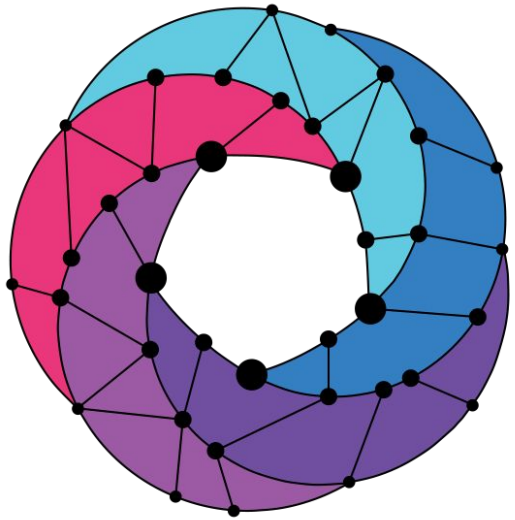

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OSM #13 Hackfest

Deployment Walkthrough

ETSI

Agenda

1. Prepare the environment
2. Deployment overview
3. Magma Orchestrator
4. Magma Access GW
5. SRS LTE

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Prepare the environment

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VIM Creation

```
$ osm vim-create --name aws-site --account_type aws \
  --auth_url https://aws.amazon.com --user <Access Key ID> \
  --password <Secret Access Key> --tenant <EKS VPC> \
  --description "AWS site, with your user" \
  --config '{key_pair: <team key>, region_name: <region>, flavor_info: \
    "{t2.nano: {cpus: 1, disk: 100, ram: 512}, \
      t2.micro: {cpus: 1, disk: 100, ram: 1024}, \
      t2.small: {cpus: 1, disk: 100, ram: 2048}, \
      t2.medium: {cpus: 2, disk: 100, ram: 4096}, \
      t2.large: {cpus: 2, disk: 100, ram: 8192}}"}'
```

K8s cluster addition

Copy `kube_config` file in case is not in the VM

```
$ osm k8scluster-add --creds ./kube_config \
      --version 1 \
      --vim aws-site \
      --k8s-nets "{k8s_net1: <EKS VPC>}" \
      --description "Base K8scluster" eks-cluster
```

Check your environment

```
$ osm vim-list
$ osm vim-how <VIM ID>
$ osm k8scluster-list
$ osm k8scluster-show <K8s cluster ID>
```

