

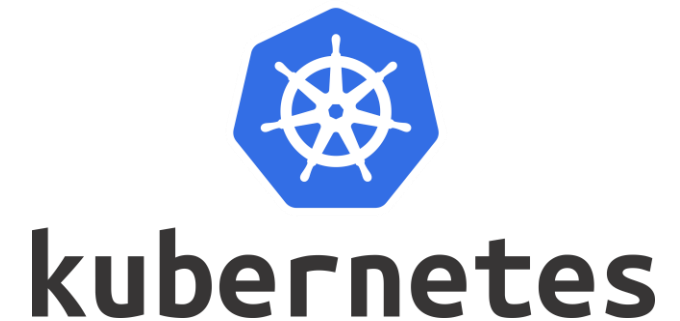
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## OSM MR8 Hackfest – Hack 4 Running Containerized Network Functions

Gerardo García (Telefónica)

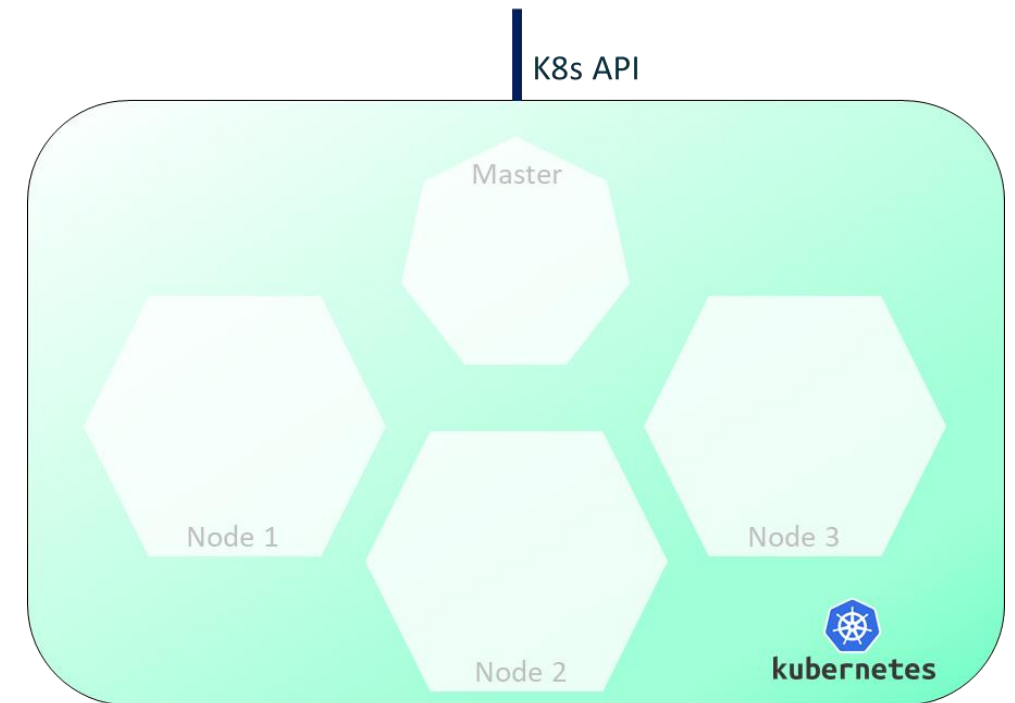
# Why K8s in OSM?

