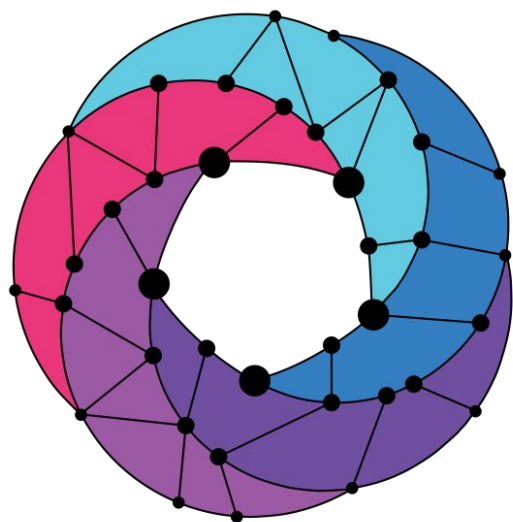




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Day 2 VNF Operations

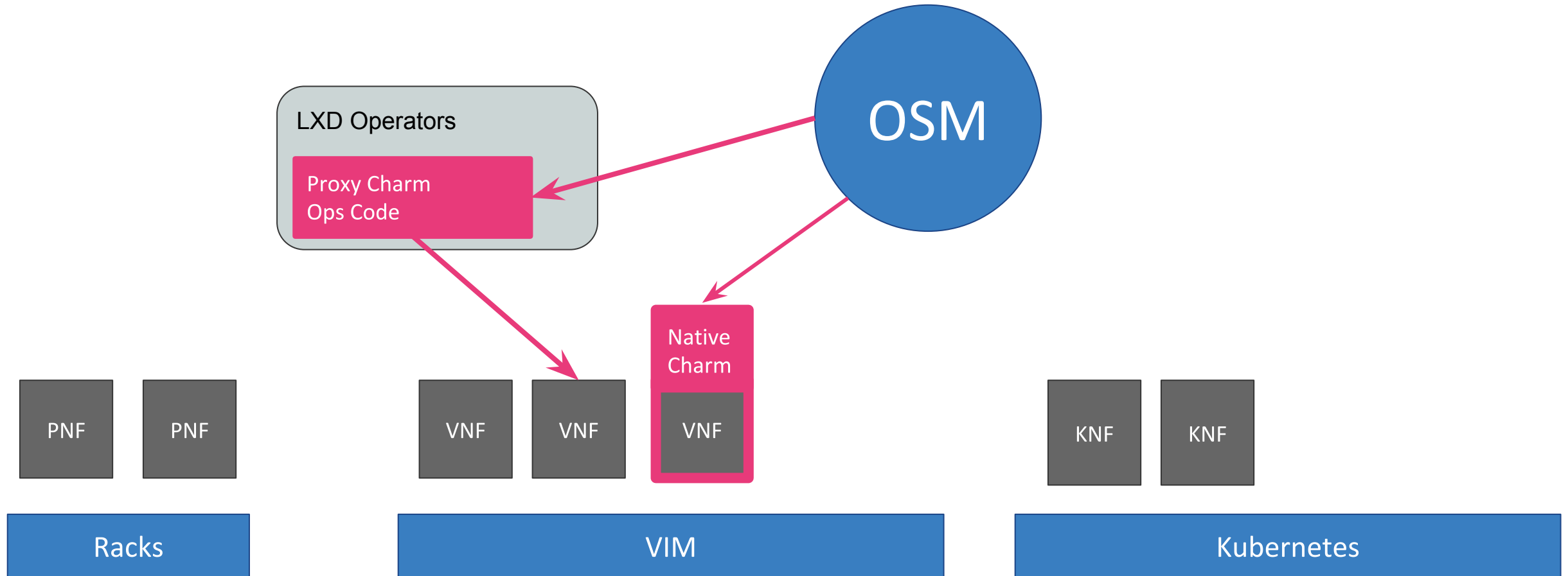
David Garcia, Mark Beierl, Dominik Fleischmann (Canonical)

Go to the workspace

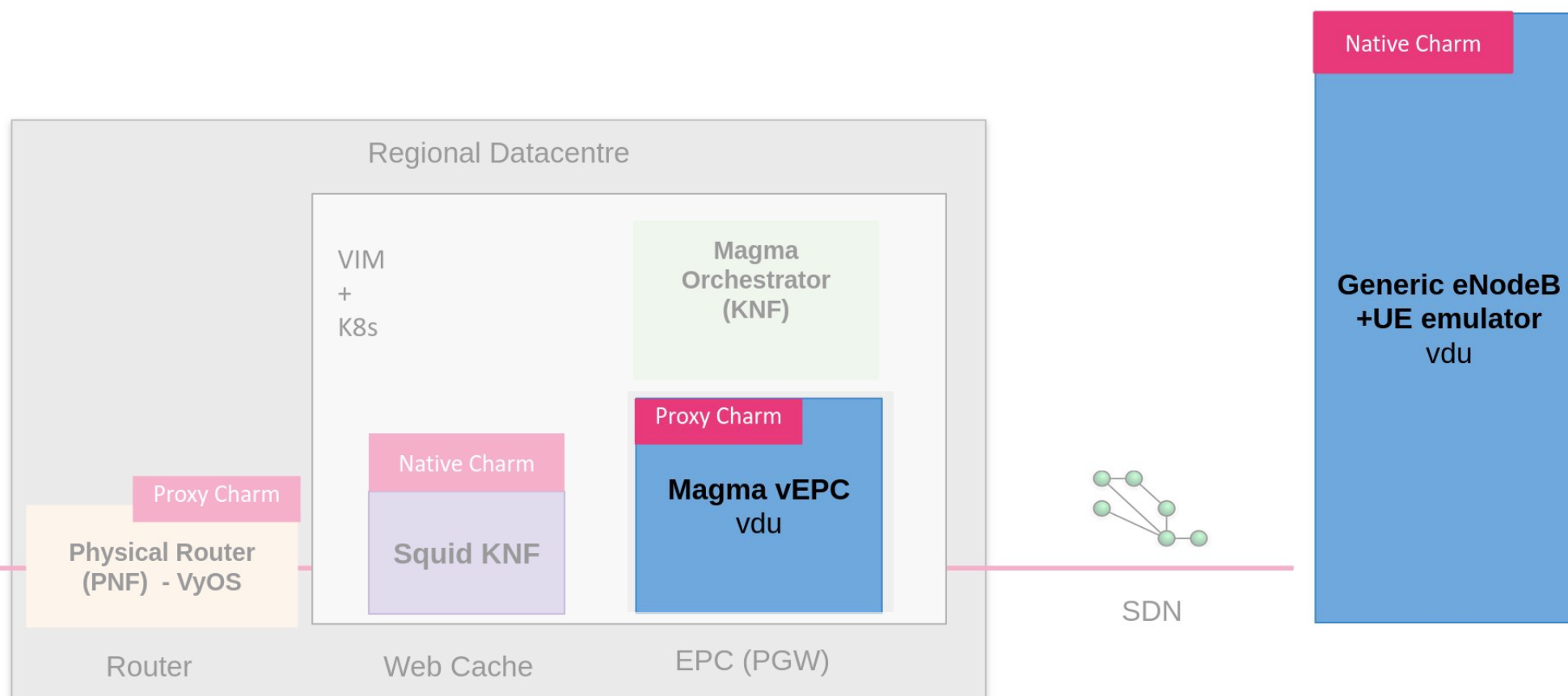
- Change directory

```
$ cp -a /home/ubuntu/examples/hd2 ~/
$ cd ~/hd2/
$ ls
01-base  02-relation
```

