
KODEKLOUD

Course Objectives

- Core Concepts
- Scheduling
- Logging Monitoring
- Application Lifecycle Management
- Cluster Maintenance
  - Operating System Upgrades
  - Kubernetes Releases/Versions
  - Cluster Upgrade Process
  - Backup and Restore Methodologies
- Security
- Storage
- Networking
- Installation, Configuration & Validation
- Troubleshooting

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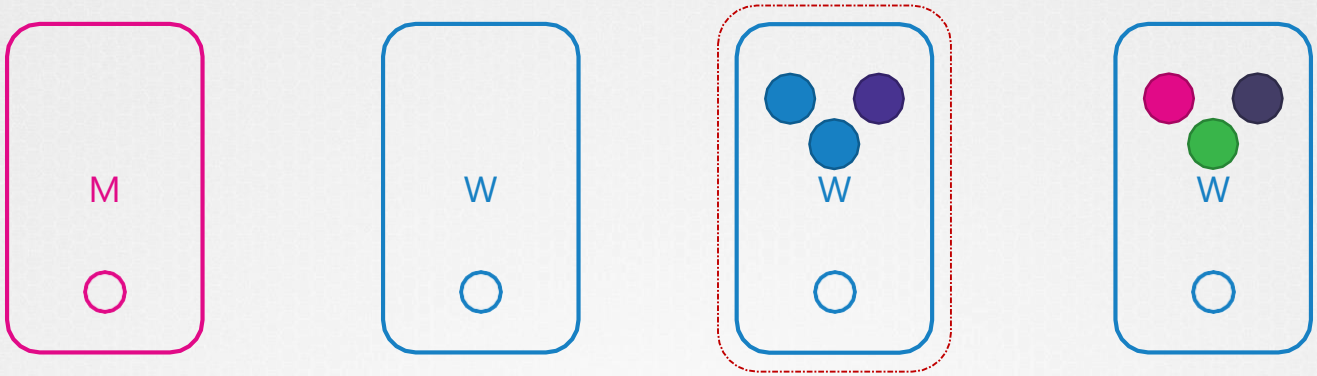
Operating System Upgrade




```
kubectl drain node-1
```

Workload wird auf andere Nodes verteilt

```
kubectl cordon node-2
```

macht einen node undschedulable

```
kubectl uncordon node-1
```

Node muss wieder schedulable gemacht werden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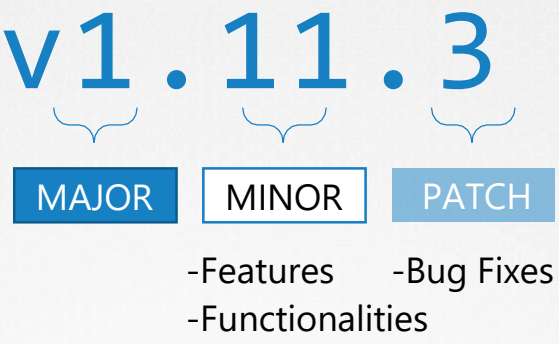
Kubernetes Releases

```
kubectl get nodes
NAME      STATUS    ROLES     AGE       VERSION
master  Ready  master node-    1d        v1.11.3
1    Ready    <none>  node-2    1d        v1.11.3
Ready  <none>                   1d        v1.11.3
```