- 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

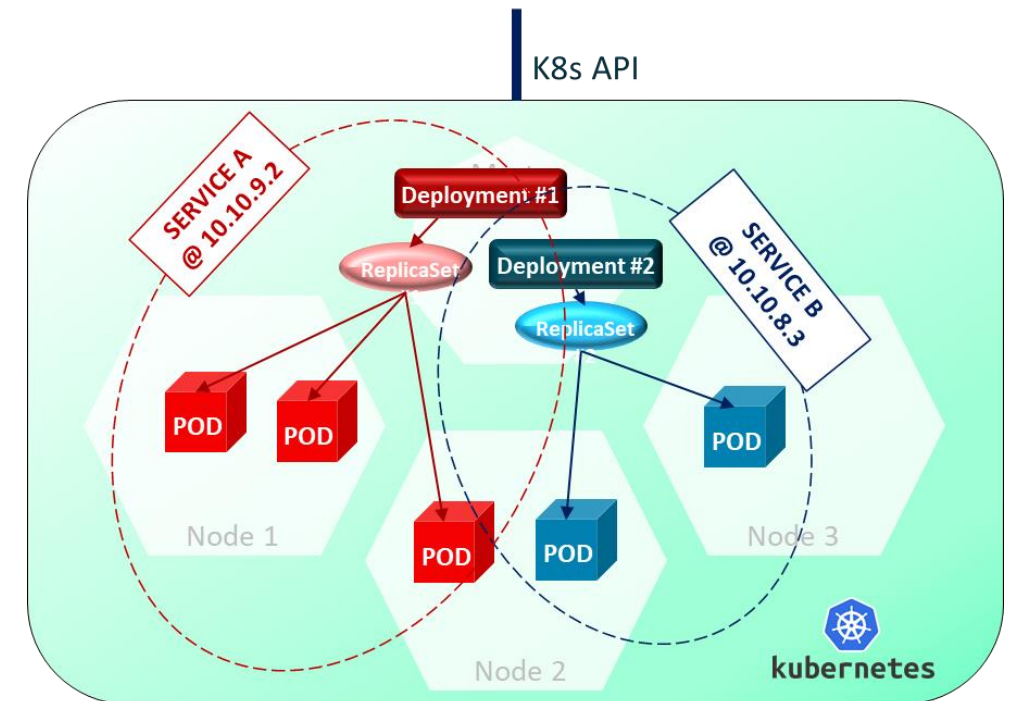
- K8s provides a huge number of high-level service objects, which are the core of its functionality:
  - Pod sets\*: deployments (+replicasets), statefulsets
  - Services: clusterIP, NodePort, LoadBalancer
  - Storage: persistent volumes, persistent volume claims
  - ...
- TWO ways to deploy a K8s app: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



(\* )The concept "pod set" is not part of K8s terminology, but has been used here for convenience

# How K8s-based apps are modelled today

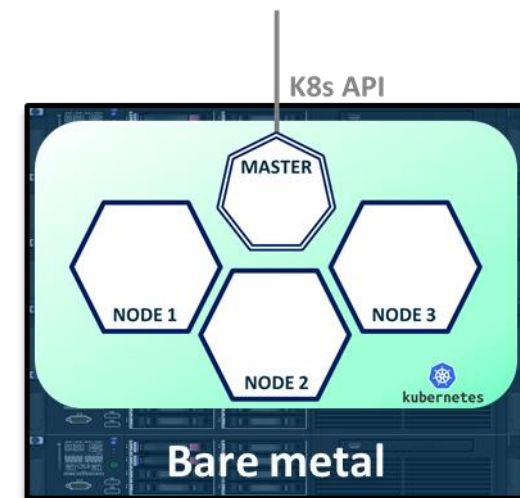
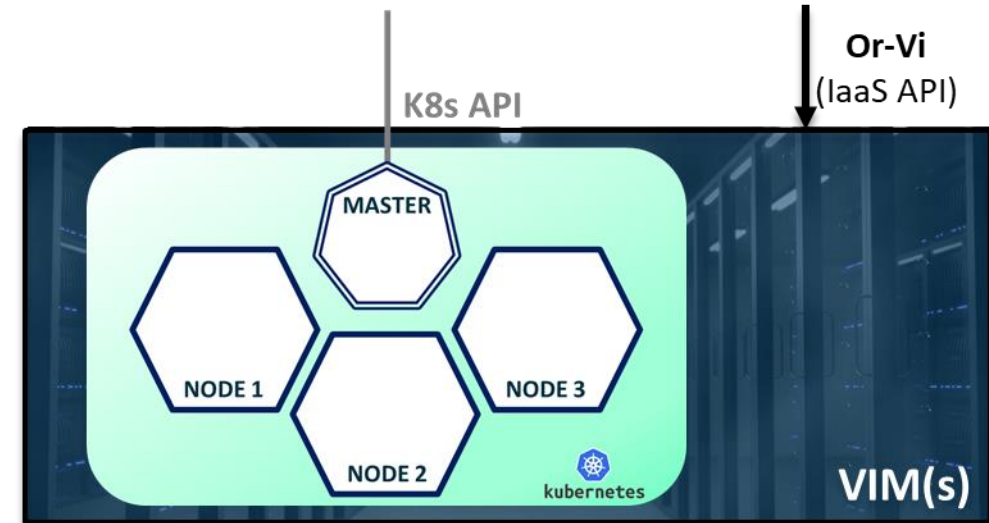
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# Requirements of K8s-based apps: a K8s cluster