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Deployment overview

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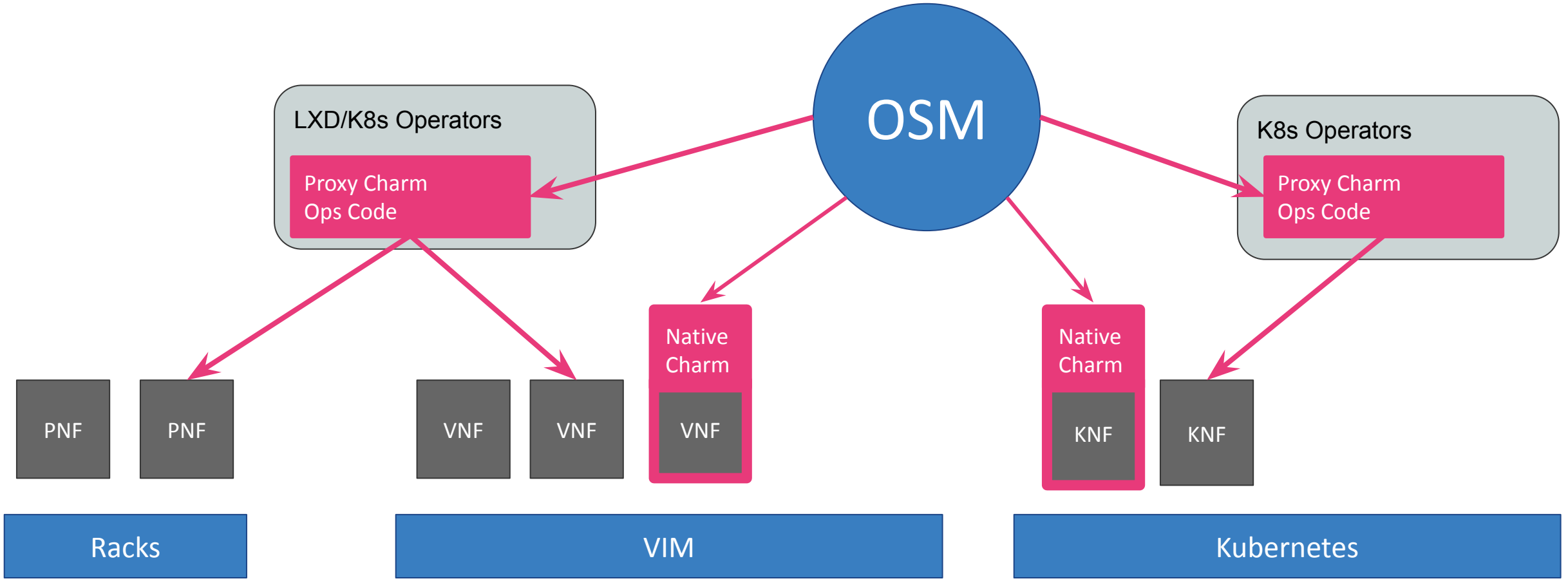
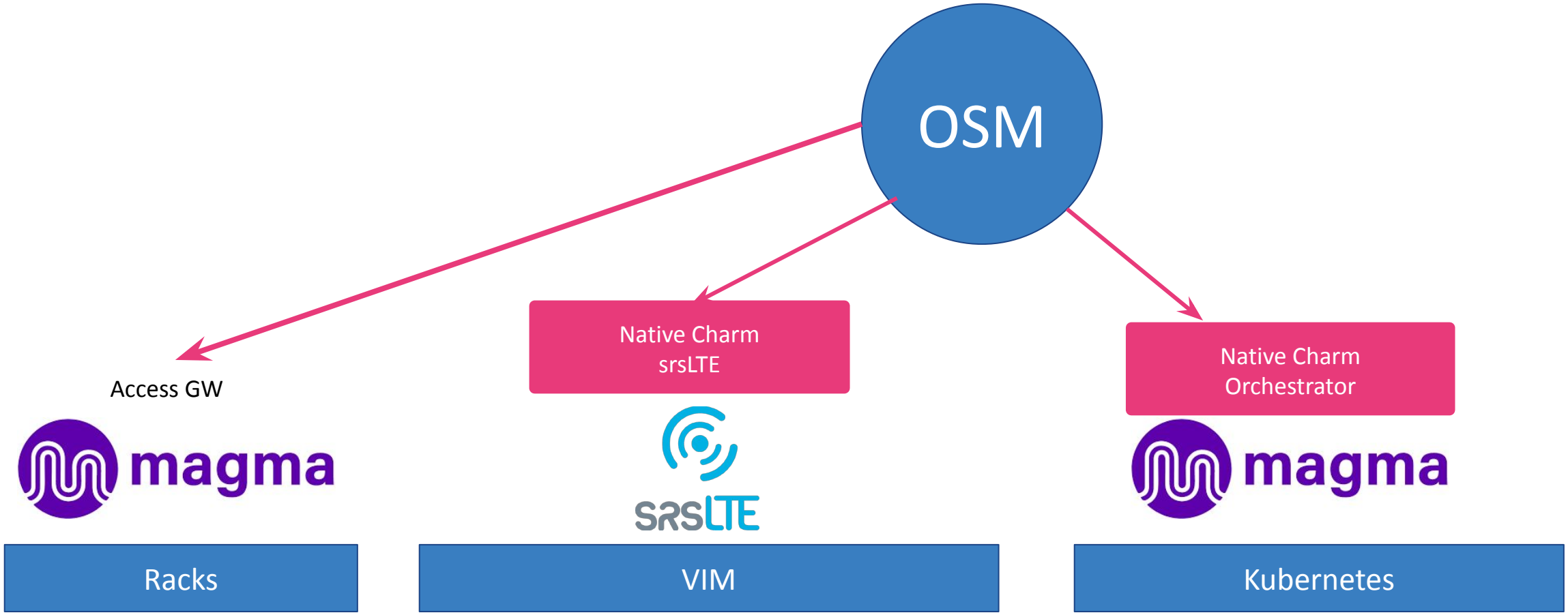
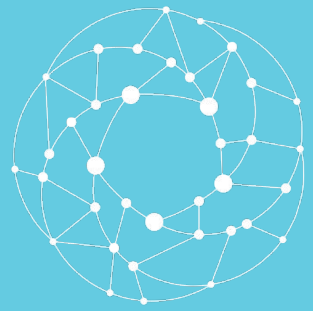
Reality is messy and mixed



