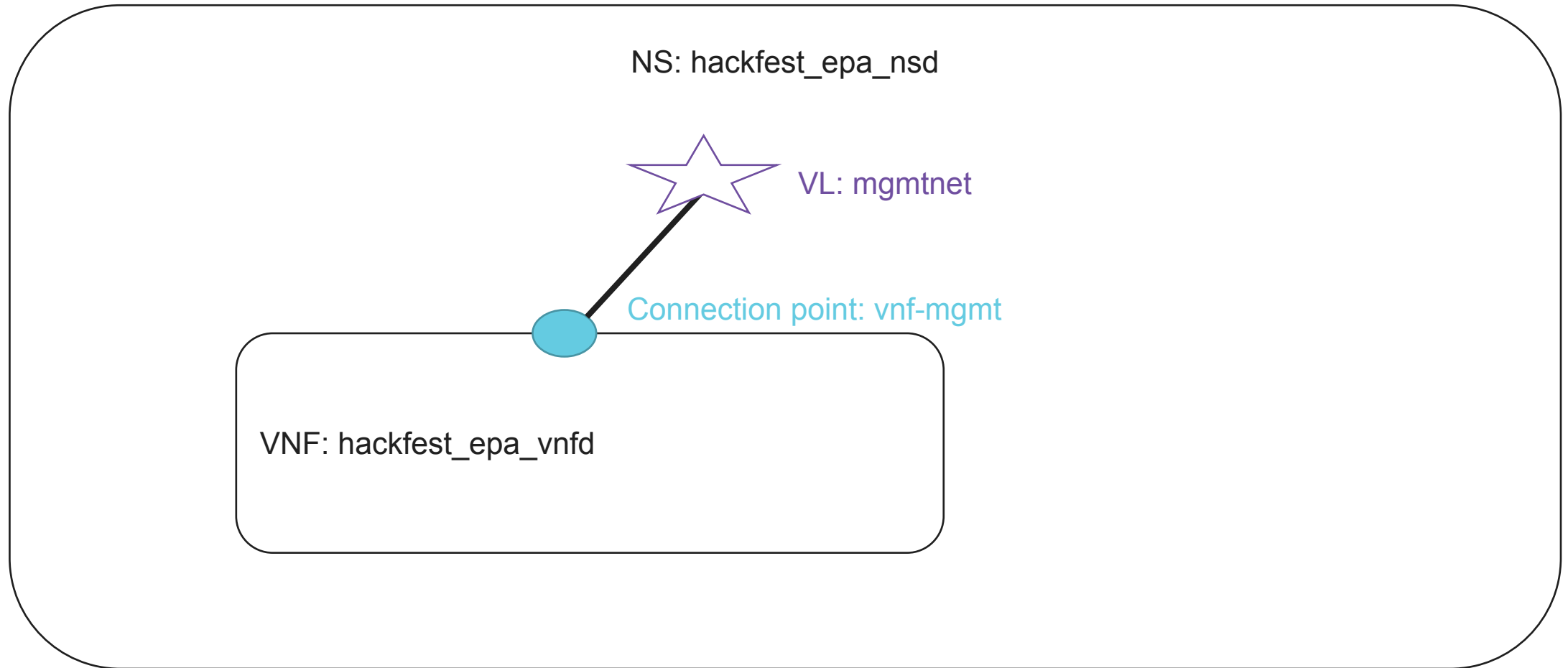
Creating the VNFD

- Edit the new descriptor
- Modify the name and id: hackfest_epa_vnfd
- Modify VDU dataVM:

```
guest-epa:
  cpu-pinning-policy: DEDICATED
  cpu-thread-pinning-policy: PREFER
  mempage-size: LARGE
  numa-node-policy:
    mem-policy: STRICT
    node-cnt: '1'
    node:
      - id: '1'
```

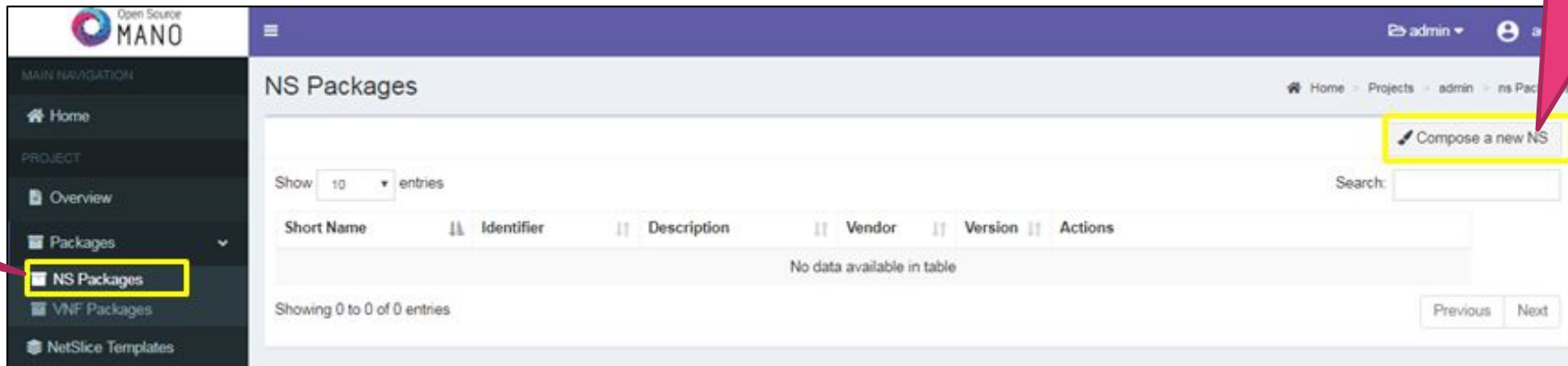
You can check if you modified it correctly by comparing your VNFD to this sample package:
https://osm-download.etsi.org/ftp/osm-6.0-six/8th-hackfest/packages/hackfest_epa_vnfd.tar.gz

