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](#))
EPA examples

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

**VDU:**
- **Name:** mgmtVM
- **Resources:** 1 CPU, 1GB RAM, 10 GB disk
- **Image name:** hackfest3-mgmt
- **Guest EPA**
- **Cloud-init**

**External Connection point:** vnf-mgmt

**Interface:** mgmtVM-eth0

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:
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](https://osm-download.etsi.org/ftp/osm-6.0-six/8th-hackfest/packages/hackfest_epa_vnfd.tar.gz)
Composing a NS

- **Steps:**
  - Compose a new NS:
    - NS Packages
  - Create new package:
    - hackfest_epa_nsd
NSD Composer

- Steps
  - NSD Composer
  - Keyboard shortcuts
Creating the NSD (1/2)

- Steps
  - Select VNFs: hackfest_epa-vnf:1 (Drag and drop)
  - Create VLs: mgmtnet (Drag and drop)
Creating the NSD (2/2)

- **Steps**
  - Link VL to VNF (Shift + Left Click)
  - Select the name for the CP (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](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:
    
    ```json
    {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

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Status</th>
<th>Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>76a03cc4-e8df-4e63-8e66-01a6a1e40576</td>
<td>epa_test-2-dataVM-1</td>
<td>ACTIVE</td>
<td>epa_test-datanet=192.168.255.10; epa_test-internal=192.168.101.13</td>
</tr>
<tr>
<td>5f1a044e-12a6-4b71-83a9-417236525374</td>
<td>epa_test-2-mgmtVM-1</td>
<td>ACTIVE</td>
<td>epa_test-datanet=192.168.255.10; epa_test-internal=192.168.101.13</td>
</tr>
<tr>
<td>e03b9177-ef94-4f9d-9c9f-2ee80b37befe</td>
<td>epa_test-1-dataVM-1</td>
<td>ACTIVE</td>
<td>epa_test-datanet=192.168.255.2; epa_test-internal=192.168.150.6</td>
</tr>
<tr>
<td>0162b119-5589-4875-9615-981936866186</td>
<td>epa_test-1-mgmtVM-1</td>
<td>ACTIVE</td>
<td>epa_test-datanet=192.168.255.2; epa_test-internal=192.168.150.6</td>
</tr>
</tbody>
</table>
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>
Checking EPA in OpenStack UI

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

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>Image Name</th>
<th>IP Address</th>
<th>Flavour</th>
<th>Key Pair</th>
<th>Status</th>
<th>Availability Zone</th>
<th>Task</th>
<th>Power State</th>
<th>Time since created</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>epa-1-mgmtVM-1</td>
<td>hackfest3-mgmt</td>
<td>172.21.248.111</td>
<td>mgmtVM-flv-1</td>
<td>-</td>
<td>Active</td>
<td>nova</td>
<td>None</td>
<td>Running</td>
<td>9 hours, 5 minutes</td>
<td>Create Snapshot</td>
</tr>
</tbody>
</table>

- That flavour should have custom metadata:

Flavours

Displaying 13 items

<table>
<thead>
<tr>
<th>Flavour Name</th>
<th>VCPUs</th>
<th>RAM</th>
<th>Root Disk</th>
<th>Ephemeral Disk</th>
<th>Swap Disk</th>
<th>RX/TX factor</th>
<th>ID</th>
<th>Public</th>
<th>Metadata</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>mgmtVM-flv-1</td>
<td>1</td>
<td>1GB</td>
<td>10GB</td>
<td>0GB</td>
<td>0MB</td>
<td>1.0</td>
<td>4e6238f7-3a7c-4e70-aeb9-9be8-375f7b3f0a4</td>
<td>Yes</td>
<td>Yes</td>
<td>Update Metadata</td>
</tr>
<tr>
<td>cimc-xhel-Vimd-flv</td>
<td>1</td>
<td>256MB</td>
<td>0GB</td>
<td>0GB</td>
<td>0MB</td>
<td>1.0</td>
<td>18a27f90-0677-4ea3-80a7-db5976361598</td>
<td>Yes</td>
<td>No</td>
<td>Update Metadata</td>
</tr>
<tr>
<td>hackfest-basic_vhdl-VM-flv</td>
<td>1</td>
<td>1GB</td>
<td>10GB</td>
<td>0GB</td>
<td>0MB</td>
<td>1.0</td>
<td>29b7a9e5-80af-4e6e-92cf-7f7ed0cf3a49</td>
<td>Yes</td>
<td>No</td>
<td>Update Metadata</td>
</tr>
</tbody>
</table>

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EPA metadata in OpenStack

• Looking into that metadata, it should have the values

![Update Flavour Metadata](image_url)

Available Metadata:
- 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
- l3vrt Driver Options
- Random Number Generator

Existing Metadata:
- 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
Open Source MANO

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