Reality is messy and mixed





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Magma Orchestrator

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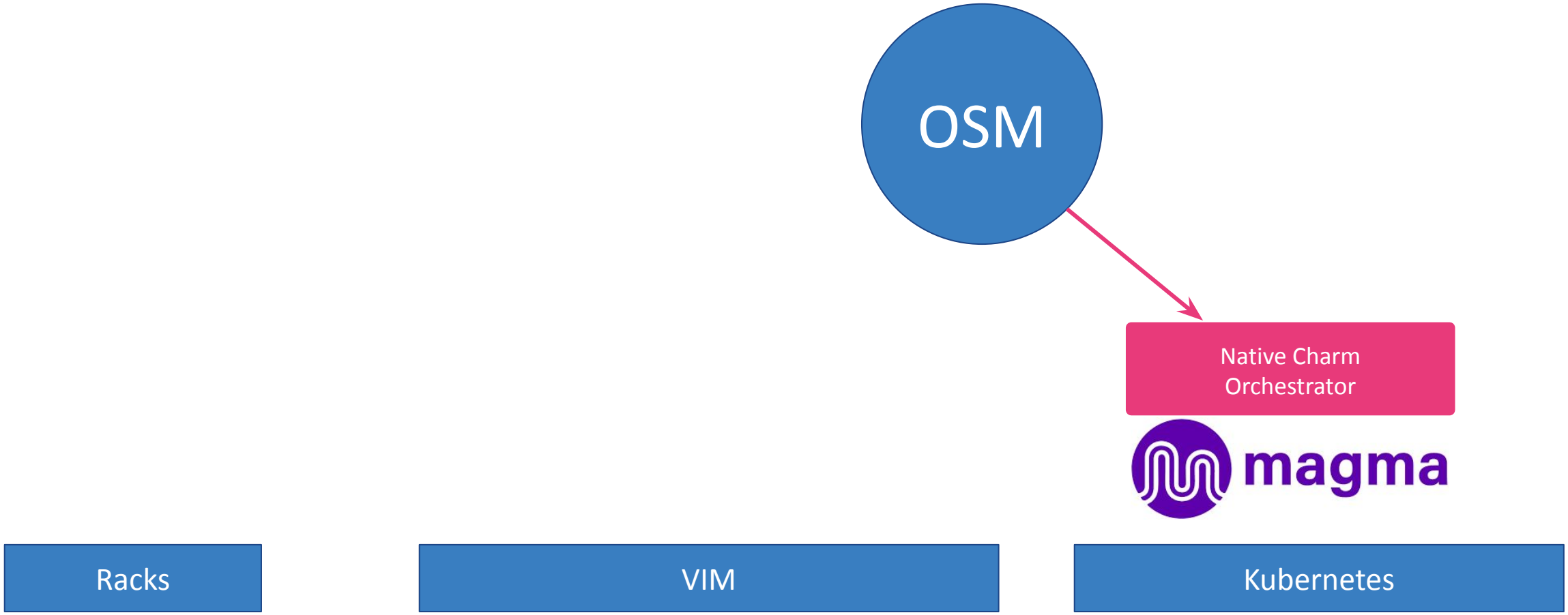
Magma Orchestrator



What are juju bundles?

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- Bundles are collections of charms.
- They represent an entire model, rather than a single application.
- From a technical point of view, a bundle is a YAML file.

Charms + Config + Relations ⟶

```
bundle: kubernetes
applications:
  mariadb-k8s:
    charm: cs:~juju/mariadb-k8s-2
    scale: 1
  mediawiki-k8s:
    charm: cs:~juju/mediawiki-k8s-3
    scale: 1
    options:
      debug: true
relations:
- - mariadb-k8s:server
  - mediawiki-k8s:db
```

Referencing the juju-bundle (VNFd)


```
vnfd:
  [...]
  kdu:
  - name: magma-orc-kdu
    juju-bundle: bundle.yaml
```

juju-bundles/bundle.yaml (VNFd)

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```
bundle: kubernetes
applications:
  nms-magmalte:
    charm: magma-nms-magmalte
  # ...
  orc8r-certifier:
    charm: magma-orc8r-certifier
    channel: edge
    scale: 1
    trust: true
    options:
      domain: team1.osmhackfest.com
  # ...
relations:
- - nms-magmalte:magma-orc8r-certifier
  - orc8r-certifier:magma-orc8r-certifier
```

Day-1 operations (VNFd)

```
vnfd:
  description: K8s container deployment of Magma Orchestrator
  df:
  - id: default-df
    lcm-operations-configuration:
      operate-vnf-op-config:
        day1-2:
          - id: magma-orc-kdu
            initial-config-primitive:
              - name: create-orchestrator-admin-user
              parameter:
                    - seq: 0
                      name: application-name
                      data-type: STRING
                      default-value: orc8r-orchestrator
                    - name: url
                      data-type: STRING
                      default-value: ''
                  [...]
```

Adding day-2 operations (VNFd)


```
vnfd:
  description: K8s container deployment of Magma Orchestrator
  df:
  - id: default-df
    lcm-operations-configuration:
      operate-vnf-op-config:
        day1-2:
          - id: magma-orc-kdu
            config-primitive:
              - name: get-admin-credentials
               parameter:
                    - name: application-name
                      data-type: STRING
                      default-value: nms-magmalte
                [...]
```

Onboarding to OSM