v1.11.3
MAJOR
MINOR
PATCH
-Features
-Functionalities
-Bug Fixes

v0.20 June 2015

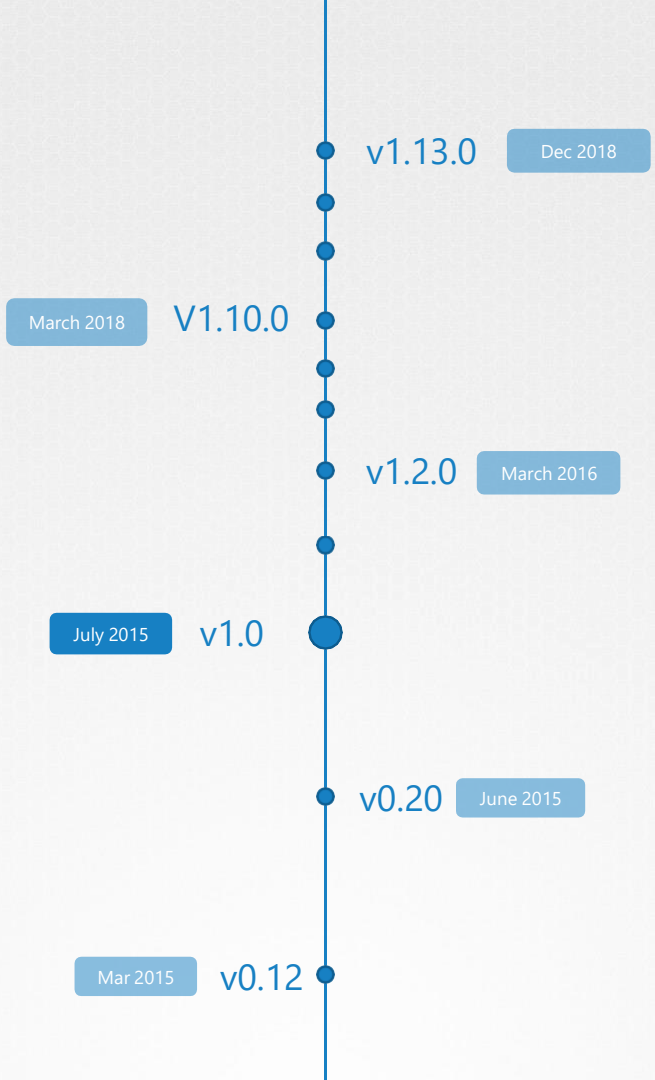
Mar 2015 v0.12

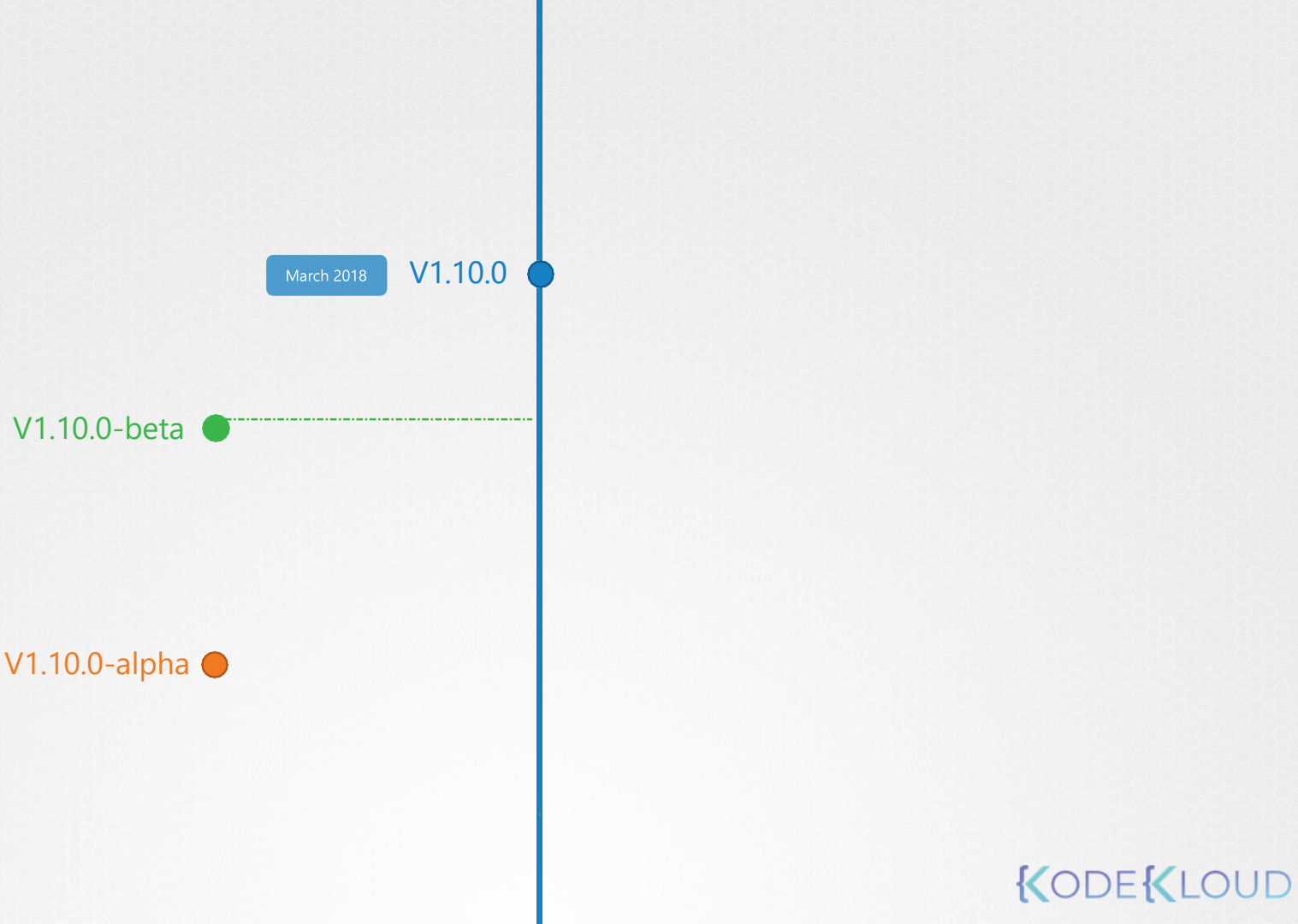
v0.10 Feb 2015

Jan 2015 v0.8

v0.6 Dec 2014

Oct 2014 v0.4


v1.13.0
Dec 2018
March 2018
V1.10.0
v1.2.0
March 2016
July 2015
v1.0
v0.20
June 2015
Mar 2015
v0.12



kubernetes / kubernetes

Watch 2,918 | Unstar 49,224 | Fork 17,023

Code | Issues 2,151 | Pull requests 992 | Projects 11 | Insights

Releases | Tags

8 days ago

v1.13.5-beta.0 ...

9cb83c5 zip tar.gz

v1.13.4

c27b913

v1.13.4

k8s-release-robot released this 8 days ago · 8 commits to release-1.13 since this release

See kubernetes-announce@ and CHANGELOG-1.13.md for details.

SHA512 for `kubernetes.tar.gz`:

```
