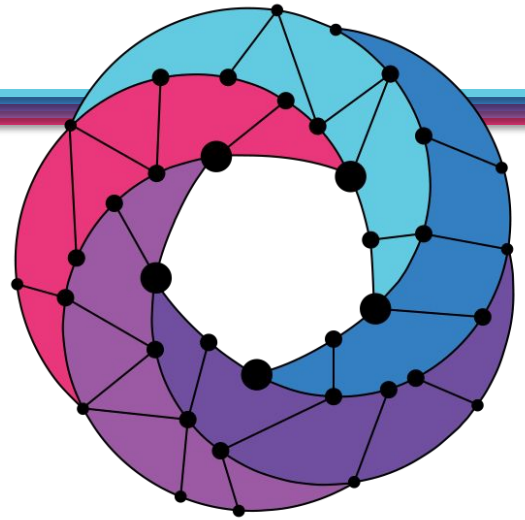

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OSM-MR#9 Hackfest

Placement optimization for our Network Services

Lars-Göran Magnusson (Arctos Labs)

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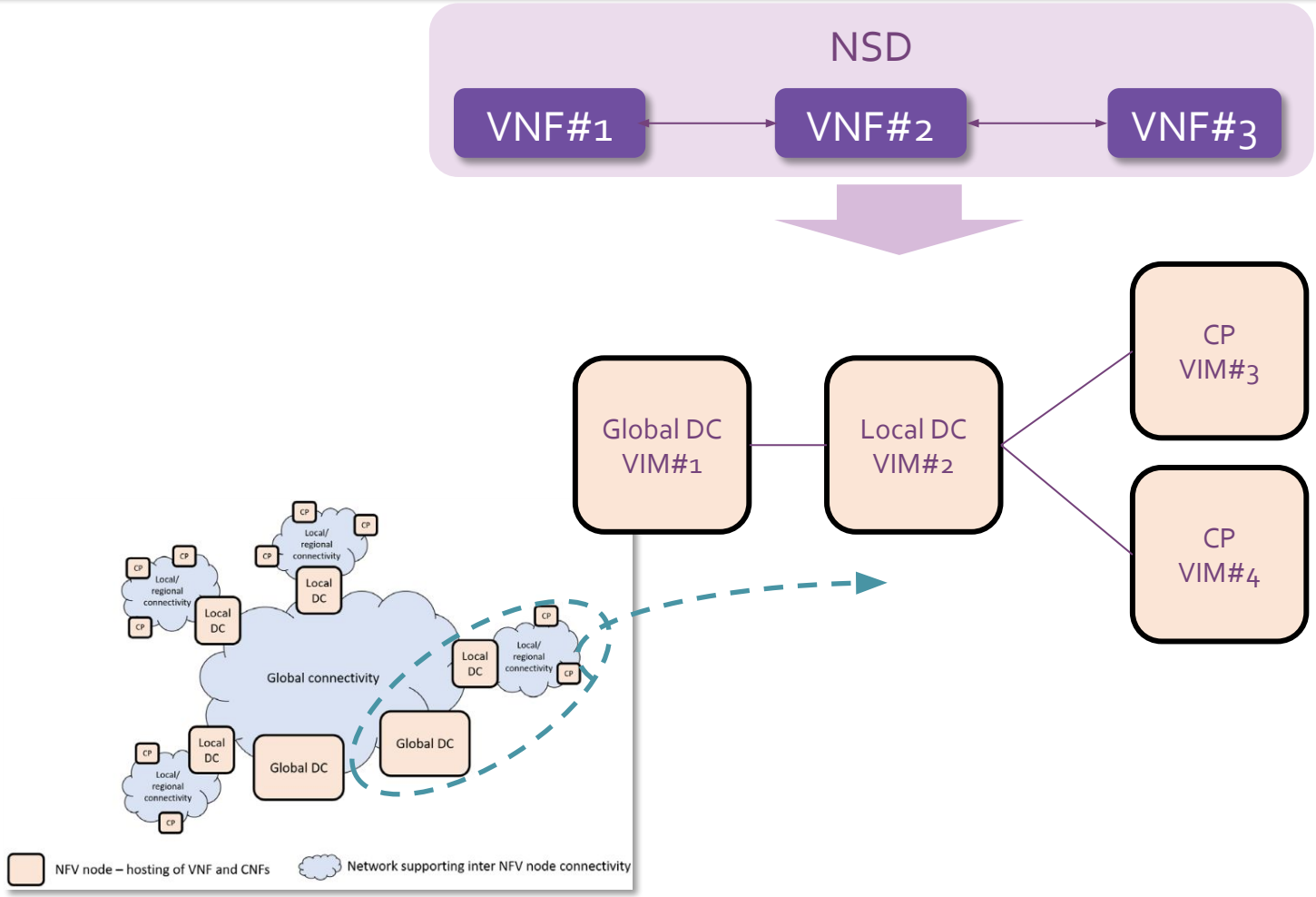
Introduction to Placement Optimization