```
$ osm nfpkg-create magma_orc_cnf.tar.gz
$ osm nspkg-create magma_orc_ns.tar.gz
```

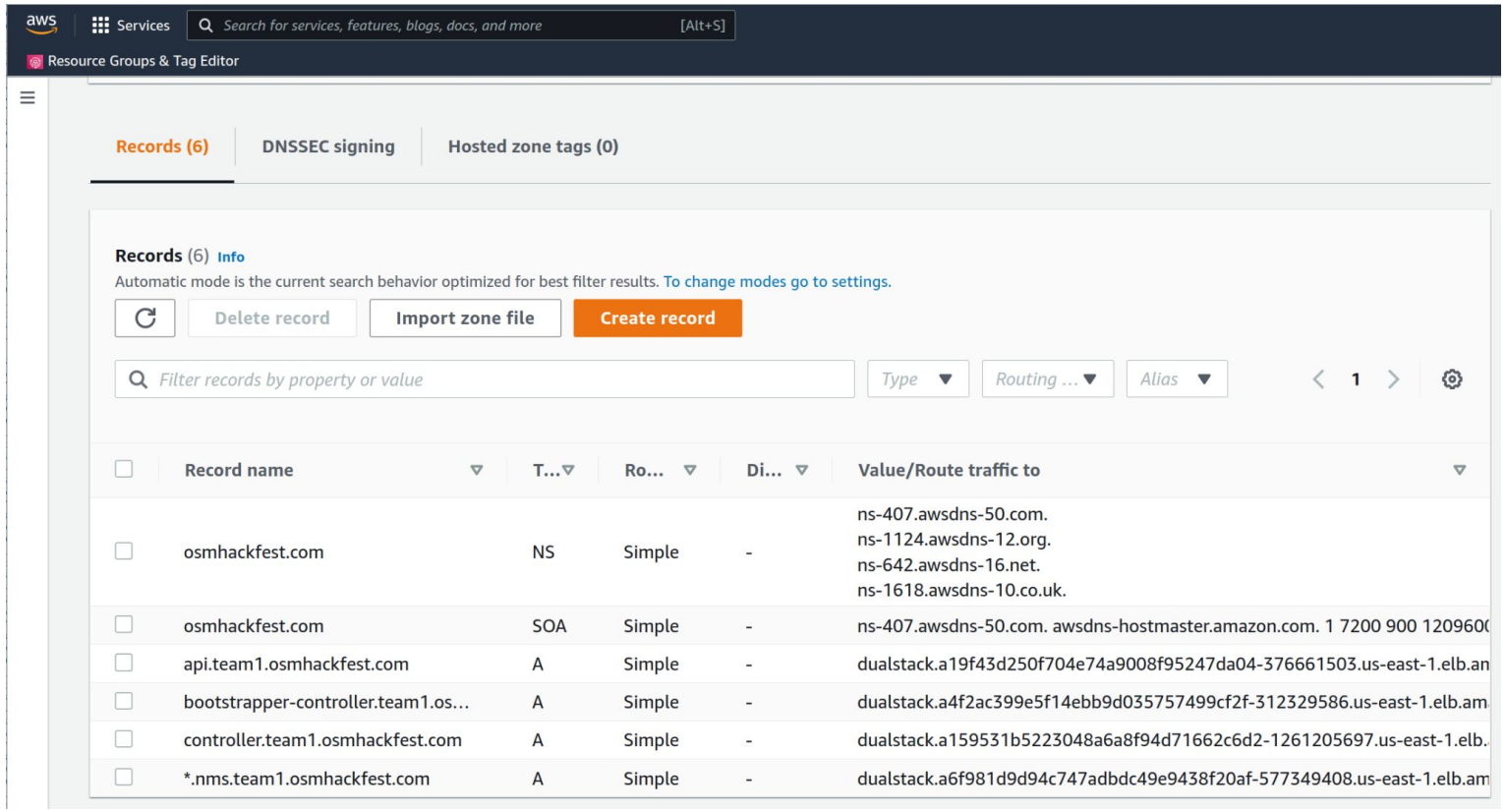
Deploy Magma Orchestrator

```
$ osm ns-create --ns_name magma_orc_cnf_ns \
                --nsd_name magma_orc_cnf_ns \
                --vim_account aws-site
```

Progress with osm ns-show

```
| admin-status          | "ENABLED"                                                                          |
| deploymentStatus      | null                                                                               |
| configurationStatus   | [                                                                                  |
|                       |     "status": "INSTALLING SW"                                                      |
| vcaStatus             | {                                                                                  |
|                       |         "meter_statuses": {},                                                      |
|                       |         "status": {                                                                |
|                       |           "status": "maintenance",                                                 |
|                       |             "agent_status": {                                                      |
|                       |               "status": "executing",                                               |
|                       |             "workload_status": {                                                   |
|                       |               "status": "maintenance",                                             |
|                       |         "agent_status": {                                                          |
|                       |           "status": "started",                                                     |
|                       |         "instance_status": {                                                       |
|                       |           "status": "running",                                                     |
|                       |         "modification_status": {                                                   |
|                       |           "status": "idle",                                                        |
|                       |         "meter-status": {                                                          |
|                       |         "model-status": {                                                          |
|                       |           "status": "available",                                                   |
| operational-status    | "init"                                                                             |
| config-status         | "init"                                                                             |
| detailed-status       | "Stage 2/5: deployment of KDUs, VMs and execution environments. 0/2. Deployed at VIM" |
|                       |         "vim_status": "DONE"                                                       |
|                       |         "vim_status": "DONE"                                                       |
|                       | revision_number: 175, 'router:external': true, segmentation_id: null,\n  shared: true, status: |
|                       |         "vim_status": "ACTIVE"                                                     |
|                       | 'router:external': false, segmentation_id: null, shared: false,\n  status: ACTIVE, subnets: |
|                       |         "vim_status": "ACTIVE"                                                     |
|                       |       "operational-status": "running"                                              |
|                       |         "operational-status": "init",                                              |
|                       |         "detailed-status": "10% Preparing libblockdev-part2 (amd64)",              |
|                       |         "VCA-status": "maintenance",                                               |
|                       |         "status": "running",                                                       |
|                       |         "status-time": "1614889418.2858396",                                       |
```

Configure route53



[How to configure route53]

Download certificates

Install *admin_operator.pfx* in your browser