591cd3f4f479744a1d4754490281735032 1c63f8c37ad771d559e293bcdbc421e89d62663300a6739c667d34e1e24bb080dd735
62dc29713381db079ba6e9223
```

Additional binary downloads are linked in the CHANGELOG-1.13.md.

Assets 3

kubernetes.tar.gz	1.85 MB
Source code (zip)	
Source code (tar.gz)	

https://github.com/kubernetes/kubernetes/releases

v1.13.4

kube-apiserver	Controller-manager	kube-scheduler	kubelet	kube-proxy	kubectl
v1.13.4	v1.13.4	v1.13.4	v1.13.4	v1.13.4	v1.13.4

ETCD CLUSTER	CoreDNS
v3.2.18	v1.1.3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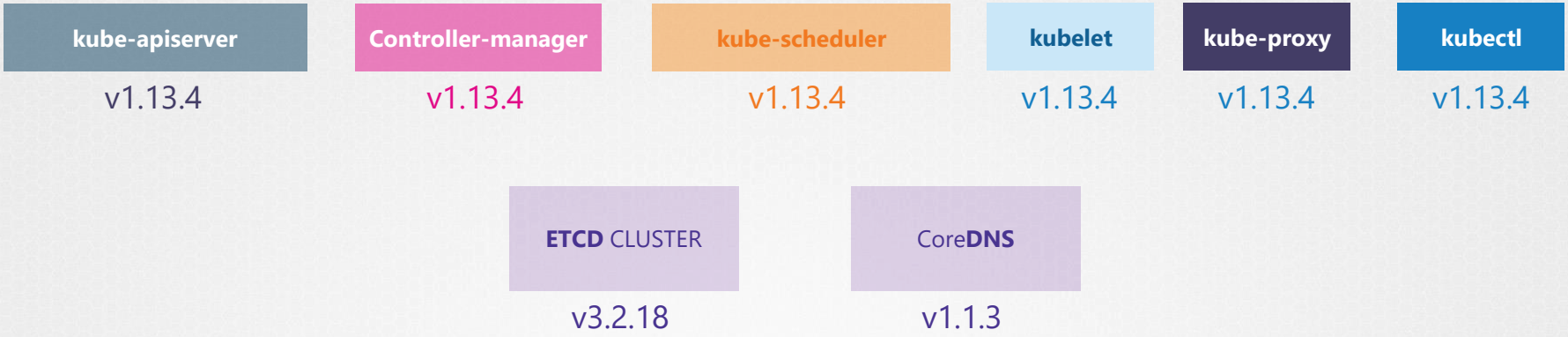
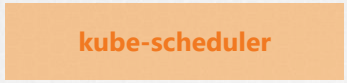
Cluster Upgrade Process


kube-apiserver
v1.13.4
Controller-manager
v1.13.4
kube-scheduler
v1.13.4
kubelet
v1.13.4
kube-proxy
v1.13.4
kubectl
v1.13.4
ETCD CLUSTER
v3.2.18
CoreDNS
v1.1.3