NS diagram



Composing a NS

- Steps:
 - Compose a new NS:



- Create new package:



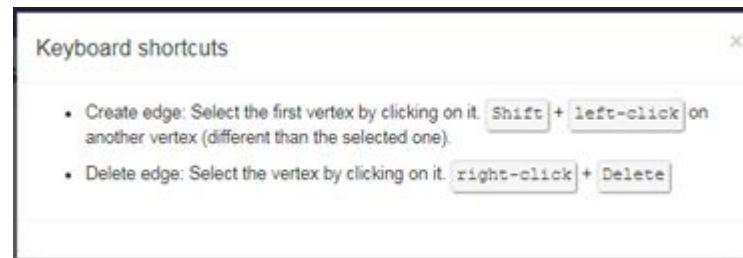
The 'Create new Package' form is shown. It has a title 'Create new Package' and a 'Package name *' field. The text 'hackfest_epa_nsd' is entered in the field, and a pink callout bubble labeled 'hackfest_epa_nsd' points to it. At the bottom of the form, there are two buttons: 'Cancel' and 'Create'.

● Steps

○ NSD Composer



○ Keyboard shortcuts



Creating the NSD (1/2)

● Steps

- Select VNFs:  (Drag and drop)

VNF

```
member-vnf-index  1
                   vnf-id-ref  hackfest_epa-vnf
```

- Create VLs:  (Drag and drop)

Virtual Link

[SAVE](#)

Vim network name	osm-ext
Name	mgmtnet
Mgmt network	true
Type	ELAN
Id	mgmtnet

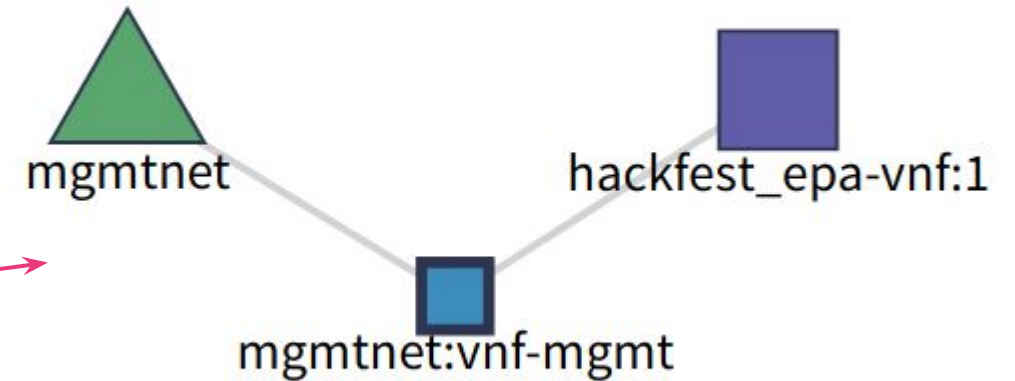
Creating the NSD (2/2)

- Steps

- Link VL to VNF (Shift + Left Click)
 - Select the name for the CP (vnf-mgmt)

mgmtnet:vnf-mgmt

- Final Scenario



You can check if you designed it correctly by comparing your NSD to this sample package:
https://osm-download.etsi.org/ftp/osm-6.0-six/8th-hackfest/packages/hackfest_epa_ns.tar.gz

Deploying NS in the UI (1/4)

- Onboard VNFD and NSD to catalog using the UI
- Launch the NS from the UI
 - Depending on the VIM, specify a VIM network name to map **mgmtnet**
 - If you need to change the VIM, change the network name using config:

```
{vld: [{name: mgmtnet, vim-network-name: osm-ext}]}
```
- Click the info button to see the mgmt IP address of each VNF
- Connect to management VNF:
 - `ssh ubuntu@<IP>`
 - password: **osm4u**

