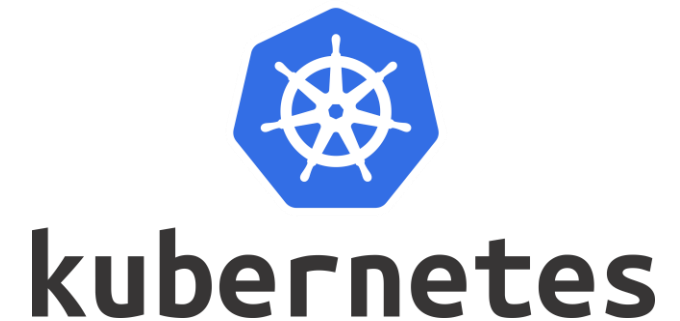# OSM MR8 Hackfest – Hack 4
# Running Containerized Network Functions

Gerardo García (Telefónica)

Why K8s in OSM?

- Applications based in micro-services
  - OSM is, in fact, already running in K8s, both distros and community installer

- Upcoming NFV use cases: 5G Core, uCPE/SD-WAN…

- K8s apps and clusters are essential ingredients for many Edge use cases

How K8s-based apps are modelled today

- K8s provides a huge number of high-level service objects, which are the core of its functionality:
  - Pod sets*: deployments (+replicasets), statefulsets
  - Services: clusterIP, NodePort, LoadBalancer
  - Storage: persistent volumes, persistent volume claims
  - …