X v1.10

X-1
v1.9 or v1.10



X-1
v.19 or v1.10

X+1 > X-1

X-2

v1.8 or v1.9 or v.110

X-2

V1.8 or v1.9 or v1.10

kube-apiserver

v1.10

Controller-manager

v1.10

kube-scheduler

v1.10

kubectl

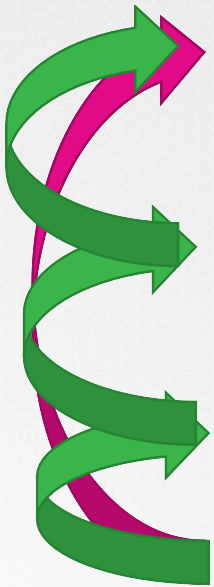
v1.10

kubelet

v1.10

kube-proxy

v1.10



v1.13 Supported

v1.12 Supported

v1.11 Supported

v1.10 Un-Supported

standard-cluster-1

Details Storage Nodes

Cluster

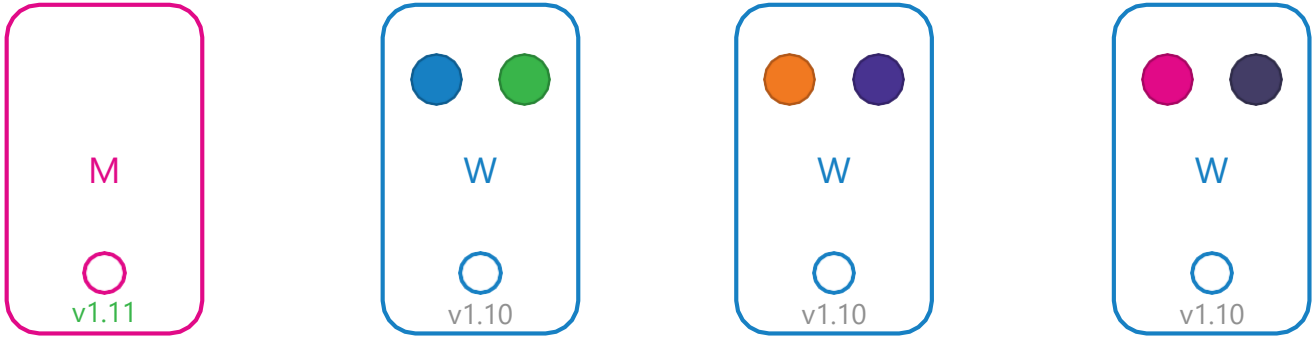
Master version	1.10.12-gke.7	Upgrade available
Endpoint	35.238.15.143	Show credentials
Client certificate	Enabled	
Binary authorisation	Disabled	
Kubernetes alpha features	Disabled	
Total size	3	
Master zone	us-central1-a	
Node zones	us-central1-a	
Network	default	