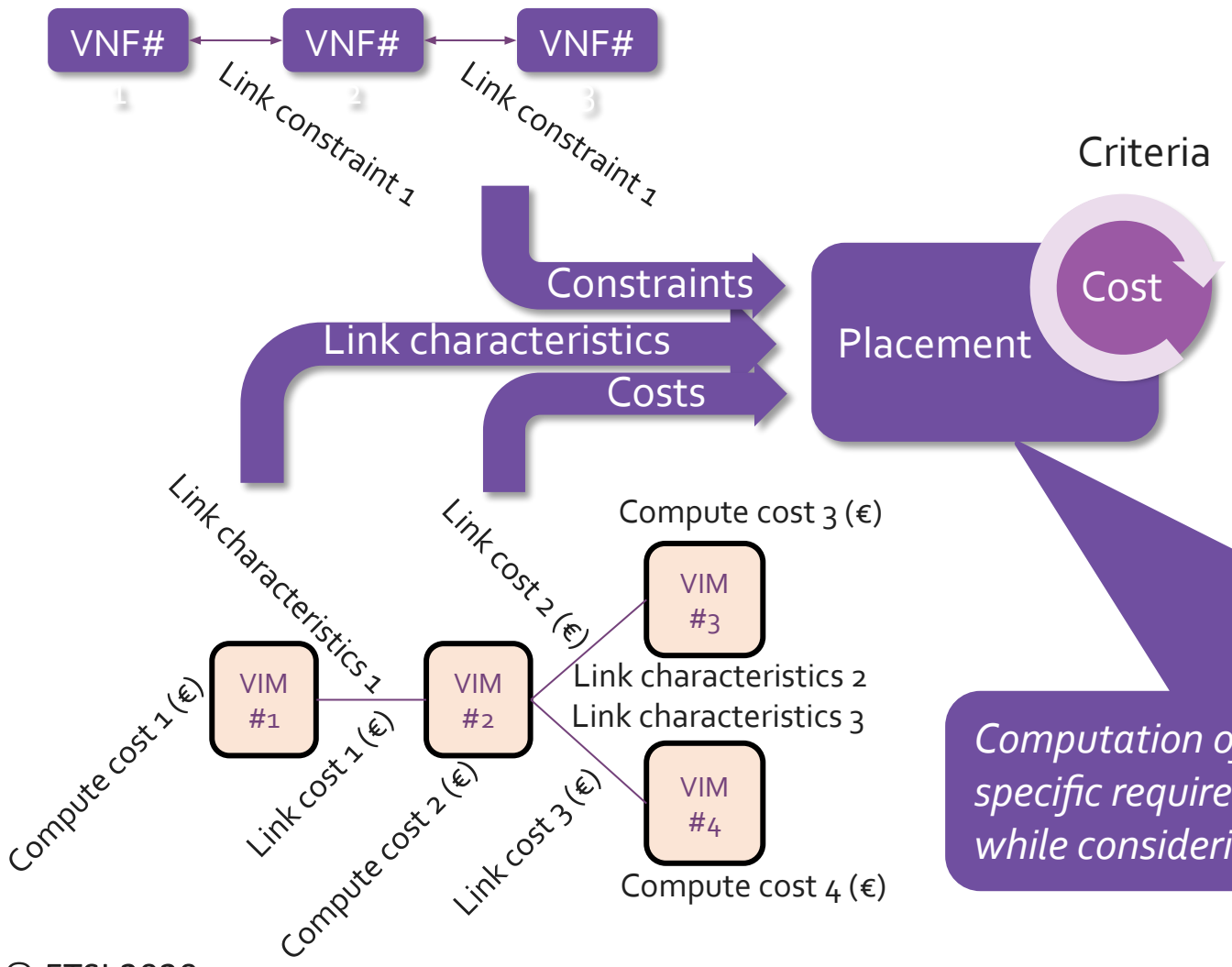
What do we mean by Placement Optimization?