- 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







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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**

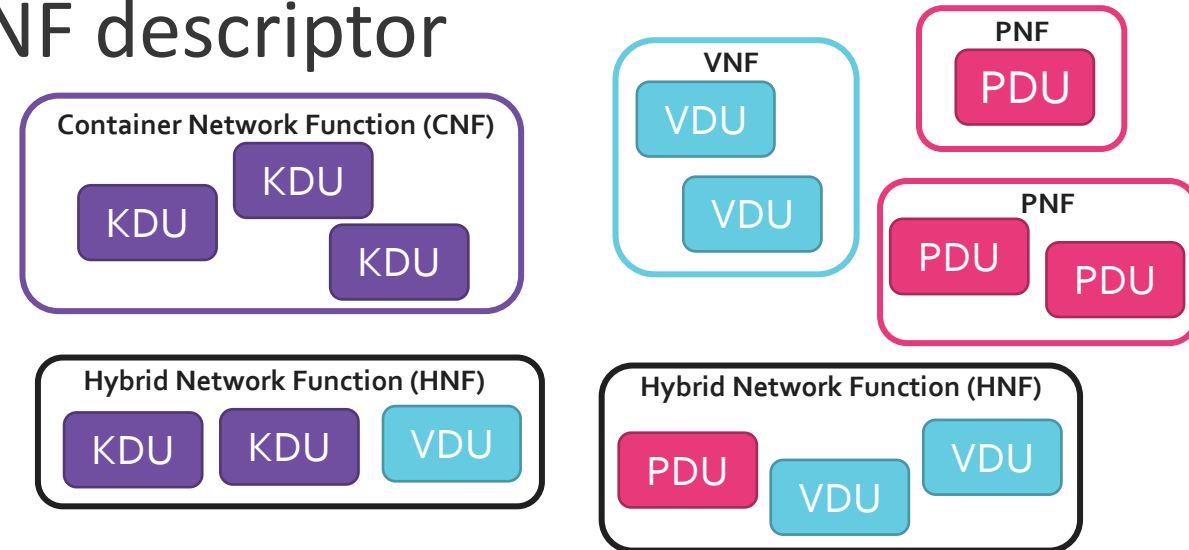
- Modelling in the VNF descriptor:

- 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

### OPTIONS:

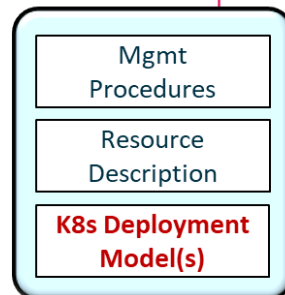
1. **By an external platform, static**
  - Cluster is then registered into OSM administratively
2. **By using external standalone platform API**
  - Covered by plugin model (Rel EIGHT)
3. **By using “enriched” APIs in some VIMs**
  - Covered by plugin model (Rel EIGHT)
4. **Created by OSM as a regular NS**