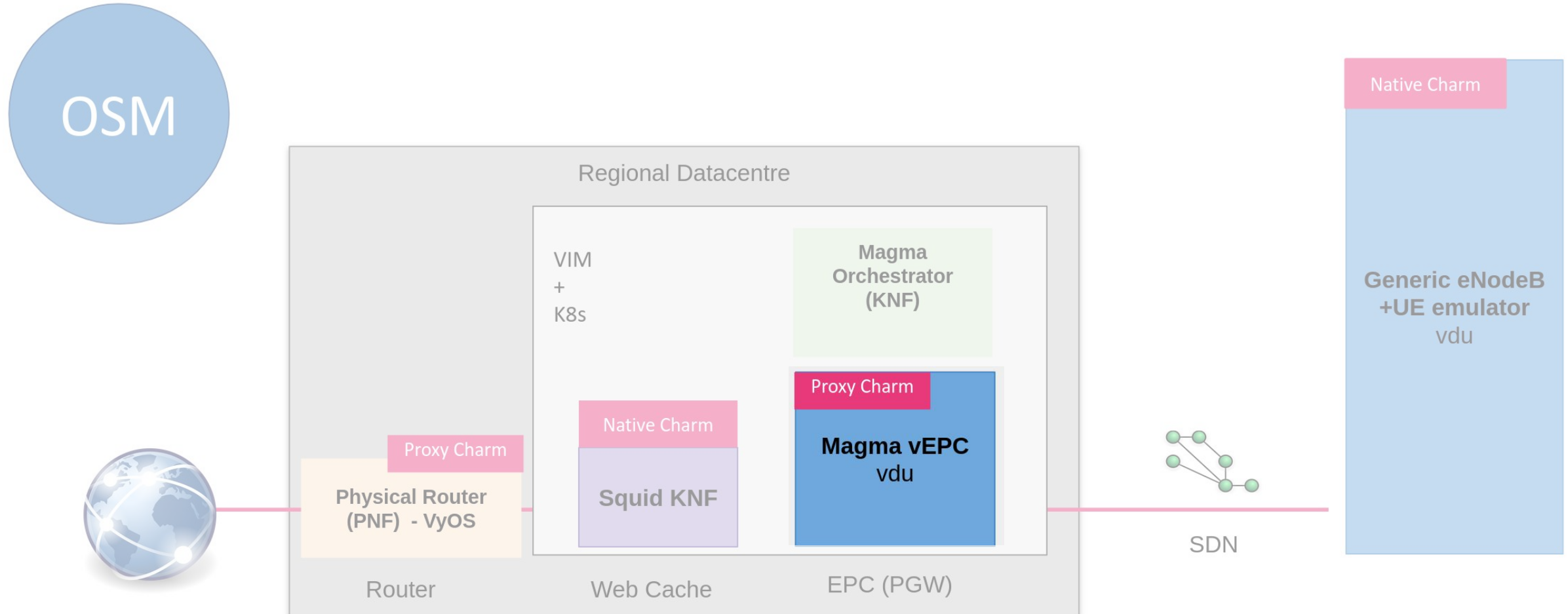
Focus on Virtualised NF operations



Cellular Data Path



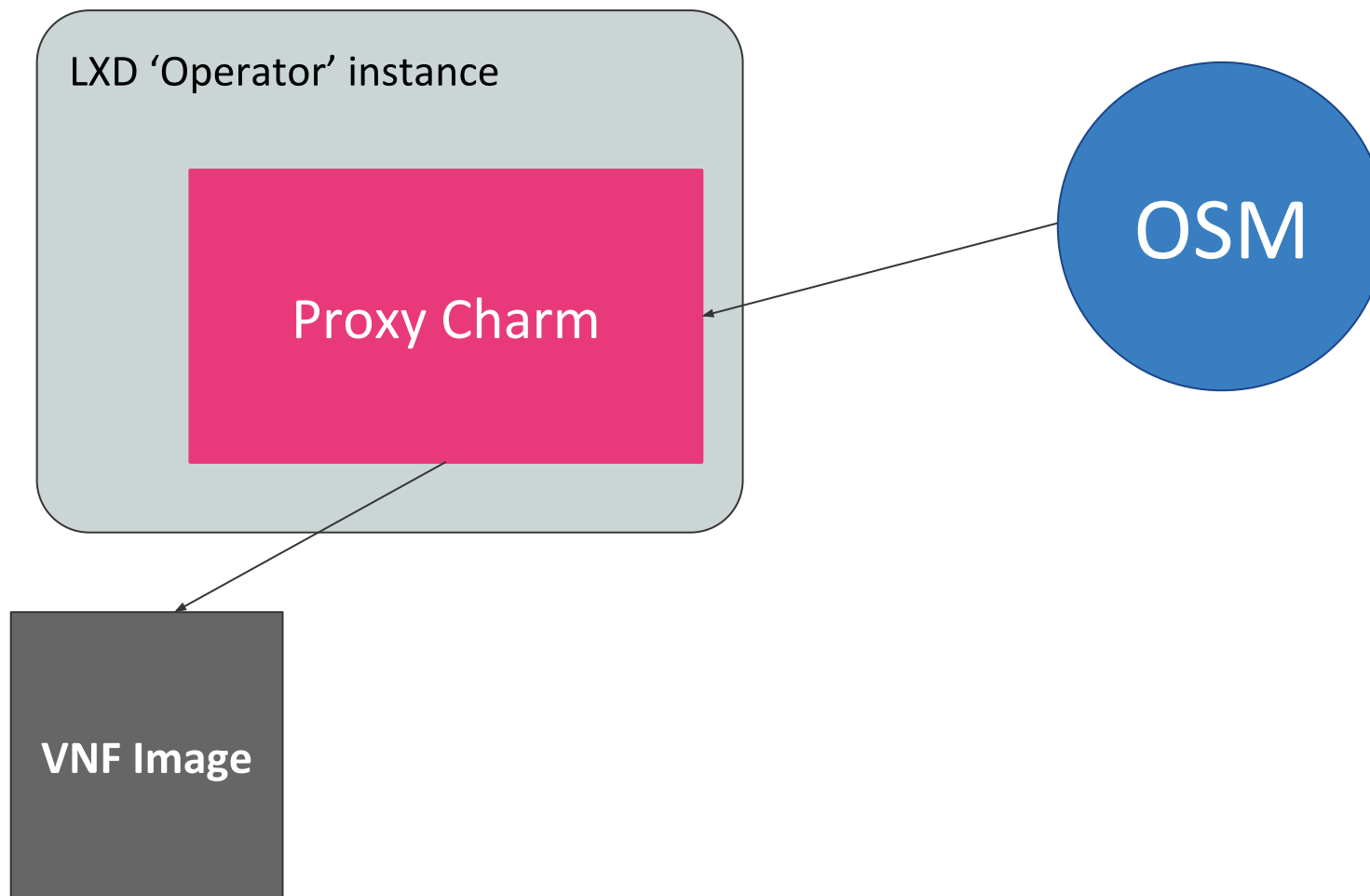
Magma vEPC



Magma vEPC

- Fixed VM image that pre-dates OSM and cannot be modified
 - Name: magma101_hf9
 - This image already has magma installed.
 - Requires a proxy charm because the image is static rather than being an installable app
- Proxy Charm:
 - Name: magmagw
 - Actions:
 - Add network
 - Add gateway
 - Delete gateway
 - Add hosts
 - Add test subscriber
 - Restart magma
 - Reset ID

Magma vEPC



Magma vEPC VNF-Configuration

- SSH access: this proxy charm will use SSH to the VM appliance image so that it can drive the workload there; this directive tells OSM to inject the SSH keys for the proxy charm LXD instance into the VM appliance on launch.
- Initial config primitive: Deployment operations
- Config primitive: Day-2 operations

```
vdu-configuration:  
  juju:  
    charm: magmagw  
  config-access:  
    ssh-access:  
      required: true  
  initial-config-primitive:  
    [...]  
  config-primitive:  
    [...]
```

VNFD: Magma vEPC

- Initial config primitive:
 - Config: In proxy charms, the first primitive must be config, which will provide the credentials to the proxy charm so it can access the VDU

```
vdu-configuration:
    [...]
    initial-config-primitive:
    - seq: '1'
      name: config
      parameter:
      - name: ssh-hostname
        value: <rw_mgmt_ip>
      - name: ssh-username
        value: magma
      - name: ssh-password
        value: magma
    [...]
    config-primitive:
    [...]
```

VNFD: Magma vEPC

- Initial config primitive:
 - Reset id
 - Add network
 - Add gateway
 - Add hosts
 - Restart magma

```
vdu-configuration:
    [...]
    initial-config-primitive:
        [...]
        - seq: '2'
          name: reset-id
        - seq: '3'
          name: add-net
          parameter:
            - name: orch_ip
              value: <orch_ip>
            - name: orch_net
              value: <orch_net>
        [...]
```

VNFD: Magma vEPC

- Initial config primitive:
 - Reset id
 - Add network
 - Add gateway
 - Add hosts
 - Restart magma

```
vdu-configuration:  
  [...]  
  initial-config-primitive:  
    [...]  
  - seq: '4'  
    name: add-gw  
    parameter:  
      - name: agw_id  
        value: <agw_id>  
      - name: agw_name  
        value: <agw_name>  
      - name: orch_ip  
        value: <orch_ip>  
      - name: orch_net  
        value: <orch_net>  
    [...]
```

VNFD: Magma vEPC

- Initial config primitive:
 - Reset id
 - Add network
 - Add gateway
 - Add hosts
 - Restart magma

```
vdu-configuration:
    [...]
    initial-config-primitive:
        [...]
        - seq: '5'
          name: add-test-subscriber
          parameter:
            - name: orch_ip
              value: <orch_ip>
            - name: orch_net
              value: <orch_net>
        - seq: '6'
          name: add-hosts
          parameter:
            - name: orch_ip
              value: <orch_ip>
```