Business Service Basic Architecture,
from *OSM Deployment and Integration WP, Feb 2020*

- Placement in context of OSM is the process of deciding **which VNF goes into which VIM**
- Optimal is subject to:
  - Cost of compute in VIMs
  - Cost of links for NS interworking
  - Constraints in NS interworking (Latency, Jitter) – if there are any
- Placement feature makes this process **Automatic & Optimal**

The Optimization Process



- Placement function
  - Will consider all VIM's available to the user
  - Will make sure constraints are met – if there are any
  - Will optimize Cost (the Criteria)
- I.e. select the option that fulfills constraints at the lowest possible cost
  - Modeled as a constraints optimization problem

Computation of optimal placement of VNFs over VIMs by matching NS specific requirements to infrastructure availability and run-time metrics, while considering cost of compute/network.

Placement optimization examples

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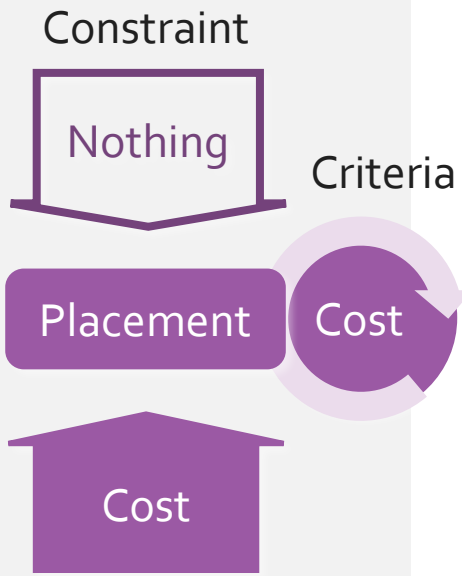
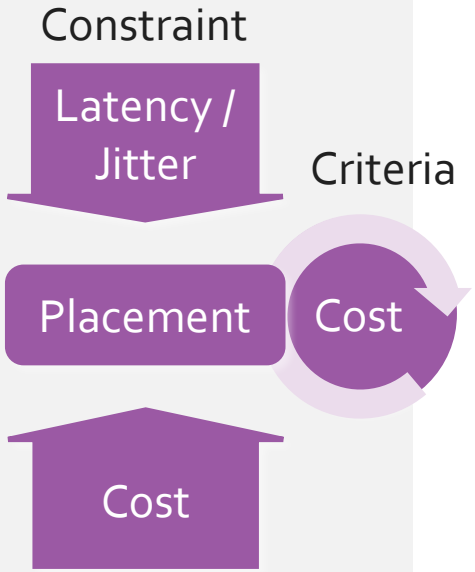
1