## STEP #2. USE OF THE K8S CLUSTER

- **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)



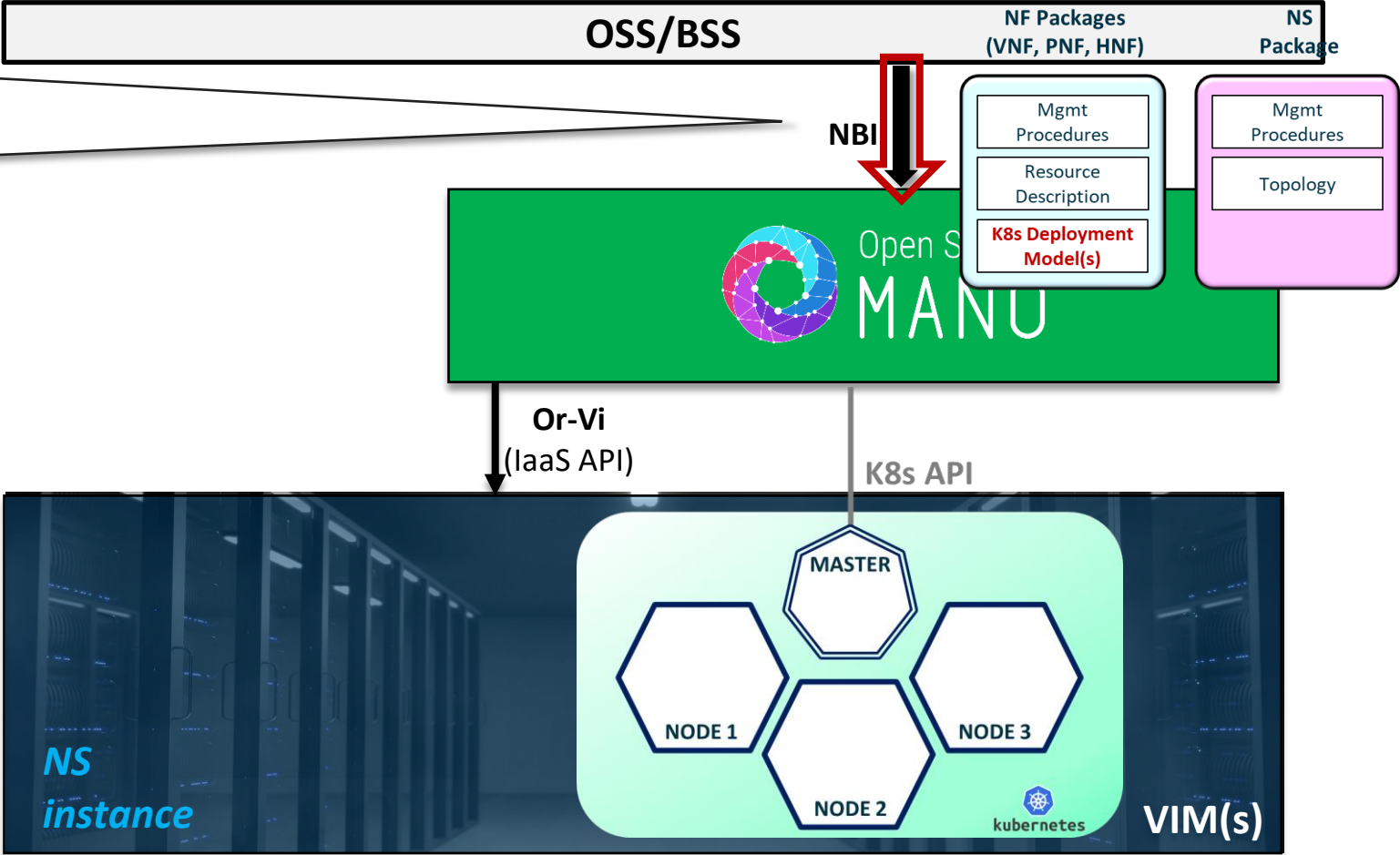
**Ready in Release SEVEN!**



# Life cycle management of KDU is managed through OSM NBI

Full K8s app lifecycle operations:

