Maintaining, Monitoring and, Troubleshooting Kubernetes

MAINTAINING KUBERNETES CLUSTERS

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Course Overview

Maintaining Kubernetes Clusters

Logging and Monitoring in Kubernetes Clusters

Troubleshooting Kubernetes Clusters

Summary

etcd backup and restore operations

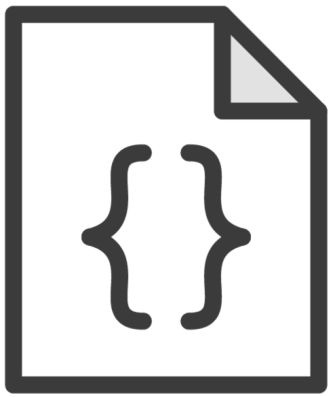
Upgrading an existing cluster

Worker Node maintenance

High availability cluster topologies

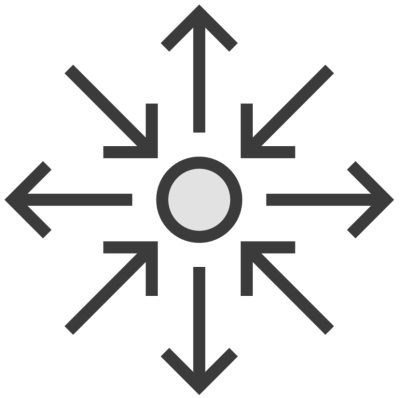
Introducing etcd

Key value datastore



Stores cluster state data and objects

Backup and Restore



High Availability

Backing up etcd

- Backup with snapshot using `etcdctl`
- Secured and/or encrypted to protect sensitive information stored
- Copied offsite as soon as possible
- Schedule backups as a `CronJob`
- Default data directory
  - `/var/lib/etcd`
  - `hostPath` mounted into a Pod

Getting etcdctl

Download from GitHub

Exec into an etcd Pod

Start a container

Backing up etcd with etcdctl

```
ETCDCTL_API=3 etcdctl --endpoints=https://127.0.0.1:2379 \
    --cacert=/etc/kubernetes/pki/etcd/ca.crt \
    --cert=/etc/kubernetes/pki/etcd/server.crt \
    --key=/etc/kubernetes/pki/etcd/server.key \
    snapshot save /var/lib/dat-backup.db

ETCDCTL_API=3 etcdctl --write-out=table \
    snapshot status /var/lib/dat-backup.db
```

Single Server
Pod-based etcd

Restoring etcd with etctl

Restore backup to another location

Move the original data out of the way

Stop etcd

Move the restored data to /var/lib/etcd

Kubelet will restart etcd

https://github.com/etcd-io/etcd/blob/master/Documentation/op-guide/recovery.md#restoring-a-cluster