- TWO ways to deploy a K8s app:
  - **Helm charts**: packaged format + indirect call to the K8s API via helm
  - **Juju charms and bundles**: packaged format + indirect call to the K8s API via Juju
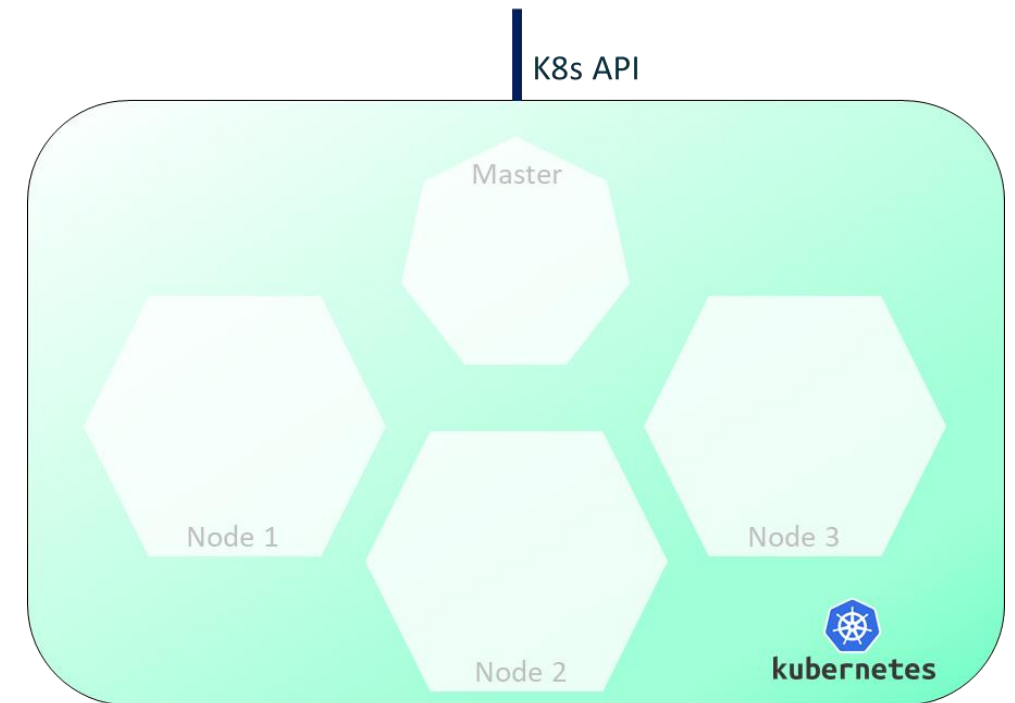
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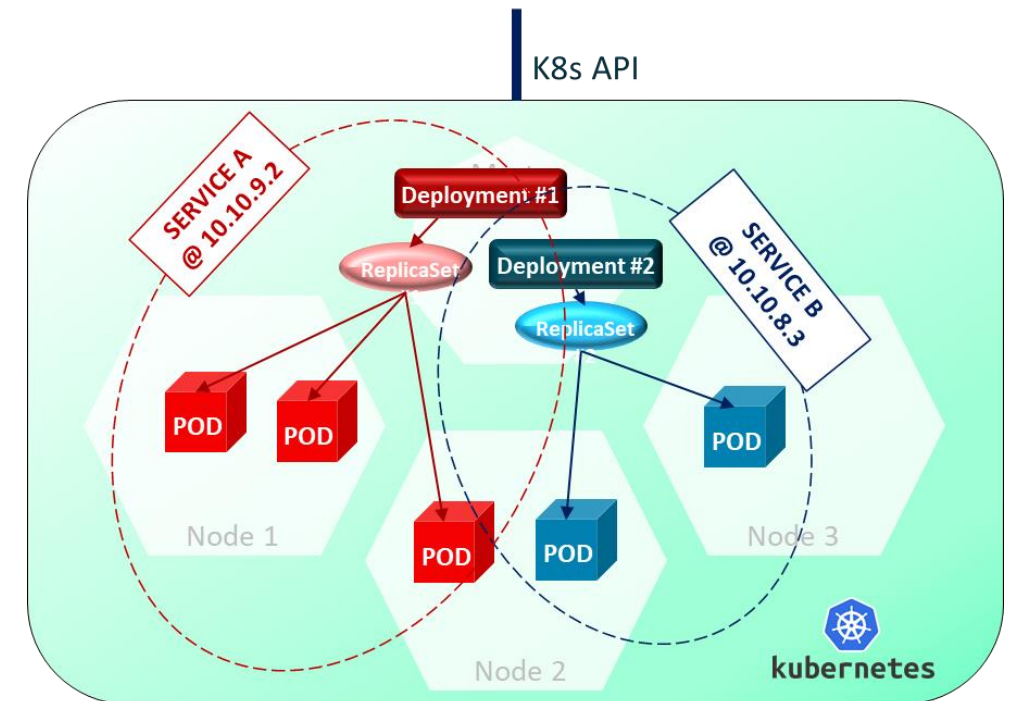
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Requirements of K8s-based apps: a K8s cluster

- The K8s cluster:
  - Can be created in different ways:
    - Standalone: Openshift, Charmed K8s, Ericsson CCD, etc.
    - As part of a VIM: Vmware Cloud PKS, AWS, etc.
  - Can run on Bare Metal or on VMs running in a VIM
  - Once created, each cluster provides a K8s API, irrespective of the way it was created.