Cost optimization **only**



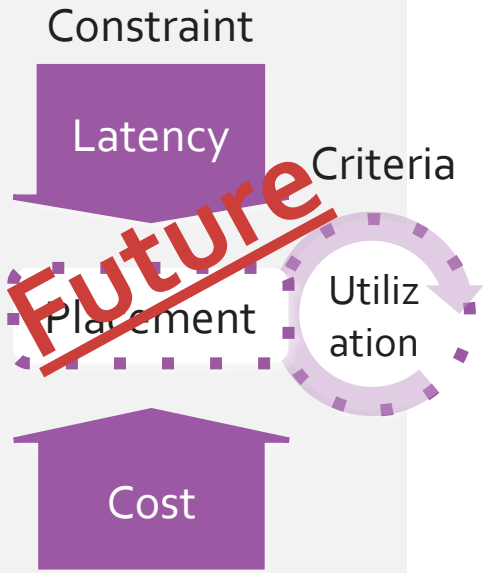
2

Cost optimization **with Latency** constraint



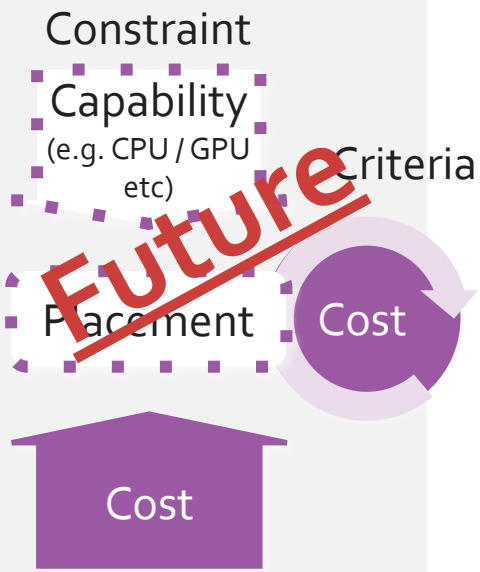
3

Utilization optimization **with Latency** constraint



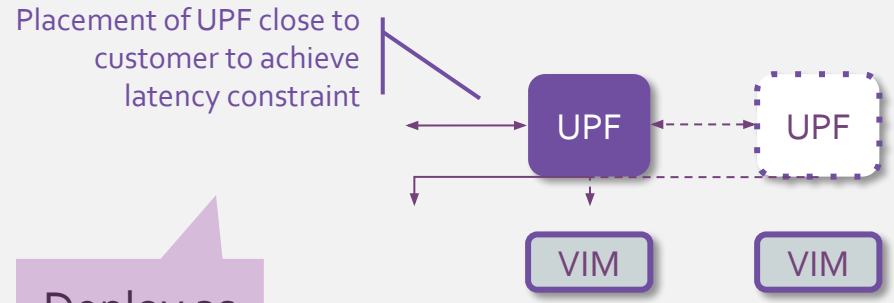
4

Cost optimization **with Capability** constraint



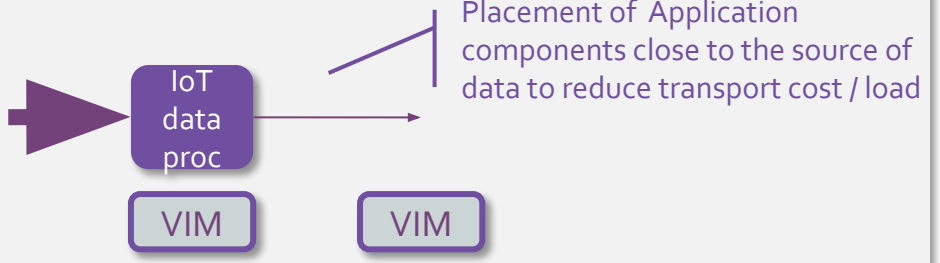
Examples of use cases

UPF supporting Low-latency

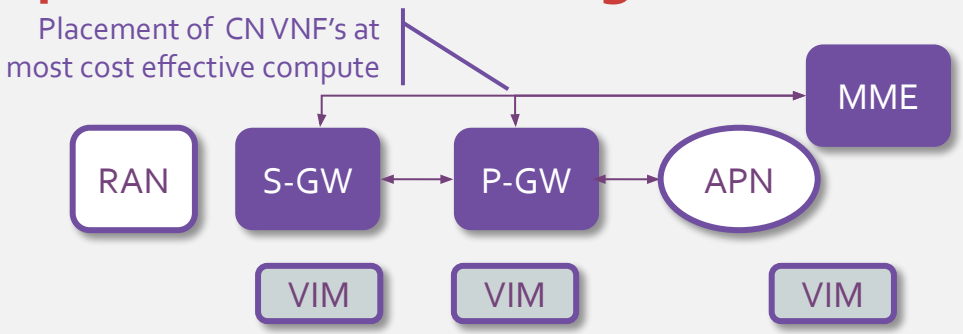


Deploy as close as it has to be

Transport optimization (cost) for Application components



Compute cost optimization for slicing



Deploy as far away as it can be

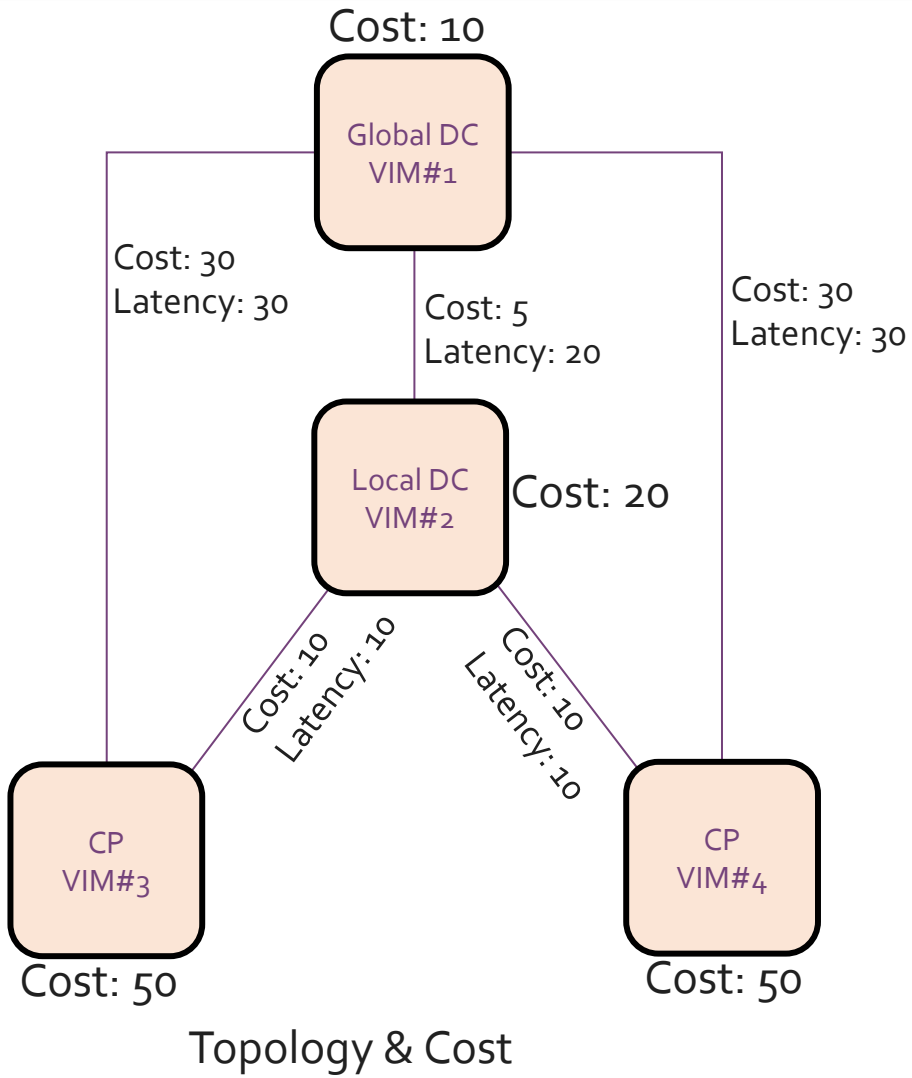
VNF Pinning