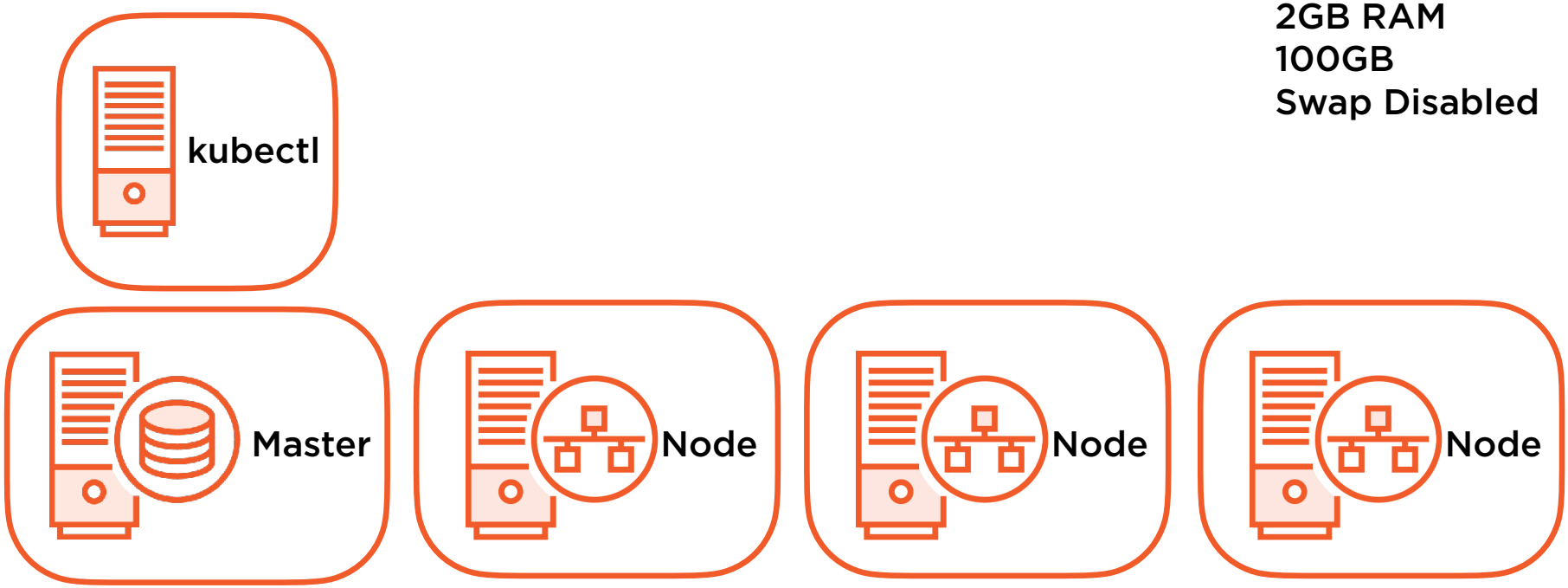
Restoring etcd with etctl

```
ETCDCTL_API=3 etcdctl snapshot restore /var/lib/dat-backup.db

mv /var/lib/etcd /var/lib/etcd.OLD

docker stop $CONTAINER_ID

mv ./default.etcd /var/lib/etcd

docker ps  | grep etcd
```

Hostnames set
Host file on each

Lab Environment

Ubuntu 16.0.4
VMware Fusion VMs
2vCPU
2GB RAM
100GB
Swap Disabled



c1-master1	c1-node1	c1-node2	c1-node3
172.16.94.10	172.16.94.11	172.16.94.12	172.16.94.13

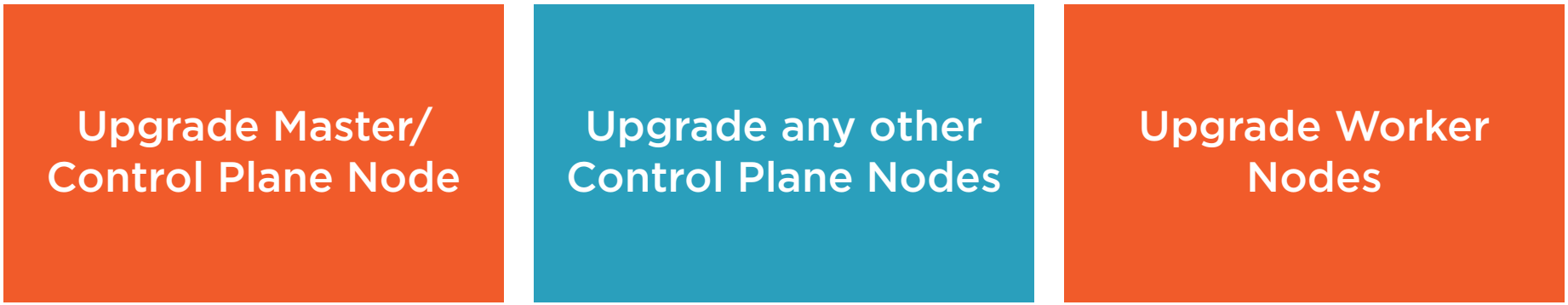
Demo

Investigating etcd and its configuration

Backing up etcd with etcdctl

Restoring etcd with etcdctl

Cluster Upgrade Process Overview



Upgrading kubeadm-based Clusters

Static Pod based Control Plane

You can only upgrade minor versions

1.17 -> 1.18

1.16 X 1.18

Read the Release Notes

https://kubernetes.io/docs/setup/release/notes/

Cluster Upgrade Process - Control Plane

Update kubeadm package	Drain the Master	kubeadm upgrade plan
kubeadm upgrade apply	Uncordon the Master	Update kubelet and kubectl