```
$ juju scp -m $model-name --container="magma-orc8r-certifier" \
    orc8r-certifier/0:/var/opt/magma/certs/..data/admin_operator.pfx \
    admin_operator.pfx
Password: password123
```

Copy *rootCA.pem* in Magma AGW machine

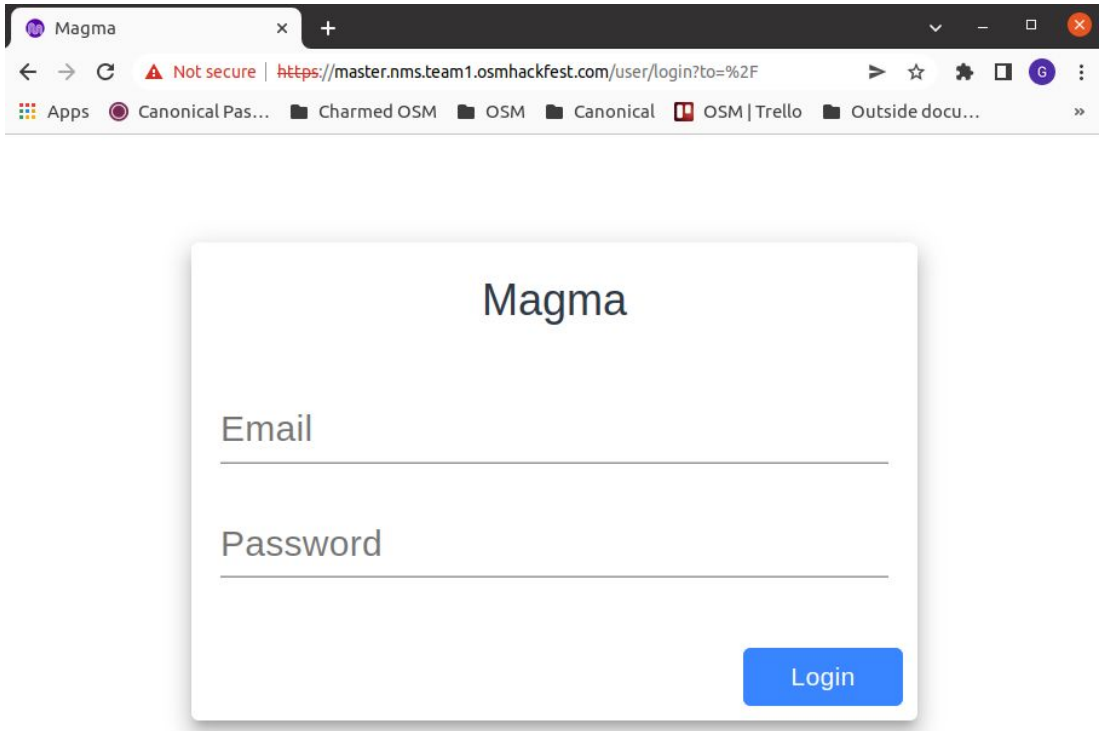
```
    $ juju scp -m $model-name --container="magma-orc8r-certifier" \
       orc8r-certifier/0:/var/opt/magma/certs/..data/rootCA.pem \
       rootCA.pem
```

Magma Orchestrator GUI

Get the GUI credentials