Checking EPA in OpenStack CLI

- There are several methods to check if the NUMA and HugesPages were applied. We are going to show one method. This is to check the OpenStack Flavors assigned to the created VM.
- List the servers: `openstack server list`

ID	Name	Status	Networks
76a01cc4-e8df-4d63-a8e6-b1a6a1e40576	epa_test-2-dataVM-1	ACTIVE	epa_test-datanet=192.168.255.10; epa_test-internal=192.168.101.13
5f1a94dc-12a6-4b71-83a9-417236525374	epa_test-2-mgmtVM-1	ACTIVE	osm-ext=172.21.248.114; epa_test-internal=192.168.101.5
e03b91f7-ef94-4fad-9caf-2ea80b37befe	epa_test-1-dataVM-1	ACTIVE	epa_test-datanet=192.168.255.2; epa_test-internal=192.168.150.6
0162b119-5509-4875-9615-081936066186	epa_test-1-mgmtVM-1	ACTIVE	osm-ext=172.21.248.129; epa_test-internal=192.168.150.13

Checking EPA in OpenStack CLI

- Show one of the data servers

```
openstack server show <mgmt_server_uuid>
```

- Show the flavor of the server

```
openstack flavor show <mgmt_server_flavor_uuid>
```

Field	Value
OS-FLV-DISABLED:disabled	False
OS-FLV-EXT-DATA:ephemeral	0
disk	10
id	484e48ad-9ced-4a99-b6a0-af2fe803e502
name	dataVM-flv-16
os-flavor-access:is_public	True
properties	hw:cpu_policy='dedicated', hw:cpu_sockets='1', hw:cpu_thread_policy='prefer', hw:mem_page_size='large', hw:numa_mempolicy='strict', hw:numa_nodes='1'
ram	1024
rxtx_factor	1.0
swap	
vcpus	4

Checking EPA in OpenStack UI

- The flavour of the VM should be a new custom one:

☐	Instance Name	Image Name	IP Address	Flavour	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
☐	epa-1-mgmtVM-1	hackfest3-mgmt	172.21.248.111	mgmtVM-flv-1	-	Active	nova	None	Running	9 hours, 5 minutes	Create Snapshot

- That flavour should have custom metadata:

Flavours

Filter

+ Create Flavour Delete Flavours

Displaying 13 items

☐	Flavour Name	VCPUs	RAM	Root Disk	Ephemeral Disk	Swap Disk	RX/TX factor	ID	Public	Metadata	Actions
☐	mgmtVM-flv-1	1	1GB	10GB	0GB	0MB	1.0	4e63f87e-1e7c-4cb9-9fb8-3755783f9ba4	Yes	Yes	Update Metadata
☐	cirros_vnfd-VM-flv	1	256MB	0GB	0GB	0MB	1.0	18a278bc-067a-4ea3-80a7-d85976361598	Yes	No	Update Metadata
☐	hackfest-basic_vnfd-VM-flv	1	1GB	10GB	0GB	0MB	1.0	2d67a9e5-f6af-460e-92cf-f7fed0c26149	Yes	No	Update Metadata

EPA metadata in OpenStack

- Looking into that metadata, it should have the values

Update Flavour Metadata

You can specify resource metadata by moving items from the left column to the right column. In the left column there are metadata definitions from the Glance Metadata Catalog. Use the "Custom" option to add metadata with the key of your choice.

Available Metadata

Filter

Custom

+

➤ CIM Processor Allocation Setting

+

➤ CIM Resource Allocation Setting Data

+

➤ CIM Storage Allocation Setting Data

+

➤ CIM Virtual System Setting Data

+

➤ Compute Host Capabilities

+

➤ Flavor Quota

+

➤ libvirt Driver Options

+

➤ Random Number Generator

+

Existing Metadata

Filter

hw:cpu_policy

dedicated

▼

+

hw:cpu_sockets

1

+

hw:cpu_thread_policy

prefer

▼

+

hw:mem_page_size

large

+

hw:numa_mempolicy

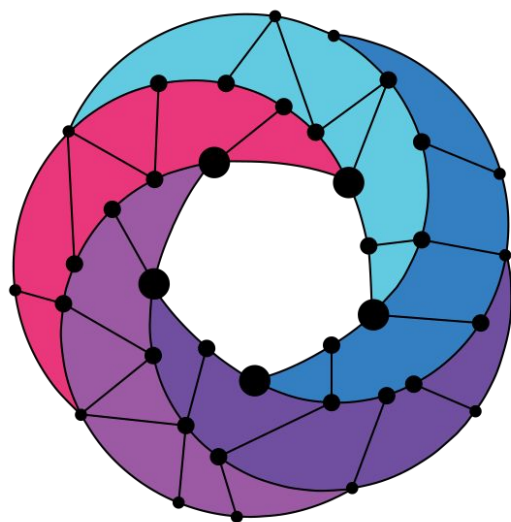
strict

+

hw:numa_nodes

1

+



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