kubeadm upgrade node

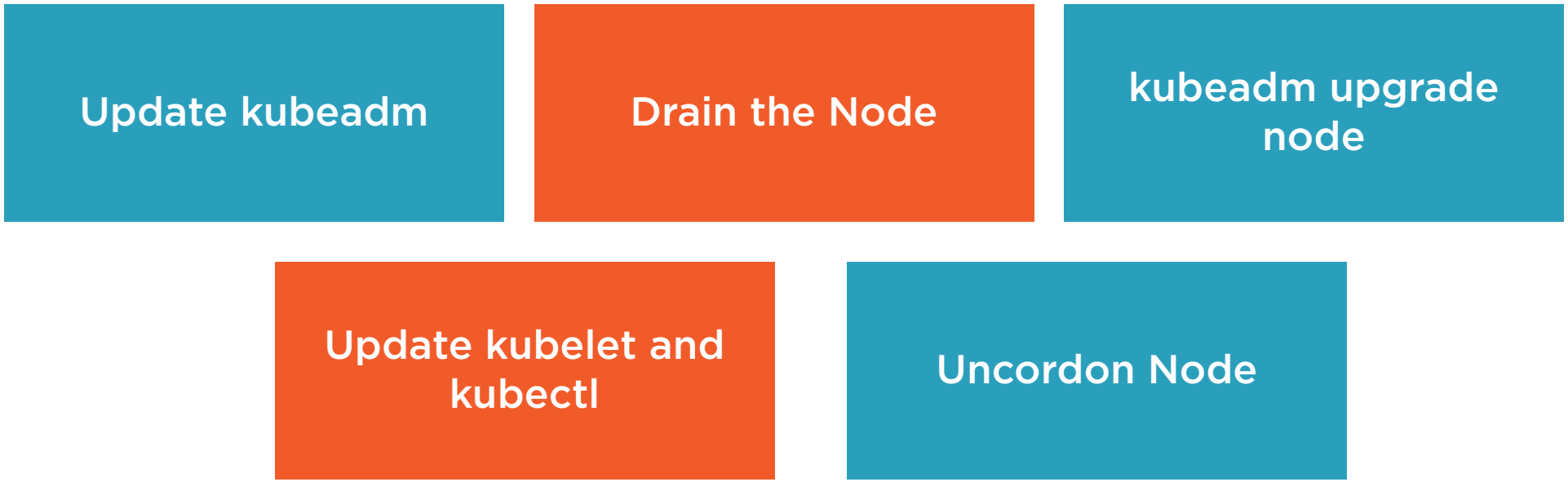
Cluster Upgrade Process - Control Plane

```
sudo apt-mark unhold kubeadm
sudo apt-get update
sudo apt-cache policy kubeadm
sudo apt-get install kubeadm=$TARGET_VERSION
sudo apt-mark hold kubeadm

kubectl drain c1-master1 --ignore-daemonsets

sudo kubeadm upgrade plan

sudo kubeadm upgrade apply v$TARGET_VERSION

kubectl uncordon c1-master1
```

Cluster Upgrade Process - Control Plane

```
sudo apt-mark unhold kubelet kubectl
sudo apt-get update
sudo apt-get install -y kubelet=$TARGET_VERSION kubectl=$TARGET_VERSION
sudo apt-mark hold kubelet kubectl
```

Cluster Upgrade Process - Worker Nodes



Cluster Upgrade Process - Worker Node

```
kubectl drain c1-node1 --ignore-daemonsets

sudo apt-mark unhold kubeadm
sudo apt-get update
sudo apt-get install -y kubeadm=$TARGET_VERSION
sudo apt-mark hold kubeadm

sudo kubeadm upgrade node

sudo apt-mark unhold kubelet kubectl
sudo apt-get update
sudo apt-get install -y kubelet=$TARGET_VERSION kubectl=$TARGET_VERSION
sudo apt-mark hold kubelet kubectl

kubectl uncordon c1-node1
```