```
$ osm ns-action magma_orc_cnf_ns \
        --vnf_name magma_orc_cnf \
        --kdu_name magma-orc-kdu \
        --action_name get-admin-credentials
$ osm ns-op-show <Op-id>
```

[Magma GUI]



Configure Magma Orchestrator

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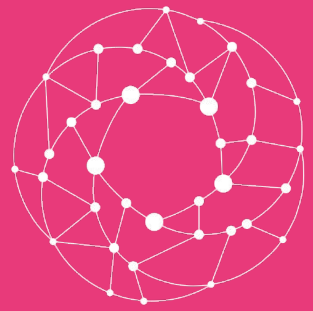
1. Create new tenant in the NMS (optional)
2. Create NMS user for tenant
3. Log in to the NMS (https://<TENANT>.nms.<YOUR DOMAIN>)
4. Create an LTE network in tenant's NMS
5. Configure PLMN (MCC: 772, MNC: 17)
6. Create APN (name: default)
7. Import subscribers to the NMS (csv file available on each team's Google Drive)



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Magma Access GW

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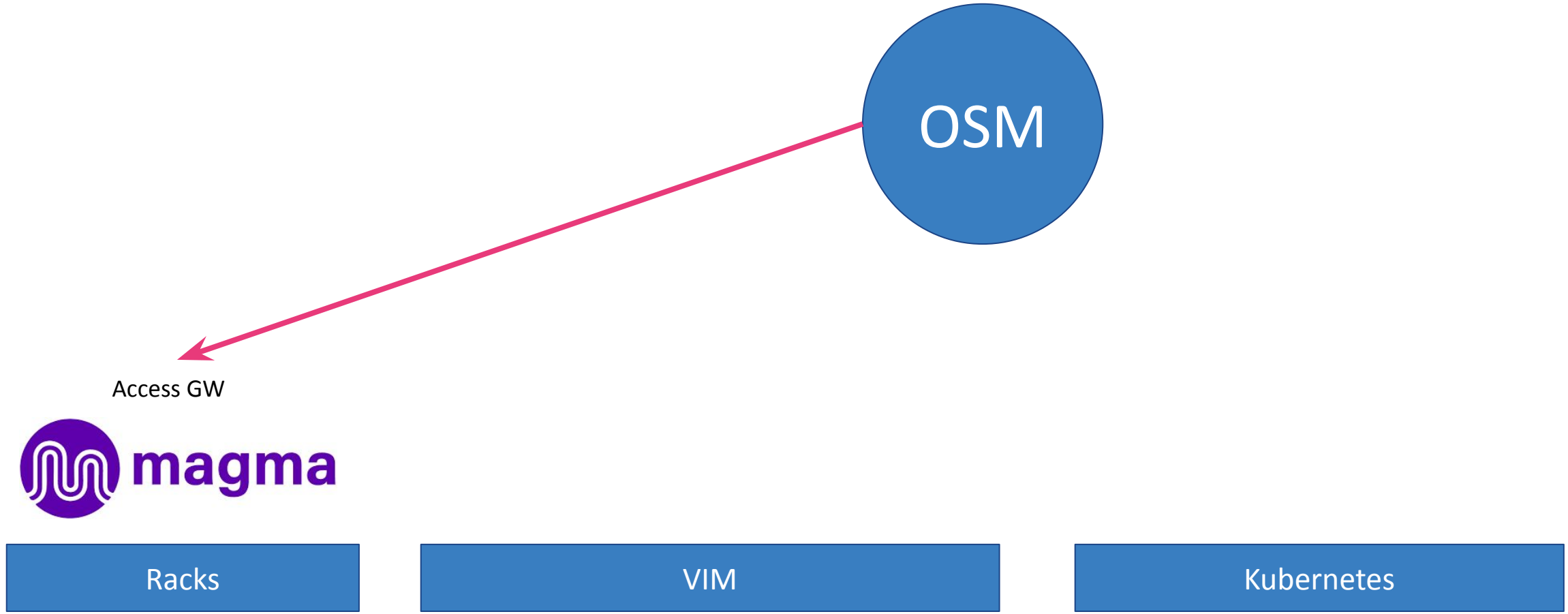
Magma Access GW



PNF vs VNF

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PNF

Higher unit cost
Bulky
Fragile
Needs care

VNF

Low unit cost
Compact
Recyclable
Needs no care

https://www.linkedin.com/pulse/technology-analogy-physical-virtual-network-functions-milind-kulkarni/

PNF - Bare Metal?

Open Source MANO

Physical Network Function

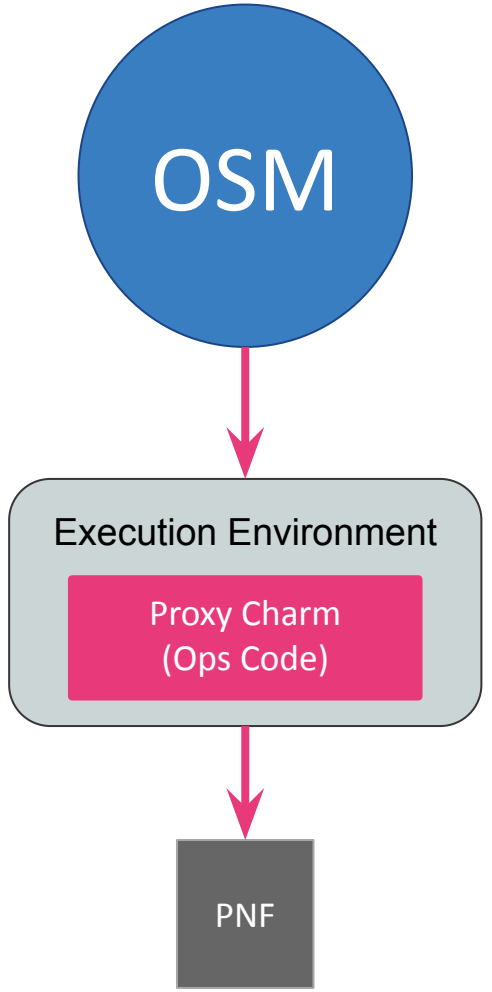
Implementation of a NF via a tightly coupled software and hardware system

- PNF refers to a function that is fixed
  - Purpose built to provide a specific function - hardware appliance
- PNF does not always mean bare metal
  - Can be unmanaged software in VM
- VNF does not always mean running in VM or Container
  - OpenStack Ironic allows for management of bare metal like a VM

https://www.etsi.org/deliver/etsi_gs/nfv/001_099/003/01.04.01_60/gs_nfv003v010401p.pdf

How do we Manage a PNF

- OSM must be given information about the PNF
  - Register a PNF as a logical entity with IP and other info
- Use in standard network function package descriptors
  - Network service and virtual network function descriptors
  - Templates that tell OSM about the PNF
- On Network Service deployment
  - OSM does not launch any VM or container
  - OSM creates an execution environment for the PNF
  - All actions execute in this environment



Breaking it down: Creating Packages