- Specific versions of K8s or CNI plugins might be required
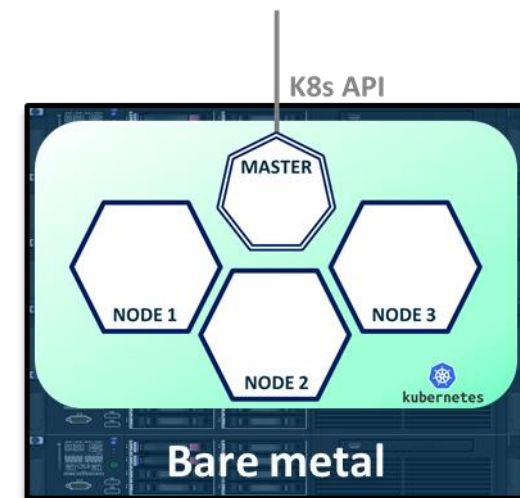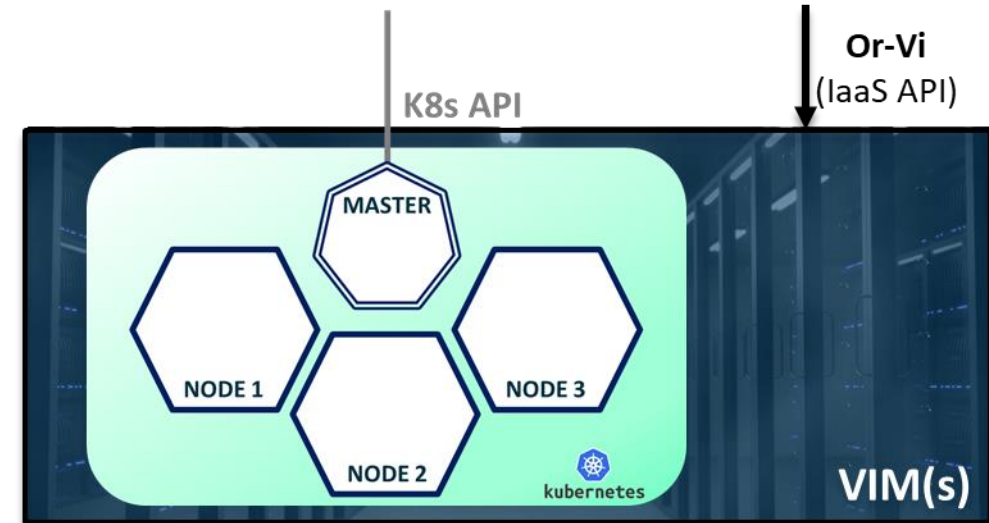
K8s support in OSM

From K8s apps to xNF
Model-driven (like everything in OSM)

- **NF composition specified in the VNF descriptor**
  - Deployment Units:
    - Virtual (VDU) = VM
    - Physical (PDU) = Physical Node
    - Kubernetes (KDU) = K8s app

- **Modelling in the VNF descriptor:**

  - KDU based on helm charts or juju bundles

```
+--ro kdu* [name]
|  +--ro name              string