kubeadm

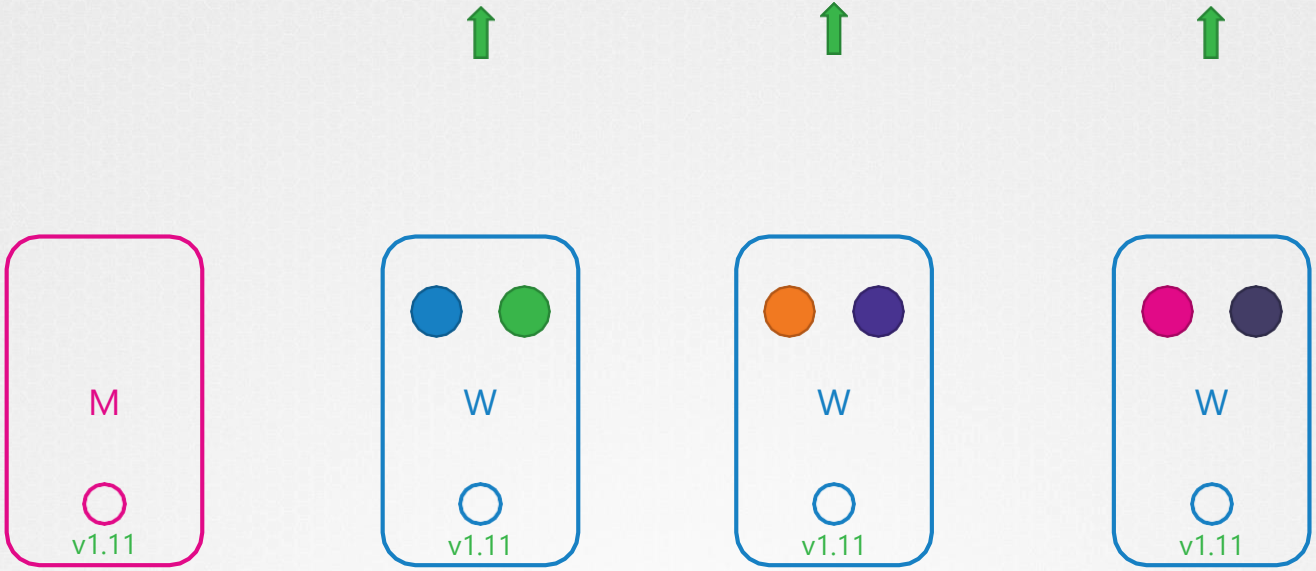
```
kubeadm upgrade plan
```

```
kubeadm upgrade apply
```

“The hard way”