```
$ osm nfpkg-create magma_agw_pnf.tar.gz
$ osm nspkg-create magma_agw_ns.tar.gz
```

Telling OSM About the PDU

- Need to tell OSM some information
  - Name
  - Type
  - Interfaces with IP addresses

```
VIMID=`osm vim-list | grep osm_ |\
       awk '{ print $4 }'`

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

```
name: MagmaAGW
description: Magma Access GW
type: gateway
vim_accounts: [ <VIM_ID> ]
shared: false
interfaces:
 -   name: gateway_public
     ip-address: <Magma AGW SGi IP>
     mgmt: true
 -   name: vnf_internal
     ip-address: <Magma AGW S1 IP>
     mgmt: false
```

Onboard the PNF in OSM

```
$ osm ns-create --ns_name magma_agw_ns \
                --nsd_name magma_agw_ns \
                --vim_account aws-site
```

Configure Magma AGW

Copy `rootCA.pem` from Magma Orchestrator to Magma AGW machine

```
$ sudo su
# magma-access-gateway.configure \
        --domain team1.osmhackfest.com \
        --root-ca-pem-path ./rootCA.pem
```

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SRS LTE

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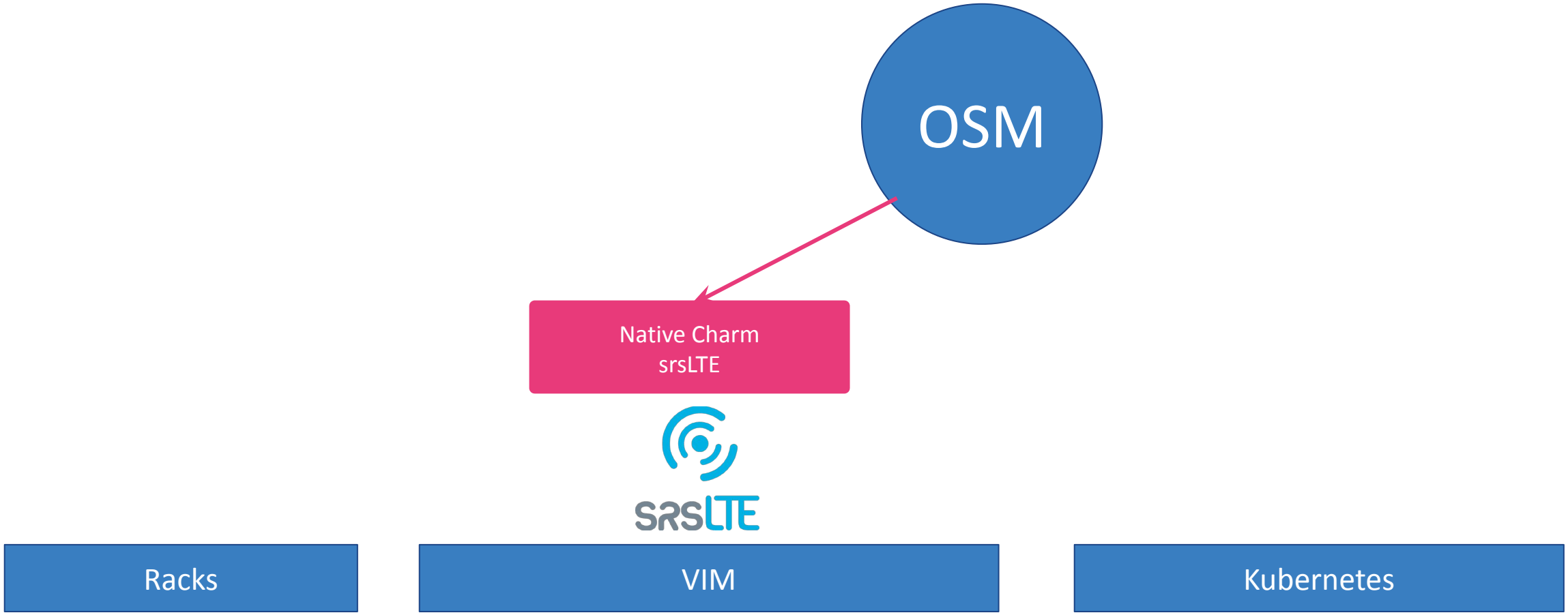
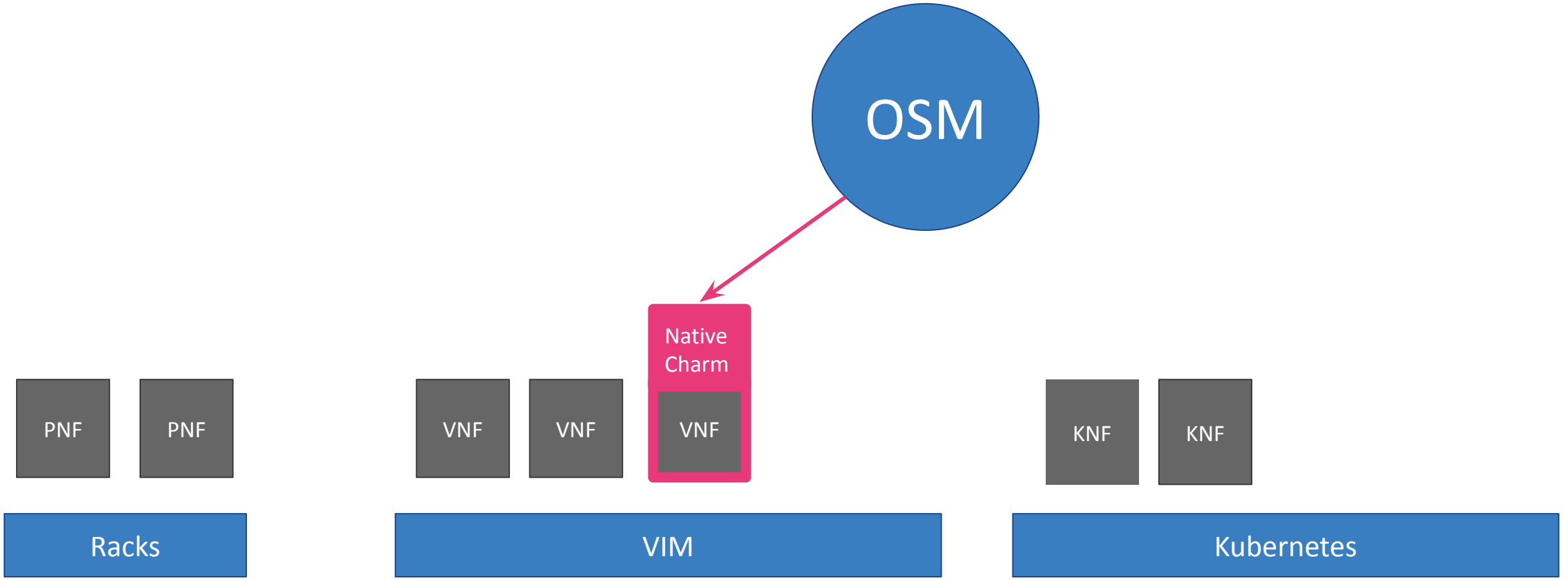
srsLTE EnodeB + UE emulator