Demo

Upgrading an existing cluster

- **Control Plane**
- **Worker Nodes**

Worker Node Maintenance

OS Updates and hardware upgrades

Drain/Cordon the Node

```
kubectl drain NODE_NAME
```

Marks the Node Unschedulable

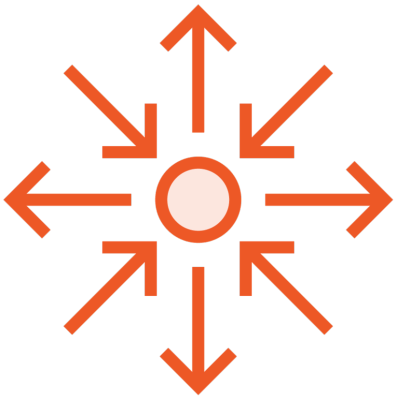
Gracefully terminates Pods

Reboot the Node

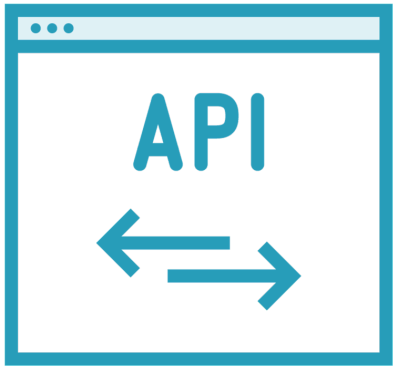
Pod Eviction Timeout

Keep resources in mind...memory and CPU