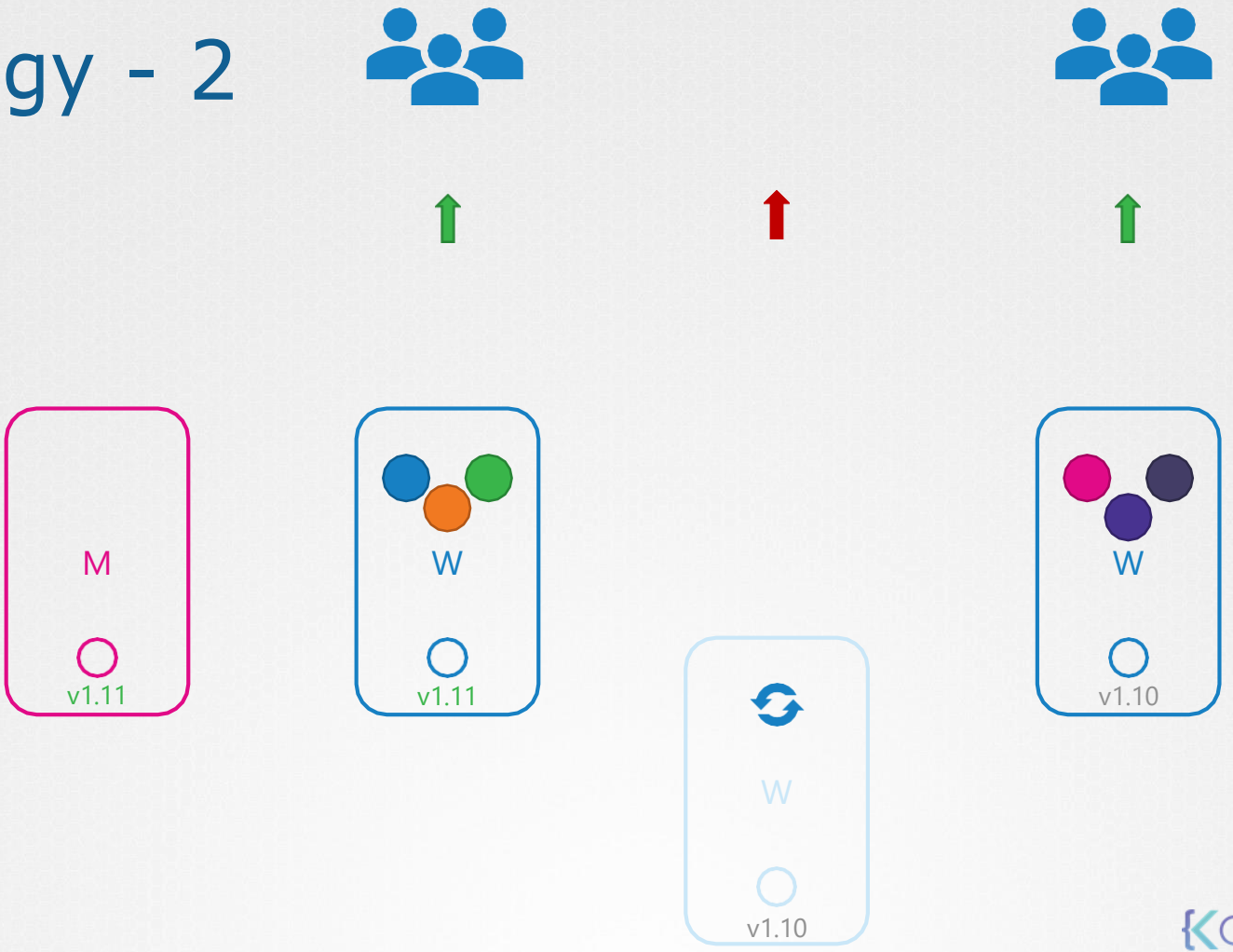

M
v1.11
W
v1.10
W
v1.10
W
v1.10

Strategy - 1

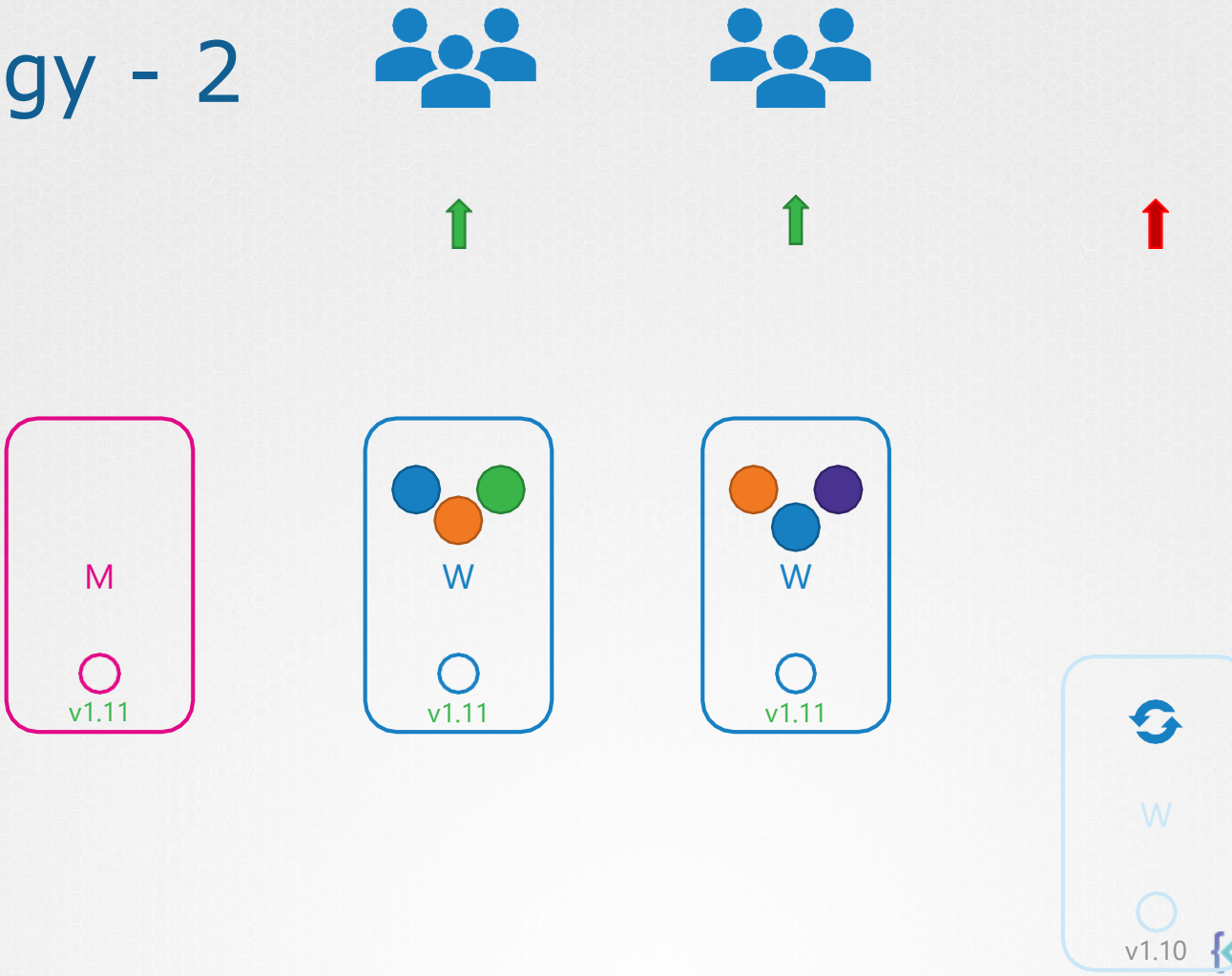


Strategy - 2

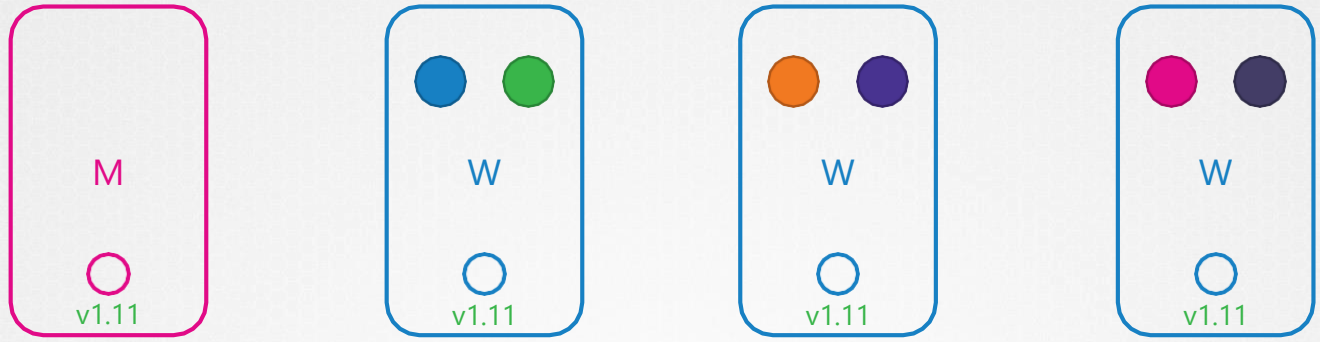
Strategy - 2



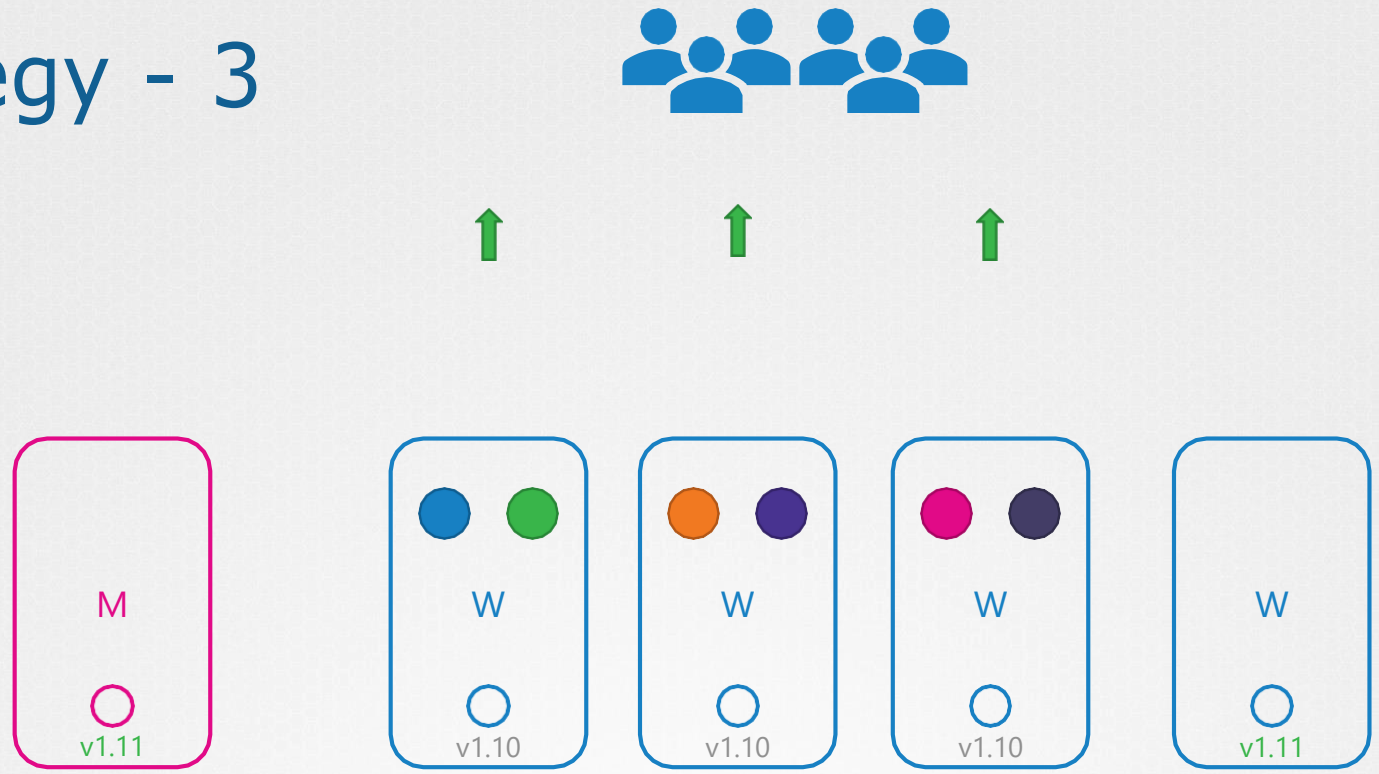
Strategy - 2



Strategy - 2



Strategy - 3



Strategy - 3

Strategy - 3

kubeadm - upgrade

kubeadm upgrade plan

```
[preflight] Running pre-flight checks.
[upgrade] Making sure the cluster is healthy:
[upgrade/config] Making sure the configuration is correct:
[upgrade] Fetching available versions to upgrade to
[upgrade/versions] Cluster version: v1.11.8
[upgrade/versions] kubeadm version: v1.11.3
[upgrade/versions] Latest stable version: v1.13.4
[upgrade/versions] Latest version in the v1.11 series: v1.11.8

Components that must be upgraded manually after you have
upgraded the control plane with 'kubeadm upgrade apply':
COMPONENT CURRENT  AVAILABLE
Kubelet     3 x v1.11.3   v1.13.4

Upgrade to the latest stable version:

COMPONENT            CURRENT   AVAILABLE
API Server           v1.11.8   v1.13.4