Example 1:	Auto	Auto	VIM#3
Example 2:	VIM#2	Auto	Auto
Example 3:	Auto	Auto	Auto

- Ability to “pin” a VNF to e.g.
  - the VIM with a specific VNF (e.g. P-GW)
  - the VIM with connectivity to a PNF
  - a CPE (customer location)

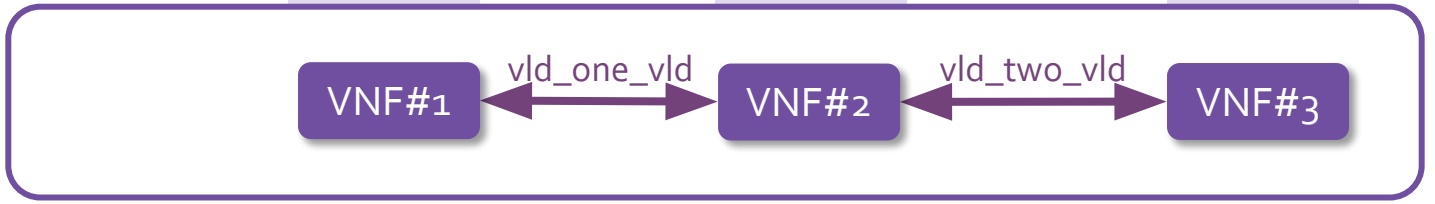
Auto implies there is no VIM specified, this placement is therefore subject to placement optimization
=> this is what Placement is all about – finding out where VNFs should (or must) be deployed in a multi-VIM NFVI

Some different scenarios



Topology & Cost

	Pinning	Constraints	Pinning	Constraints	Pinning
Scenario a:	Auto		Auto		Auto
Scenario b:	VIM#3		Auto		Auto
Scenario c:	VIM#4		Auto	latency=15	Auto