|  +--ro description?       string
|  +--ro (kdu-model)?
|  |  +--:(helm-chart)
|  |  |  +--ro helm-chart?    string
|  |  +--:(juju-bundle)
|  |     +--ro juju-bundle?   string
```

  - K8s cluster requirements:

```
+--rw k8s-cluster
|  +--rw version*    string
|  +--rw cni*        enumeration
|  +--rw nets* [id]
|     +--rw id                            string
|     +--rw external-connection-point-ref?   -> ../../../connection-point/name
```
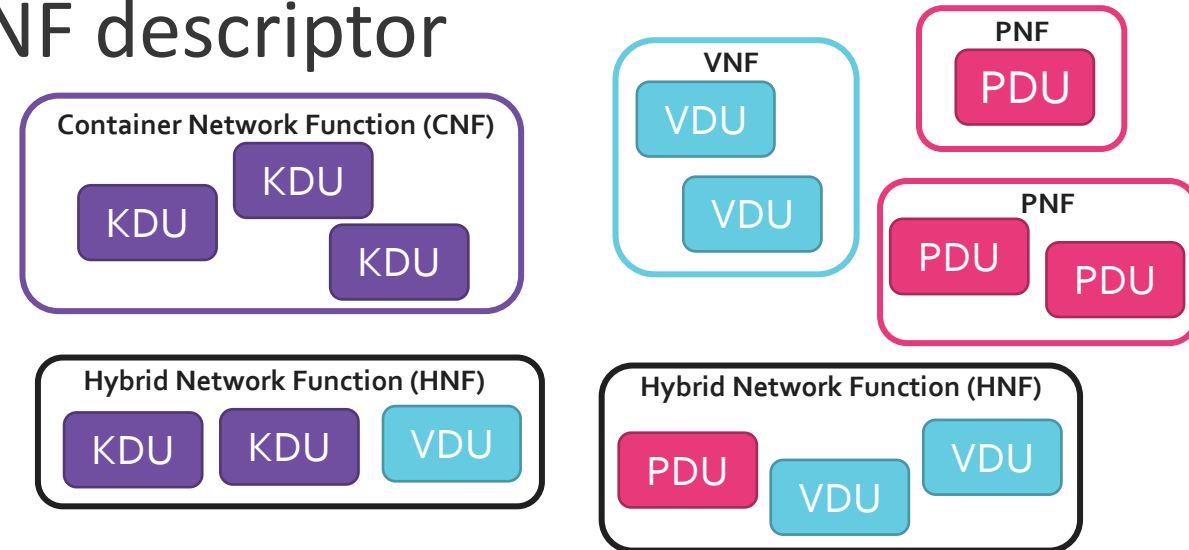
Two steps are considered in OSM