srsLTE EnodeB + UE emulator



eNodeB and UE Emulator VNF

- Image: Ubuntu20.04 cloud image
  - Just Enough Operating System (JEOS)
  - Base OS with cloud init and ssh, very few packages installed
- All software is installed at deployment time

eNodeB and UE Emulator Operations

- Native charm:
  - Name: srs-enb-ue
  - Actions:
    - Attach UE
    - Detach UE

Day-1 operations (VNFd)

```
vnfd:
  description: srsLTE VDU
  df:
  - id: default-df
    lcm-operations-configuration:
      operate-vnf-op-config:
        day1-2:
        - id: srsLTE-vdu
          initial-config-primitive:
          - name: config
            execution-environment-ref: srs-enb-ue-ee
            parameter:
            - name: bind_address_subnet
              value: <bind_address_subnet>
            - name: mme_addr
              value: <mme_addr>
              [...]
```

Day-2 operations (VNFd)

```
vnfd:
  description: K8s container deployment of Magma Orchestrator
  df:
  - id: default-df
    lcm-operations-configuration:
      operate-vnf-op-config:
        day1-2:
        - id: magma-orc-kdu
          config-primitive:
          - name: attach-ue
            execution-environment-ref: srs-enb-ue-ee
            parameter:
            - data-type: STRING
              name: usim-imsi
            - data-type: STRING
              name: usim-k
            - data-type: STRING
              name: usim-opc
          - name: detach-ue
            execution-environment-ref: srs-enb-ue-ee
              [...]
```

Onboarding to OSM

```
$ osm nfpkg-create srs-lte-enb_vnfd.tar.gz
$ osm nspkg-create srs-lte-enb_nsd.tar.gz
```

Deploy srs LTE

```
$ osm ns-create
  --ns_name enb --nsd_name srs-lte-enb_nsd --vim_account aws-site \
  --config "{vld: [
              {name: mgmt, vim-network-name: <EKS public subnet> }
            ],
            additionalParamsForVnf: [
              {member-vnf-index: 'srsLTE',
               additionalParams: {
                 bind_address_subnet: '<subnet CIDR>',
                 mme_addr: '<AGW eth1 IP>',
                 enb_mcc: '722',
                 enb_mnc: '71'}}]}"
```

Attach UE to Magma

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```
$ osm ns-action enb --vnf_name "srsLTE"
        --vdu_id srsLTE-vdu \
        --action_name attach-ue \
        --params '{
            usim-imsi: "722170000000008",
            usim-k: "c8eba87c1074edd06885cb0486718341",
            usim-opc: "17b6c0157895bcaa1efc1cef55033f5f"
          }'
```