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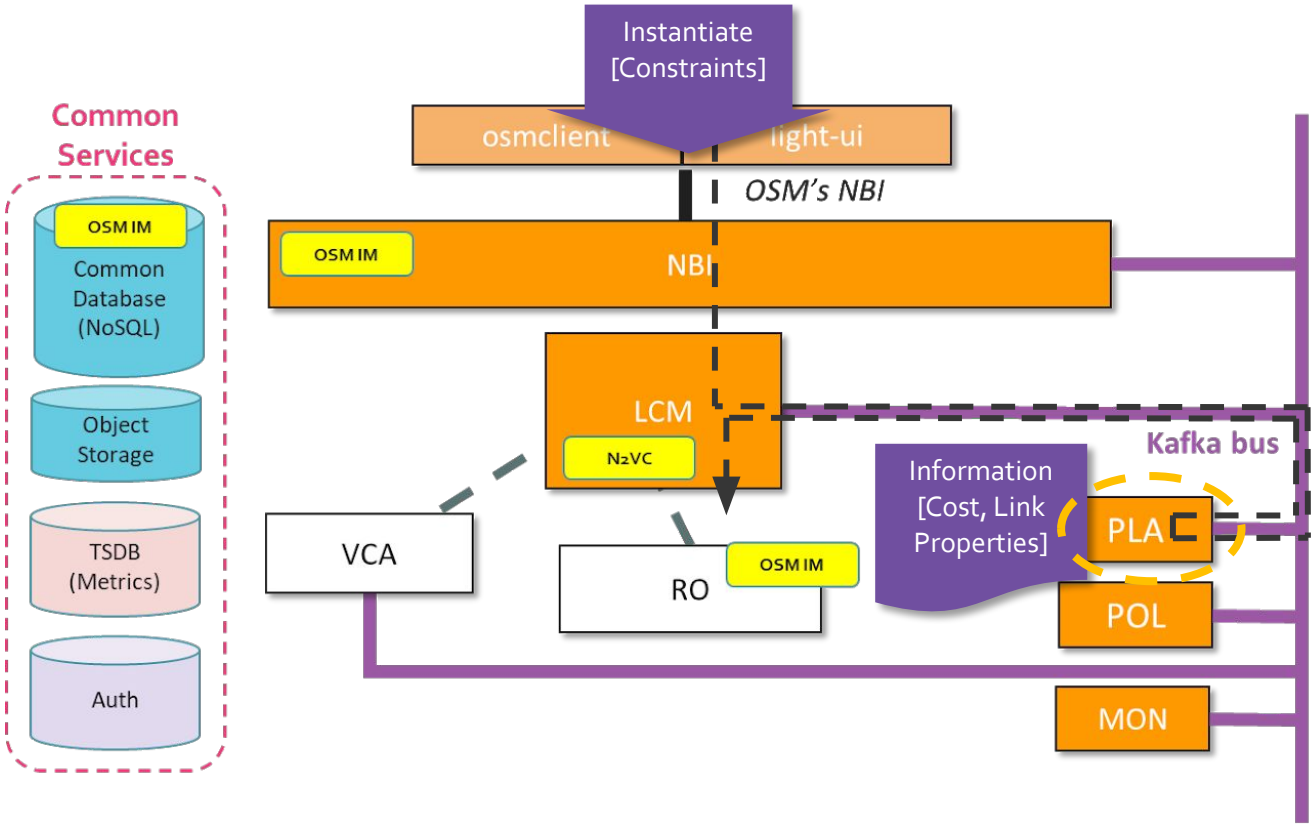
Install and configure PLA in OSM

The PLA component in OSM



- New component
  - Optional, install with --pla

- Basic functionality initially
- Automatic placement is optional, invoked by the user at instantiate of Network Service
  - --config '{placement-engine: PLA, placement-constraints: {}, ...}'
  - Constraints given in the instantiation request
  - Will consider placement over the VIMs available to the user
- Interacts with LCM, Common Services

Configure PLA

- You need two configuration files
  - vnf_price_list.yaml
  - pil_price_list.yaml
- The configuration files are copied to the PLA container using the following commands:

```
$ docker cp vnf_price_list.yaml $(docker ps
-qf name=osm_pla):/placement/.
```

```
$ docker cp pil_price_list.yaml $(docker ps
-qf name=osm_pla):/placement/.
```

The price list for compute determines the price for each VNF at each VIM . The file (vnf_price_list.yaml) is written in Yaml

```
- vnfd: hackfest_magma-agw-enb_vnfd
  hackfest:
    prices:
      - vim_url: http://172.21.247.1:5000/v3
        vim_name: etsi-openstack
        price: 5
      - vim_url: http://172.21.7.5:5000/v3
        vim_name: etsi-openstack-lowcost
        price: 1
  admin:
    prices:
      - vim_url: http://172.21.247.1:5000/v3
        vim_name: etsi-openstack
        price: 5
      - vim_url: http://172.21.7.5:5000/v3
        vim_name: etsi-openstack-lowcost
        price: 1
```

The price list and characteristics for transport links between VIMs (PoP Interconnecting Link – PiL). In current release the price is given per link without any consideration to BW or other QoS parameter. The file (pil_price_list.yaml) is written in Yaml.

```
pil:
  - pil_description: Link between vim1 and vim2
    pil_price: 5
    pil_latency: 10
    pil_jitter: 2
    pil_endpoints:
      - etsi-openstack
      - etsi-openstack-lowcost
```

Note: In current OSM release the link characteristics are hard coded into this file, in future releases this data should be retrieved from the infrastructure by monitoring mechanisms.