STEP #1. CREATION OF THE K8S CLUSTER	STEP #2. USE OF THE K8S CLUSTER

OPTIONS:
 	
1. **By an external platform, static**
   • Cluster is then registered into OSM administratively
2. **By using external standalone platform API**
   • Covered by plugin model (Rel EIGHT)
3. **By using "enriched" APIs in some VIMs**
   • Covered by plugin model (Rel EIGHT)
4. **Created by OSM as a regular NS**
	• **The full catalog of K8s objects is entirely incorporated in a future-proof manner**:
	
	  • **Helm charts**: +20,000 stable applications are already available for production
	  • **Juju bundles**: fairly powerful for inter-object configurations
	
	• OSM also supports **hybrid cases**, which are required for real VNFs (e.g. 5G Core)
	
	NF Packages (VNF, PNF, HNF)
	Mgmt Procedures
	Resource Description
	K8s Deployment Model(s)
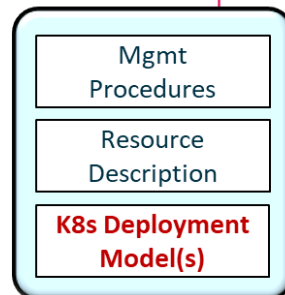	
	Ready in Release SEVEN!

Life cycle management of KDU is managed through OSM NBI

Full K8s app lifecycle operations:
- `install`
- `upgrade`
- `rollback`
- `delete`
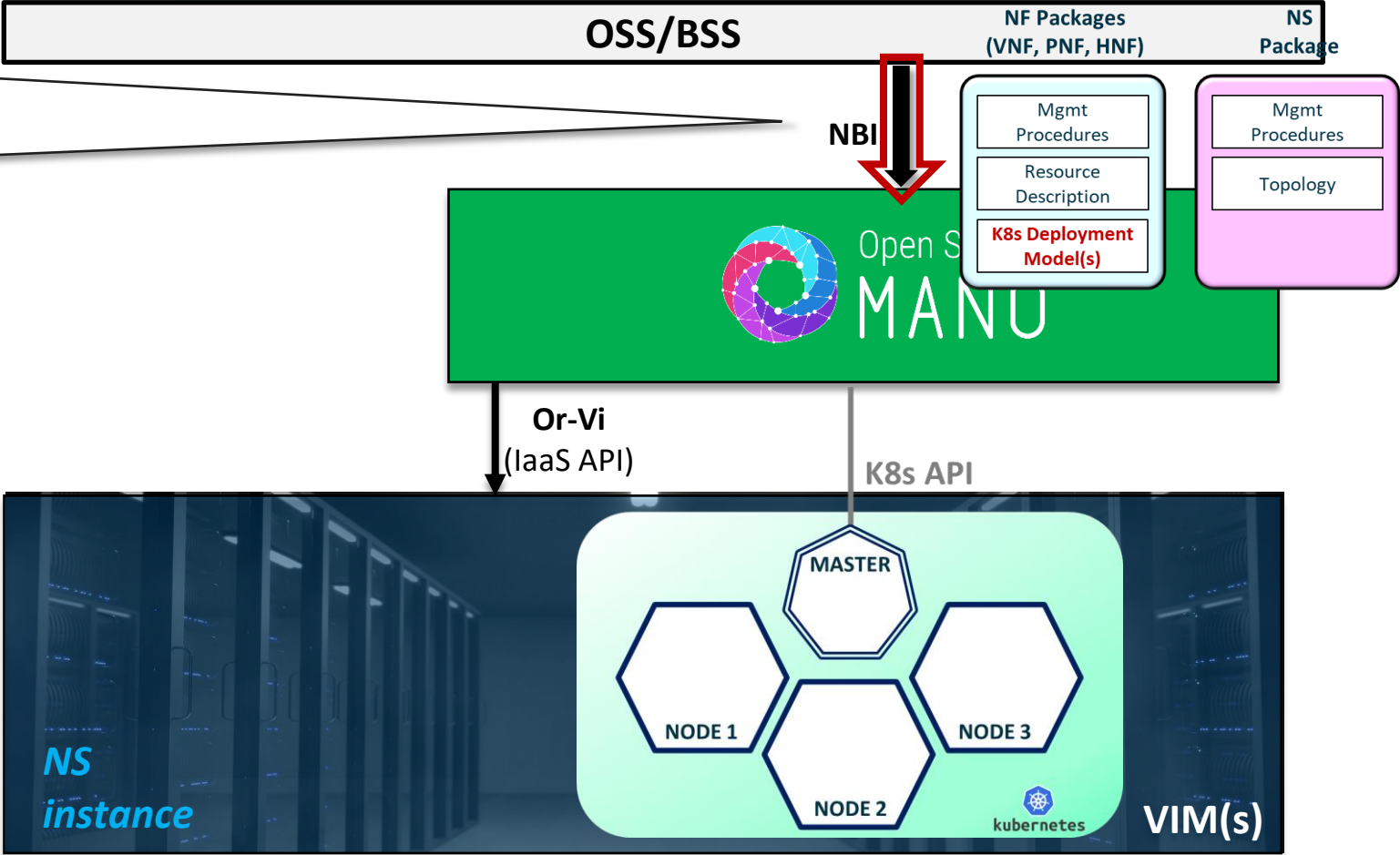
Hands-on

Instantiating KNFs and running implicit primitives

OSM K8s cluster preparation

Installation: [K8s cluster installation guide](#)

Your Kubernetes cluster needs to meet the following requirements:

- Kubernetes Loadbalancer, to expose your KNFs to the network

- Kubernetes default Storageclass, to support persistent volumes.