- install
- upgrade
- rollback
- delete





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Hands-on

Instantiating KNFs  
and running implicit  
primitives



# OSM K8s cluster preparation

Installation: [K8s cluster installation guide](#)

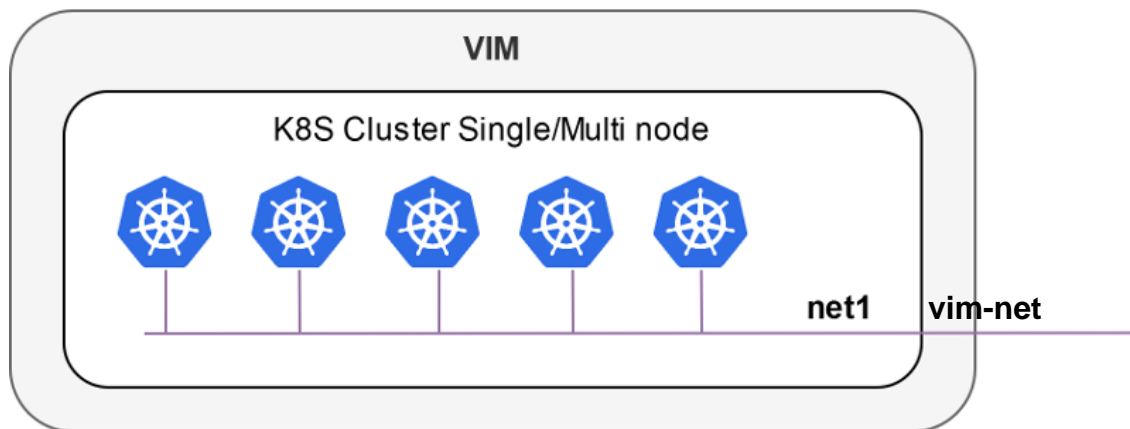
Your Kubernetes cluster needs to meet the following requirements:

- Kubernetes Loadbalancer, to expose your KNFs to the network
- Kubernetes default Storageclass, to support persistent volumes.