Note: Don't copy the files as hackfest participant, it's already done!

Invoke PLA

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1. Request Placement Cost Optimization

   --config '{ **placement-engine: PLA** }'

2. Request Placement Cost Optimization with pinning of specified VNF

   --config '{placement-engine: PLA,
   vnf: [{member-vnf-index: "1", vim_account: OpenStack3}]}'

3. Request Placement Cost Optimization with VLD Constraints

   --config '{placement-engine: PLA,
   placement-constraints: {vld-constraints: [{id: vld_1, link-constraints: {latency: 120, jitter: 20}}, {id: vld_2, link-constraints: {jitter: 20 }}]}}'

4. Combo of 2 and 3

   --config '{placement-engine: PLA,
   **vnf: [{member-vnf-index: "1", vim_account: OpenStack4}],
   placement-constraints: {vld-constraints: [{id: vld_1, link-constraints: {latency: 15}}]}}**'

Note: GUI is also supported, with or without YAML file

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~~Hands-on:~~

Placement of the Magma AGW + emulator VNF

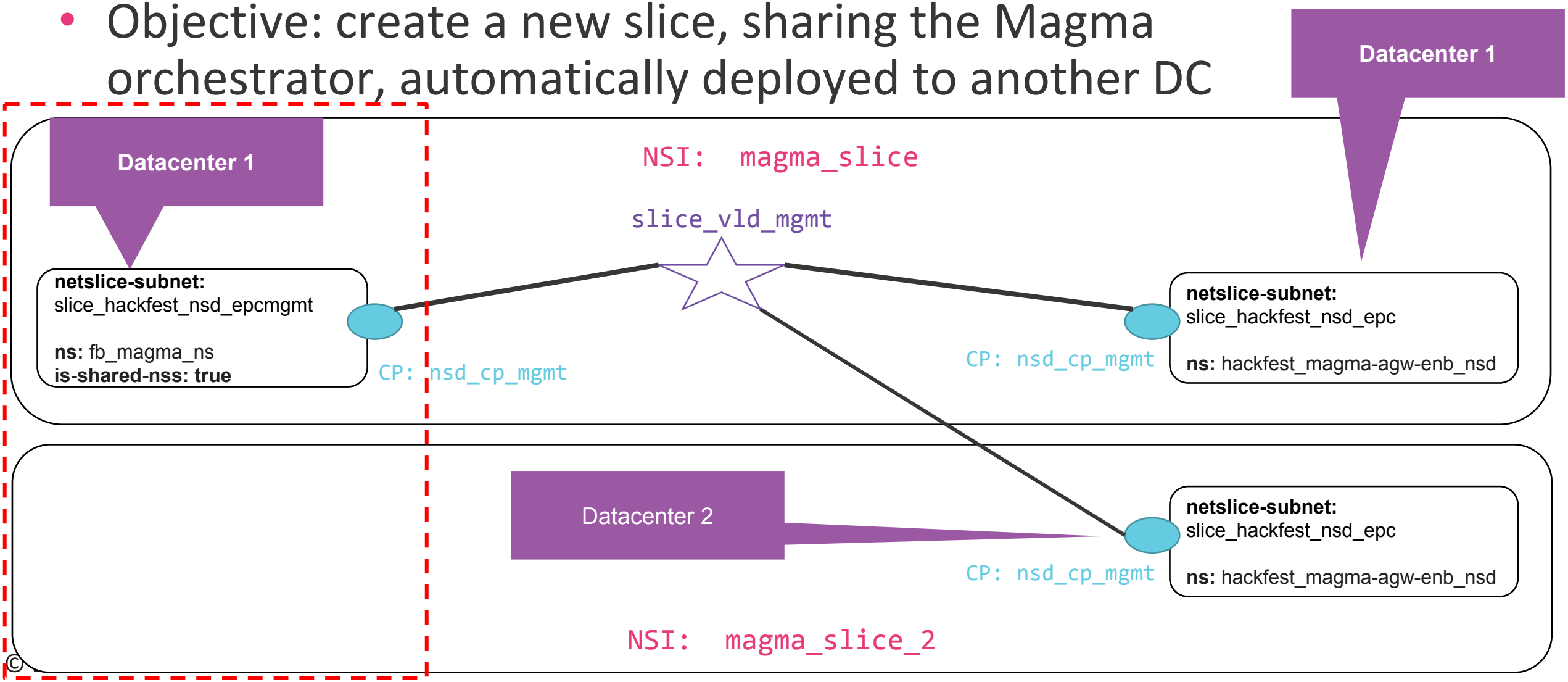
Hands-on cancelled

- We have to cancel the hands-on session
- To do the hands-on we need a second VIM
- Unfortunately our second VIM is at the moment not available in the MR#9 hackfest environment