VNFD: Magma vEPC

- Initial config primitive:
 - Reset id
 - Add network
 - Add gateway
 - Add hosts
 - Restart magma

```
vdu-configuration:
    [...]
    initial-config-primitive:
        [...]
        - seq: '6'
          name: add-hosts
          parameter:
            - name: orch_ip
              value: <orch_ip>
        - seq: '7'
          name: restart-magma
    config-primitive:
        [...]
```

VNFD: Magma vEPC

- Config primitive:
 - Add gateway
 - Delete gateway
 - Reset id
 - Restart magma

```
vdu-configuration:
    [...]
    initial-config-primitive:
        [...]
    config-primitive:
        - name: add-gw
          parameter:
            - name: agw_id
              default-value: <agw_id>
            - name: agw_name
              default-value: <agw_name>
            - name: orch_ip
              default-value: <orch_ip>
            - name: orch_net
              default-value: <orch_net>
        [...]
    [...]
```

VNFD: Magma vEPC

- Config primitive:
 - Add gateway
 - Delete gateway
 - Reset id
 - Restart magma

```
vdu-configuration:
    [...]
    initial-config-primitive:
        [...]
    config-primitive:
        [...]
        - name: del-gw
          parameter:
            - name: agw_id
              default-value: <agw_id>
            - name: orch_ip
              default-value: <orch_ip>
            - name: orch_net
              default-value: <orch_net>
        - name: reset-id
        - name: restart-magma
```