Association of K8s cluster to VIM
A K8s cluster is expected to be connected

K8s cluster deployed inside a VIM
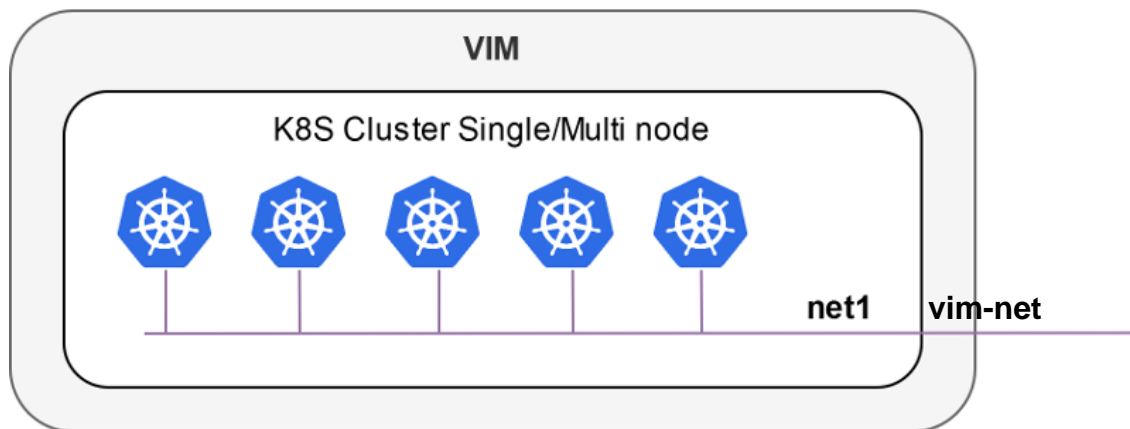
K8s cluster deployed outside a VIM, connected to a VIM network
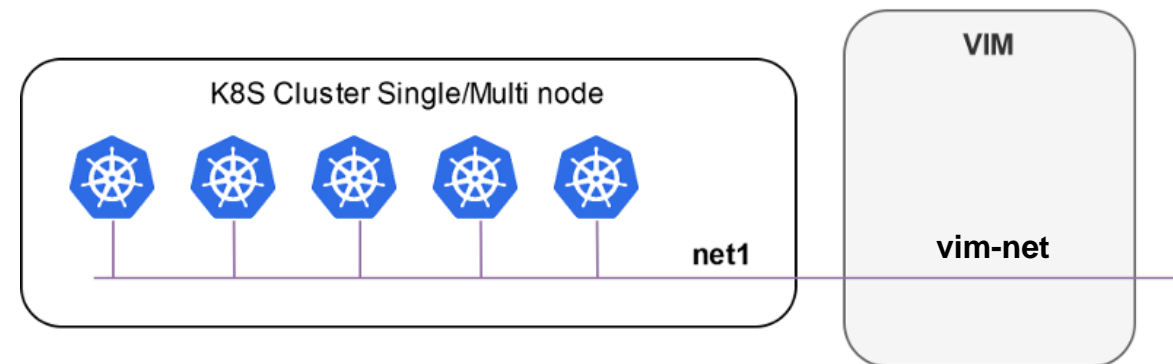

```
osm k8scluster-add --creds kubeconfig.yaml \
                   --version '1.15' \
                   --vim openstack-site-hackfestXX \
                   --k8s-nets '{"net1": "osm-ext"}' \
                   cluster-XX
```

Hands-on session

- We will follow this guide: https://osm.etsi.org/docs/user-guide/05-osm-usage.html#using-kubernetes-based-vnfs-knfs

- Add a K8s cluster

- Onboard KNF and NS packages

- Instantiate and check status

- Running implicit primitives

- Terminate NS

Hands-on session
Adding a K8s cluster

- Information to create the cluster:
  - Version: 1.15
  - VIM: openstack-site-hackfest-XX
  - K8s nets:
    - net1: osm-ext
  - Credentials file: kubeconfig.yaml

- Please check that the status of the k8s cluster shown with `osm k8scluster-list` and `osm k8scluster-show` is `ENABLED`.

Hands-on session
Repos

- No need to add repos

Hands-on session
Instantiation config file

```
---

additionalParamsForVnf:

  - member-vnf-index: openldap

    additionalParamsForKdu:

      - kdu_name: ldap

        additionalParams:

            replicaCount: "2"
```

Hands-on session
Status

```
osm nf-list --ns <NS_NAME>|<NS_ID>

osm vnf-show <ID> --kdu ldap
```

Demo: Cluster creation using OSM packages

How to install a K8s cluster

You can follow this guide: https://osm.etsi.org/docs/user-guide/15-k8s-installation.html

```
osm nfpkg-create k8s_jujumachine_vnf.tar.gz
osm nfpkg-create k8s_jujucontroller_vnf.tar.gz
osm nspkg-create k8s_juju_ns.tar.gz
osm ns-create --ns_name k8s-cluster \
              --nsd_name k8s_juju \
              --vim_account <VIM_ID> \
              --config_file k8s-cluster.yaml \
              --ssh_keys ${HOME}/.ssh/id_rsa.pub
```