- What now?
  - Walkthrough of the hands-on
  - Demo

Shared Network Slices

- Objective: create a new slice, sharing the Magma orchestrator, automatically deployed to another DC



Launch a 2nd slice

- Create another VIM

The vim name is important, it must match content of the vnf_price_list.yaml file

--user, --password and –tenant follows your personal settings for the hackfest

```
osm vim-create --name etsi-openstack-x-lowcost --user osm_hackfest_x --password osm_hackfest_x
--auth_url http://172.21.7.5:5000/v3 --tenant osm_hackfestx --account_type openstack --config
'{management_network_name: osm-ext, dataplane_physical_net: physnet2, microversion: 2.32}'
```

Another VIM url

Don’t forget the additional configuration

- List the vims, and collect the new vim uuid, we need it in the next step

```
osm vim-list
```

Launch a 2nd slice

- Register the PDU to the 2nd vim account

1) Edit pdu.yaml

```
name:          router01
description:    router
type:          gateway
vim_accounts:   [ 94c1218a-e9c7-42d8-b0ae-6de0d0a635ae ]
shared:        false
interfaces:
 -  name:      eth0
    ip-address: 172.21.250.200
    vim-network-name: osm-ext
    mgmt:      true
 -  name:      eth1
    ip-address: 192.168.239.7
    mgmt:      false
```

Enter the uuid for the new vim to the vim_accounts list

2) Launch the pdu-create command

```
osm pdu-create --descriptor_file pdu.yaml
```

- Note: You may also use the GUI (Instances → PDU Instances) to register the PDU

Launch a 2nd slice

- Prepare for PLA support – modify the configuration file
  - make a copy of params_slices.yaml

Uncomment placement-engine: PLA
Uncomment wimAccountId: False

Need another agw_id, agw_name e.g. 101

```
netslice-subnet:
- id: slice_hackfest_nsd_epc
  placement-engine: PLA
  wimAccountId: False
  additionalParamsForVnf:
  - member-vnf-index: '1'
    additionalParams:
      agw_id: 'agw_101'
      agw_name: 'AGW101'
      orch_ip: '172.21.251.XXX'  ## change this to the MetalLB IP address of your orc8r_proxy service.
      orch_net: 'osmnet'

- id: slice_hackfest_nsd_epcmgmt
  additionalParamsForVnf:
  - member-vnf-index: 'orc8r'
    additionalParamsForKdu:
    - kdu_name: orc8r
      additionalParams:
        proxyserviceloadBalancerIP: '172.21.251.XXX' # MetalLB IP Address
```

- Create the slice

```
osm nsi-create --nsi_name magma_slice_2 --nst_name magma_slice_hackfest_nst \
--config_file params_slices2.yaml --ssh_keys ~/.ssh/id_rsa.pub --vim_account etsi-openstack
```

Use your ordinary vim_account

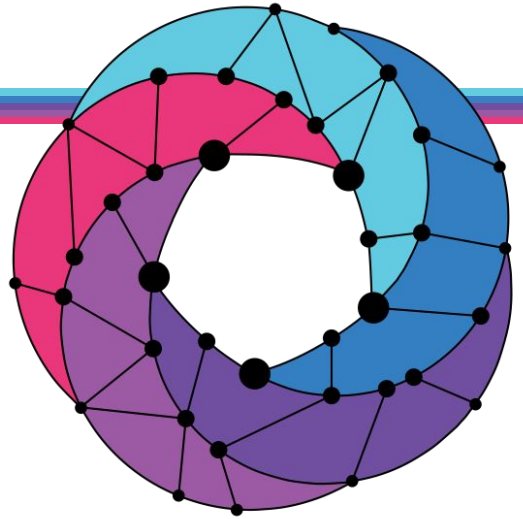
Launch a 2nd slice

- Check where the vnf ended up

```
osm vnf-list
```

- vim_account_id should correspond to etsi-openstack-x-lowcost for the new slice
- same Magma orc8r as before
- You may configure and send traffic over the new slice
- Clean up: delete the slice

```
osm nsi-delete <nsi_name> or <nsi_id>
```



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