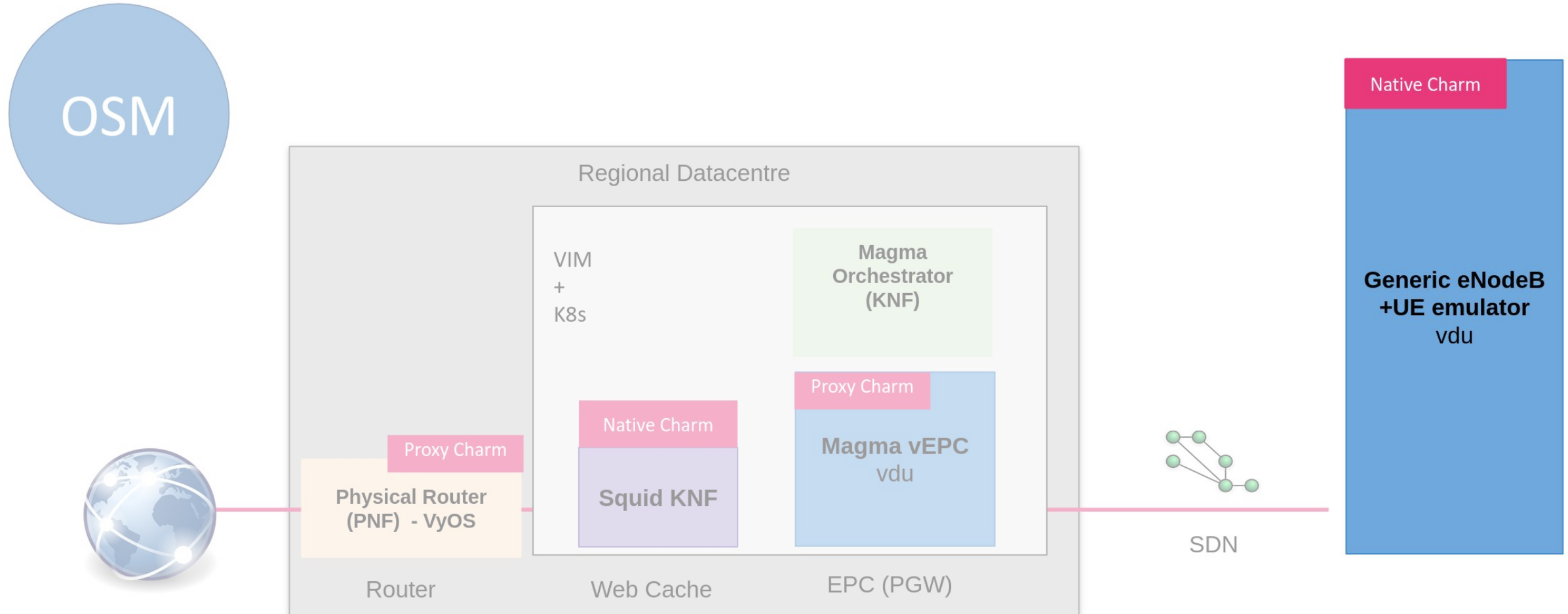


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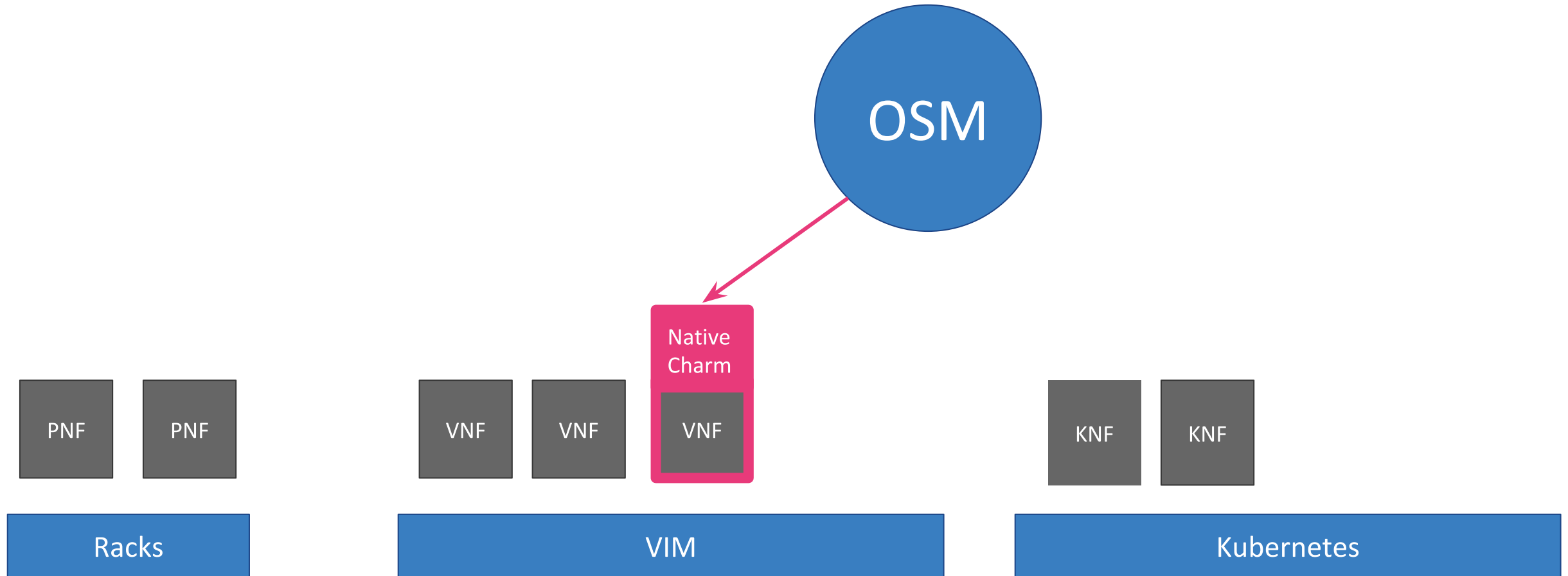
Diving into the Charm

magemagw

EnodeB + UE emulator



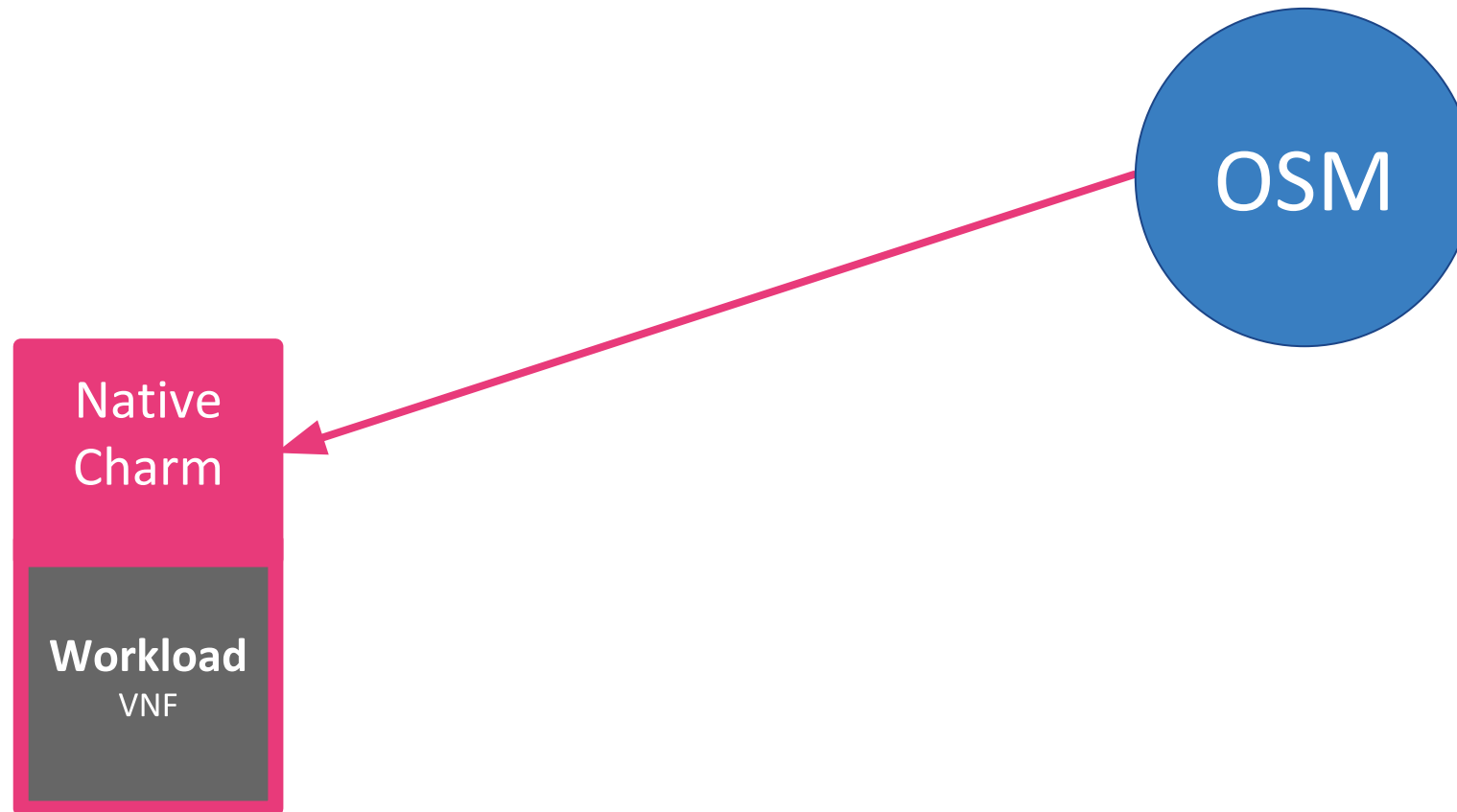
Primitives in EnodeB + UE emulator



EnodeB and UE emulator

- Image: Based on Ubuntu (Bionic)
 - Name: srsLTEfauxRF_hf9
 - This image already has enodeB and UE installed.
- Native charm:
 - Name: enodeb
 - Actions:
 - ~~Register~~
 - Attach UE
 - ~~Unregister~~
 - Detach UE
 - Remove default gateway