HA Cluster Architecture Overview

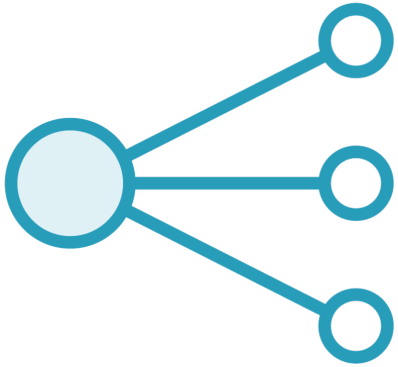


Keeping applications online



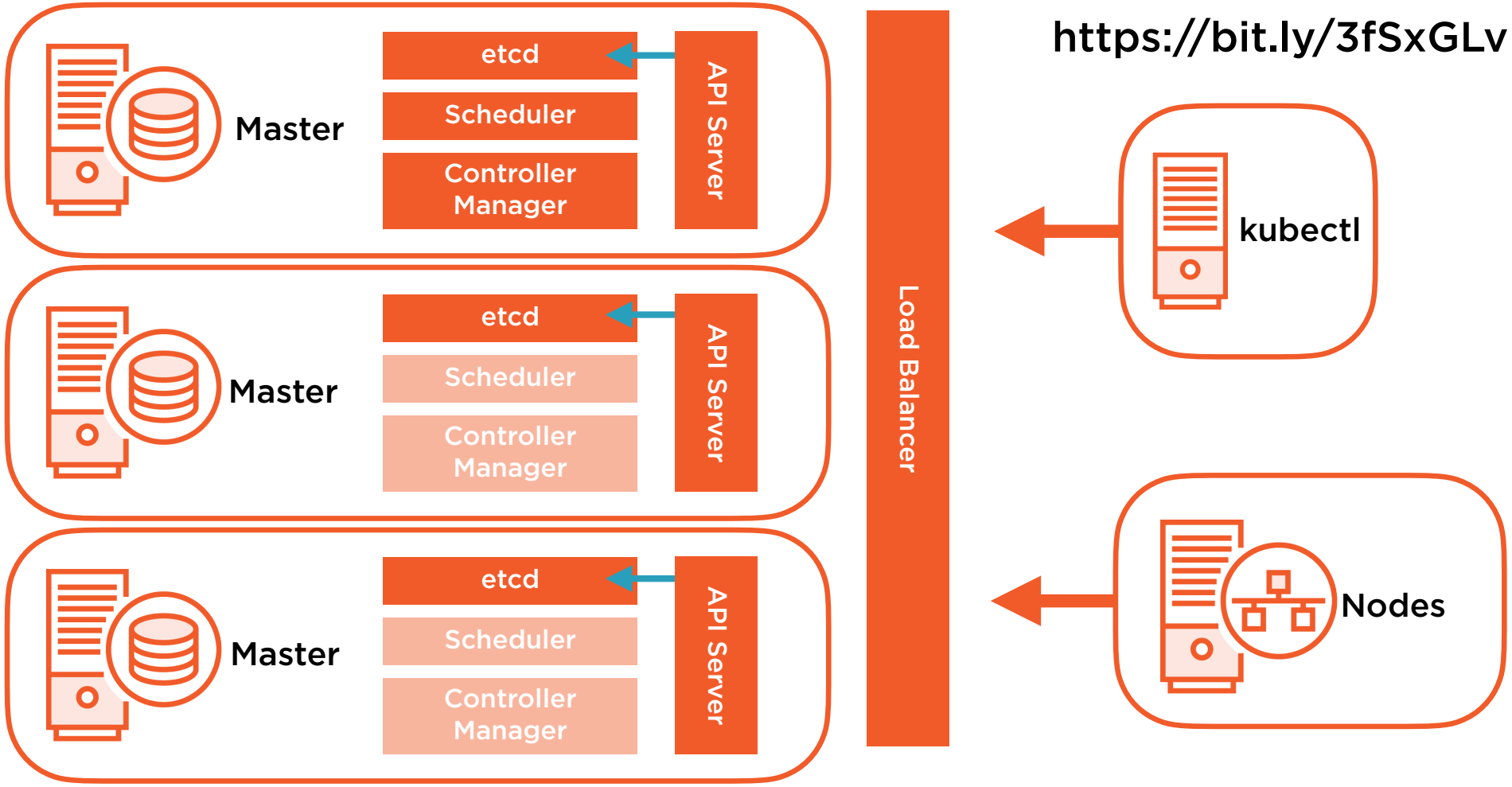
API Server

etcd

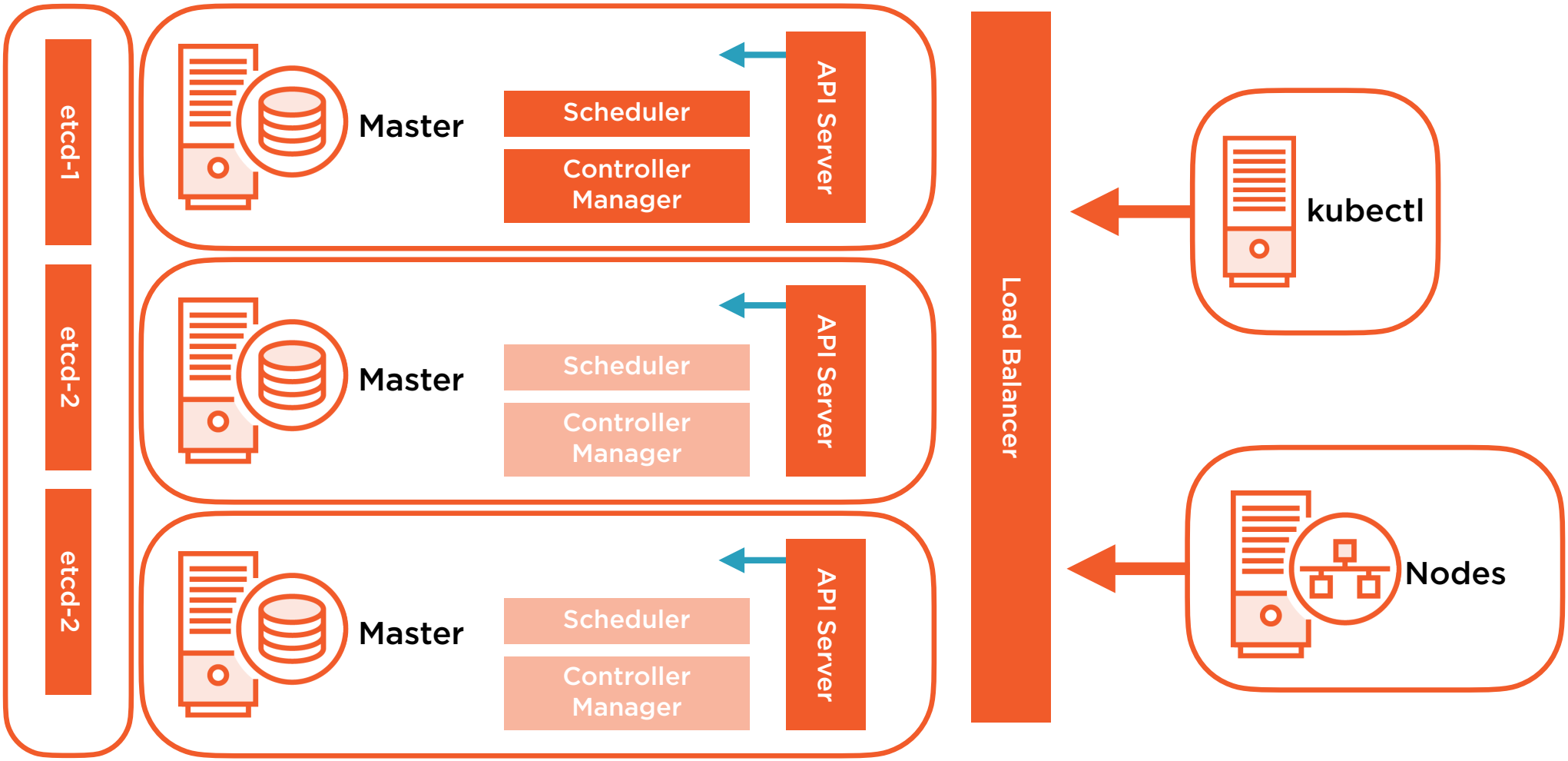


Running multiple Masters/Control Plane Nodes

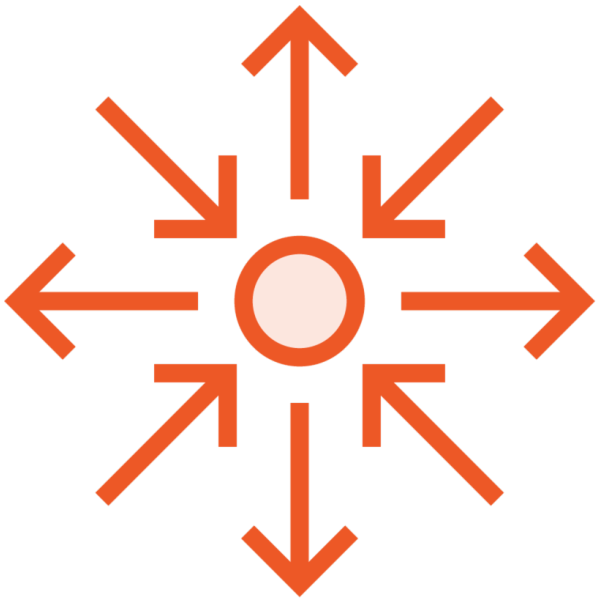
HA Cluster Topology - Stacked etcd



HA Cluster Topology - External etcd



Resources for Building High Availability Clusters



Cluster Topologies

https://bit.ly/3cOdWqi

Building an HA Cluster with kubeadm

https://bit.ly/37dyMOL

Building an HA etcd cluster

https://bit.ly/3dOrRxH

Review

- etcd backup and restore operations
- Upgrading an existing cluster
- Worker Node maintenance
- High availability cluster topologies

Up Next:
Logging and Monitoring in Kubernetes Clusters