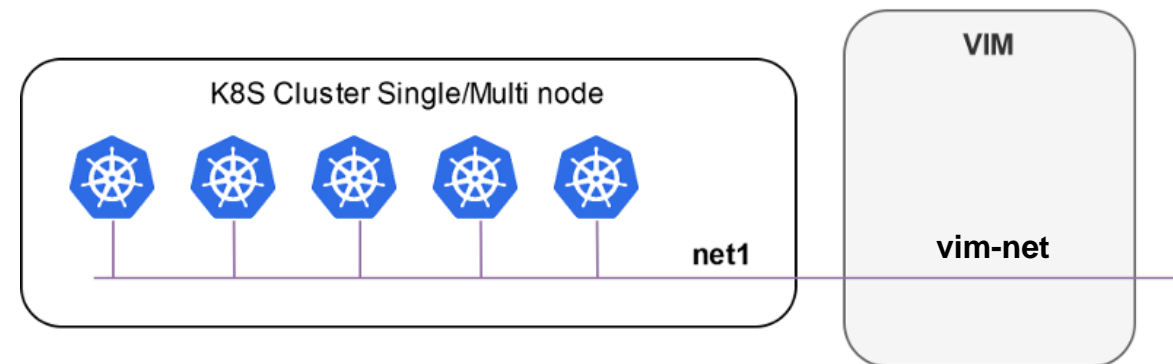
# Association of K8s cluster to VIM

## 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
```



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



Search docs

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    - 5.6.3. Adding kubernetes cluster

## 5.6. Using Kubernetes-based VNFS (KNFs)

From Release SEVEN, OSM supports Kubernetes-based Network Functions (KNF). This feature unlocks more than 20.000 packages that can be deployed besides VNFS and PNFs. This section guides you to deploy your first KNF, from the installation of multiple ways of Kubernetes clusters until the selection of the package and deployment.

### 5.6.1. Kubernetes installation

KNFs feature requires an operative Kubernetes cluster. There are several ways to have that Kubernetes running. From the OSM perspective, the Kubernetes cluster is not an isolated element, but it is a technology that enables the deployment of microservices in a cloud-native way. To handle the networks and facilitate the connection to the infrastructure, the cluster have to be associated to a VIM. There is an special case where the Kubernetes cluster is installed in a baremetal environment without the management of the networking part but in general, OSM consider that the Kubernetes cluster is located in a VIM.

For OSM you can use one of these three different ways to install your Kubernetes cluster:

1. OSM Kubernetes cluster Network Service
2. Self-managed Kubernetes cluster in a VIM
3. Kubernetes baremetal installation

### 5.6.2. OSM Kubernetes requirements

After the Kubernetes installation is completed, you need to check if you have the following components in your cluster.

1. **Kubernetes Loadbalancer**: to expose your KNFs to the network
2. **Kubernetes default Storageclass**: to support persistent volumes.

### 5.6.3. Adding kubernetes cluster to OSM

In order to test Kubernetes-based VNF (KNF), you require a K8s cluster connected to a network in the VIM (e.g. `vim-net`). If you have a baremetal installation of Kubernetes, you will need to add a VIM in order to add the Kubernetes cluster.

- 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
```



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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>



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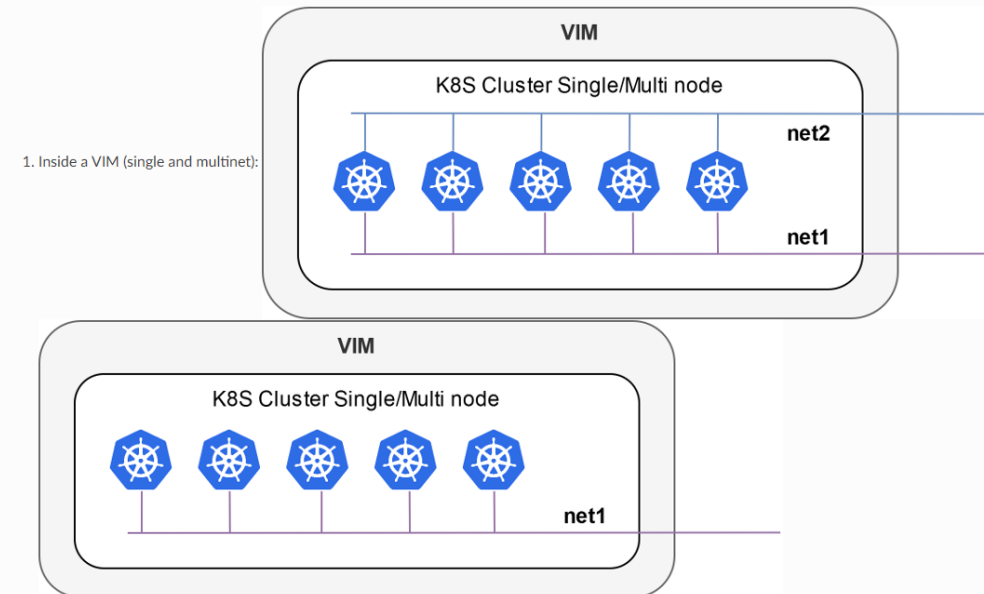
Docs » 15. ANNEX 7: Kubernetes installation and requirements

[View page source](#)

## 15. ANNEX 7: Kubernetes installation and requirements

This section illustrates a safe procedure to setup a Kubernetes cluster that meets the requirements described in chapter 5. Please note that there might be many alternative ways to achieve the same result (i.e. create an equivalent K8s cluster), so, in case you are using different tooling to create your K8s cluster, this annex should be taken just as informative information and refer instead to your tool's guide to the authoritative reference to achieve equivalent results.