EnodeB + UE Emulator



VNFD: EnodeB + UE Emulator

- VDU Configuration: When the charm is not a proxy charm, it needs to be inside the vdu-configuration because it will be deployed inside the VM (=VDU)
 - Juju:charm:proxy = False: If proxy is False, it means we are working with a native charm
 - Initial config primitive:
 - Remove default gateway

```
vdu-configuration:  
  juju:  
    charm: enodeb  
    proxy: False  
  config-access:  
    ssh-access:  
      required: True  
      default-user: ubuntu  
  initial-config-primitive:  
    - seq: '1'  
      name: remove-default-gw  
  config-primitive:  
    [...]
```

VNFD: EnodeB + UE Emulator

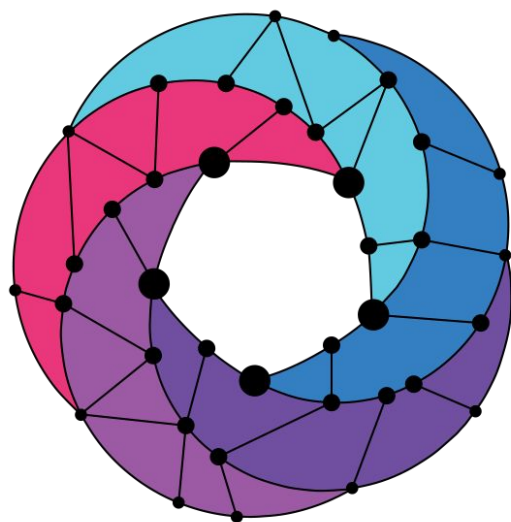
- VDU Configuration:
 - Config primitive:
 - Attach UE
 - Detach UE

```
vdu-configuration:  
  [...]  
  config-primitive:  
    - name: attach-ue  
      parameter:  
        - name: usim-imsi  
          data-type: STRING  
        - name: usim-k  
          data-type: STRING  
        - name: usim-opc  
          data-type: STRING  
    - name: detach-ue
```



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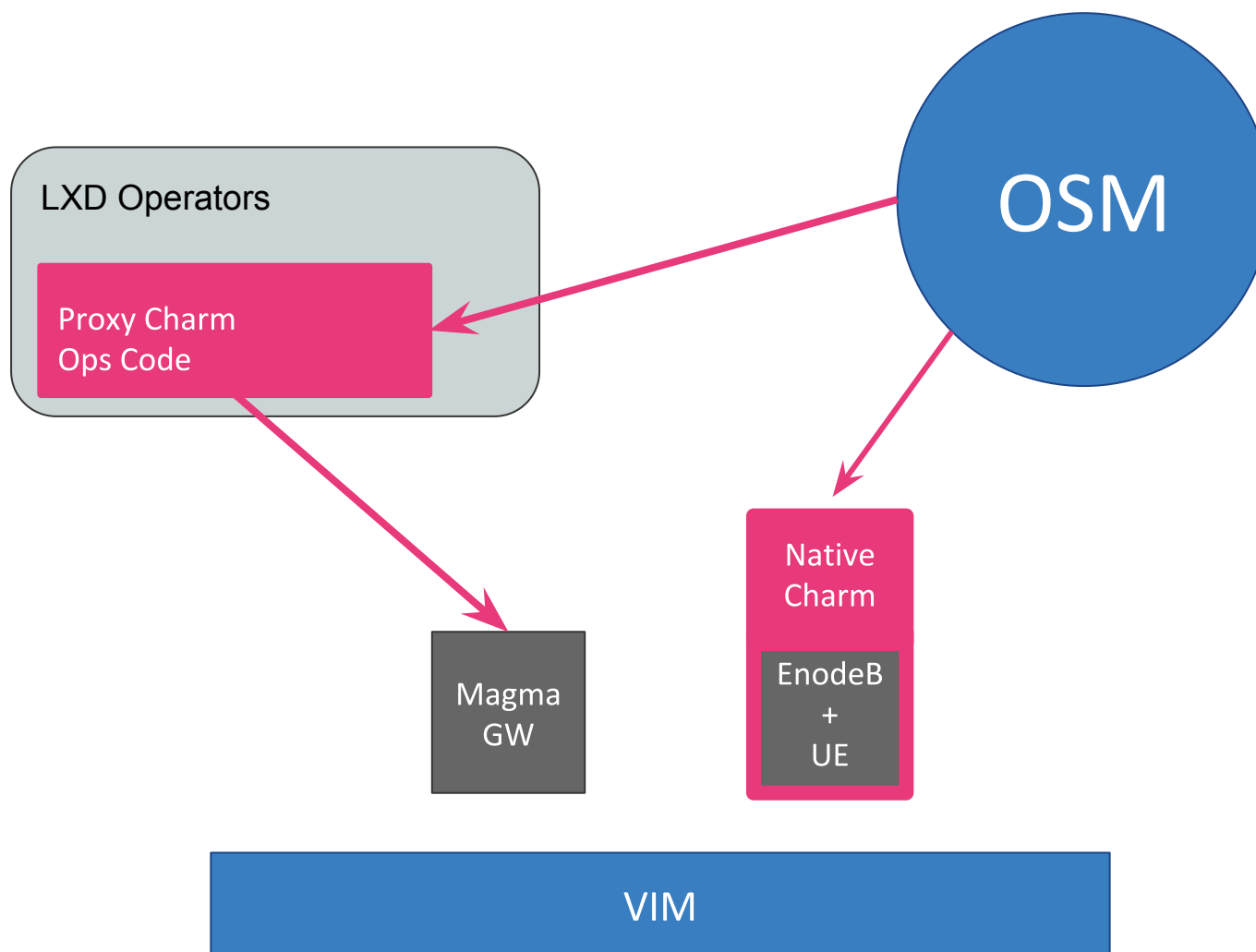
Diving into the Charm enodeb