How to install a K8s cluster using OSM packages
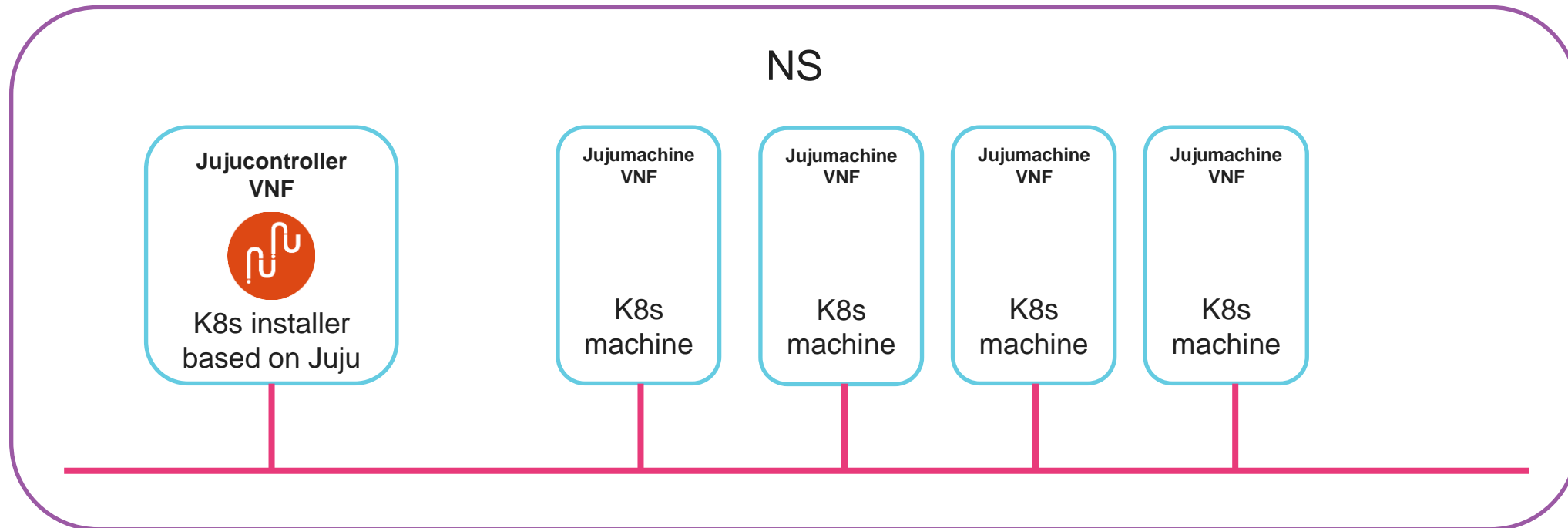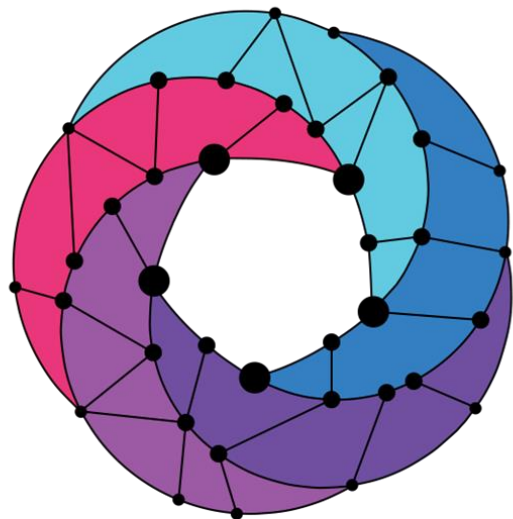
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