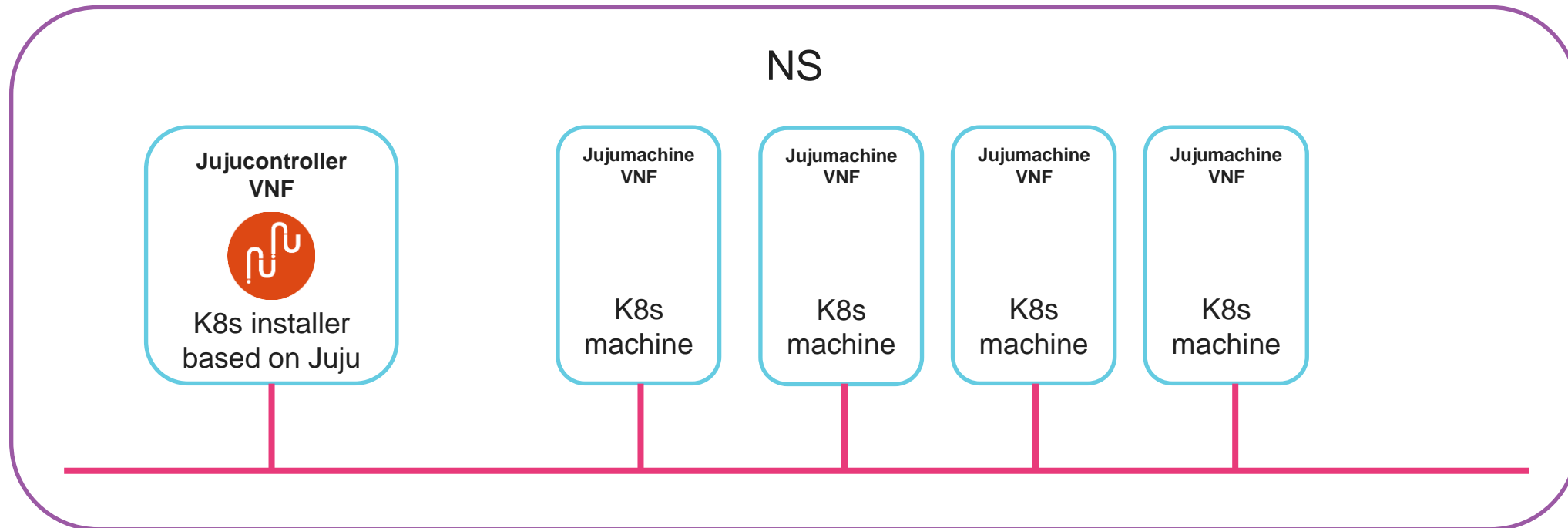
There are two modes to represent a K8s cluster in OSM.

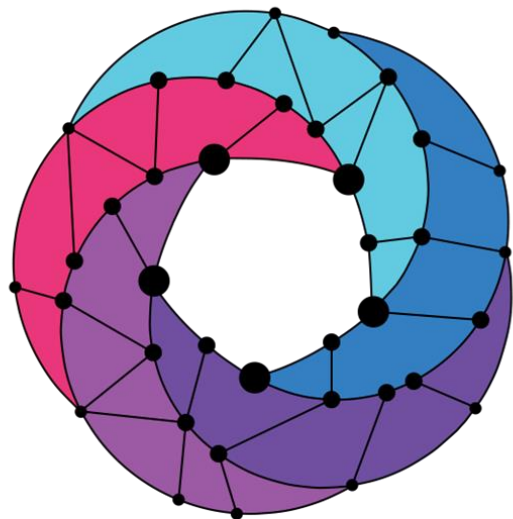


# How to install a K8s cluster using OSM packages

```
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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[osm.etsi.org/wikipub](https://osm.etsi.org/wikipub)