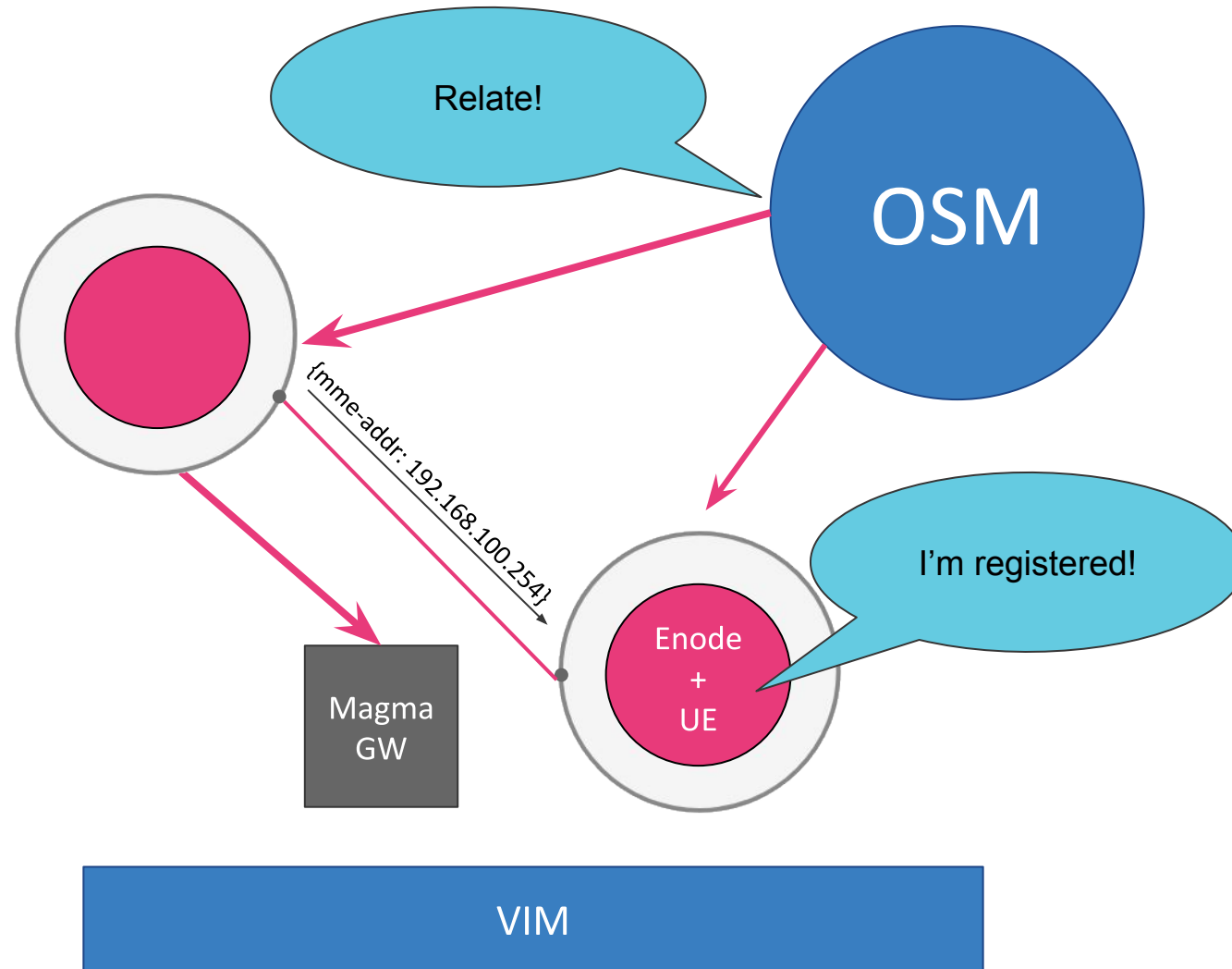


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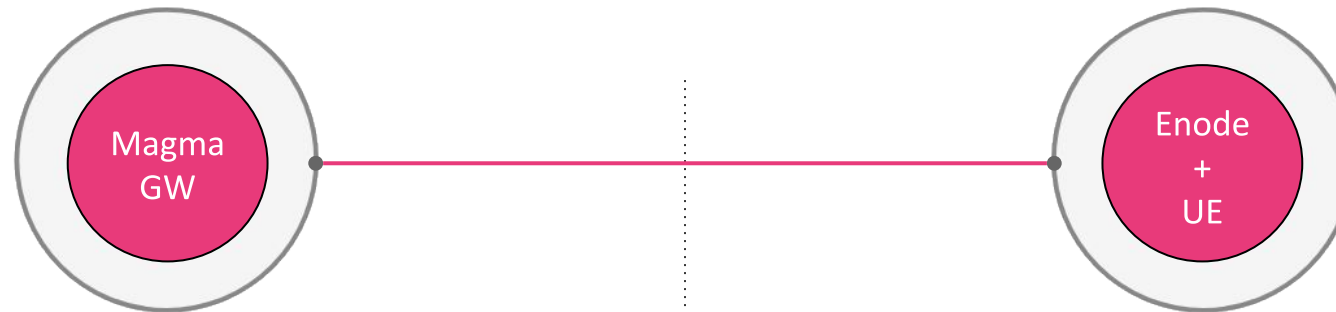
Introduction to Juju Relations

David Garcia (Canonical)





- When a relation is established, relation_joined event is triggered in both charms
- After relation_joined, relation_changed will be trigger
- Any time a charm writes into the relation_data, relation_changed event will be triggered in the other side of the relation



```
def on_relation_joined(self, event):
    rel = self.model.get_relation("agw")
    if rel is None:
        event.defer()
        return
    if not self.state.ready:
        return
    rel.data[self.unit]["mme-addr"] = get_ip()
```

```
def on_relation_changed(self, event):
    rel = self.model.get_relation("agw")
    if rel is None:
        event.defer()
        return
    mme_addr = rel.data[event.unit].get("mme-addr")
    if mme_addr:
        ...
```

VNFD: Relation

- In the vnf configuration we need to specify the relations we want to add.
- The entities key is a two-element array that includes both endpoints of the relation.
- The id of the entity is the VDU id, and the endpoint is the name of the interface/endpoint provided by the charm

vnf-configuration:

relation:

- name: agw

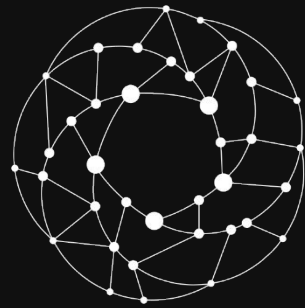
entities:

- id: srsLTE-vdu

endpoint: agw

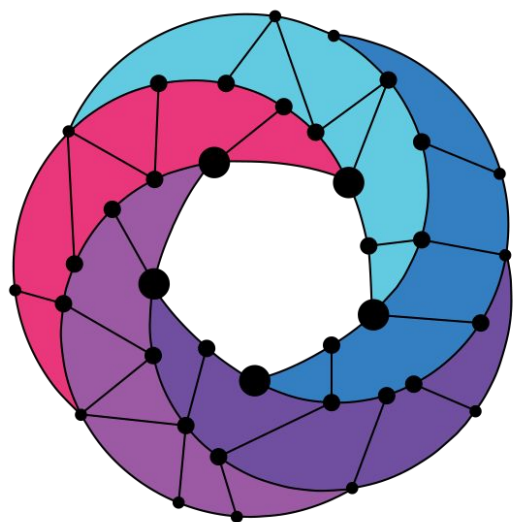
- id: magma-agw-vdu

endpoint: agw



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Let's code!



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Day 2 VNF Operations

David Garcia, Mark Beierl, Dominik Fleischmann (Canonical)

Go to the workspace

- Change directory

```
$ cd 02-relation/ # Or the edited 01-base
$ ./build.sh
```

```
$ osm nsd-delete hackfest_magma-agw-enb_nsd
$ osm vnfd-delete hackfest_magma-agw-enb_vnfd

$ osm nfpkg-create hackfest_magma-agw-enb_vnfd
$ osm nspkg-create hackfest_magma-agw-enb_nsd

$ osm ns-create --ns_name magmaAGW_X \
                --nsd_name hackfest_magma-agw-enb_nsd \
                --config_file params.yaml \
                --ssh_keys ~/.ssh/id_rsa.pub \
                --vim_account etsi-openstack
```

Deployment parameters

- params.yaml

```
additionalParamsForVnf:  
- member-vnf-index: 'MagmaAGW+srsLTE'  
  additionalParams:  
    agw_id: 'agw_01'  
    agw_name: 'AGW1'  
    orch_ip: '172.21.251.x' ## change this to your assigned address  
    orch_net: 'osmnet'
```

Wait until is deployed

- See network services:

```
osm ns-list
```

- Show how charms progress:

```
juju switch <ns_id>  
watch -c juju status --color
```

Check day-1 actions

- Show actions

```
juju show-action-status
```

Execute day-2 actions

- Initiate radio:

```
osm ns-action magmaAGW_X --vnf_name "MagmaAGW+srsLTE" --vdu_id srsLTE-vdu  
--action_name register --para Done with relations 68.100.254", gtp-bind-addr:  
"192.168.100.10", sfc-bind-addr: "192.168.100.10"}
```

- Attach UE Emulator:

```
osm ns-action magmaAGW_X --vnf_name "MagmaAGW+srsLTE" --vdu_id srsLTE-vdu  
--action_name attach-ue --params '{usim-imsi: "7220700000000008", usim-k:  
"c8eba87c1074edd06885cb0486718341", usim-opc:  
"17b6c0157895bcaa1efc1cef55033f5f"}'
```

Checks

- Check MME logs

```
osm ns-list  
ssh magma@<ip> # passwd=magma  
tail -f /var/log/mme.log
```

- Magma Orch UI: admin@magma.test/password1234

```
VNFID=`osm vnf-list | grep orc8r | awk '{ print $2 }'`  
osm vnf-show $VNFID --kdu orc8r > vnf-show.txt  
MAGMAIP=`cat vnf-show.txt | grep nginx-proxy | grep "LoadBalancer" | awk '{  
print $4 }'`  
echo Magma web interface is https://$MAGMAIP
```

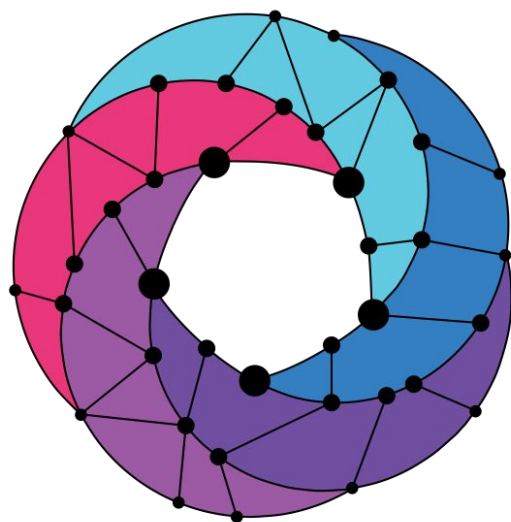
Clean up

- Detach and unregister:

```
osm ns-action magmaAGW_X --vnf_name "MagmaAGW+srsLTE" --vdu_id srsLTE-vdu  
--action_name detach-ue
```

- Remove NS and packages:

```
osm ns-delete magmaAGW_X
```



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