Controller  Manager   v1.11.8   v1.13.4
Scheduler            v1.11.8   v1.13.4
Kube Proxy           v1.11.8   v1.13.4
CoreDNS              1.1.3     1.1.3
Etcd                 3.2.18    N/A

You can now apply the upgrade by executing the following command:
```

kubeadm - u


```
kubeadm upgrade plan
[preflight] Running pre-flight checks.
[upgrade] Making sure the cluster is healthy:
[upgrade/config] Making sure the configuration is correct:
[upgrade] Fetching available versions to upgrade to
[upgrade/versions] Cluster version: v1.11.8
[upgrade/versions] kubeadm version: v1.11.3
[upgrade/versions] Latest stable version: v1.13.4
[upgrade/versions] Latest version in the v1.11 series: v1.11.8

Components that must be upgraded manually after you have
upgraded the control plane with 'kubeadm upgrade apply':
COMPONENT CURRENT  AVAILABLE
Kubelet     3 x v1.11.3   v1.13.4

Upgrade to the latest stable version:

COMPONENT            CURRENT   AVAILABLE
API Server           v1.11.8   v1.13.4
Controller  Manager   v1.11.8   v1.13.4
Scheduler            v1.11.8   v1.13.4
Kube Proxy           v1.11.8   v1.13.4
CoreDNS              1.1.3     1.1.3
Etcd                 3.2.18    N/A

You can now apply the upgrade by executing the following command:

        kubeadm upgrade apply v1.13.4

Note: Before you can perform this upgrade, you have to update kubeadm to v1.13.4.
```

kubeadm - upgrade


```
apt-get upgrade -y kubeadm=1.12.0-00
```

```
kubeadm upgrade apply v1.12.0
```

```
…

[upgrade/successful] SUCCESS! Your cluster was upgraded to "v1.12.0". Enjoy!

[upgrade/kubelet] Now that your control plane is upgraded, please proceed with
upgrading your kubelets if you haven't already done so.
```

```
kubectl get nodes
```

```
NAME      STATUS    ROLES     AGE       VERSION
master   Ready   masternode-    1d        v1.11.3
1    Ready    <none> node-2    1d        v1.11.3
Ready   <none>                  1d        v1.11.3
```

```
apt-get upgrade -y kubelet=1.12.0-00
```

```
systemctl restart kubelet
```

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kubeadm - upgrade

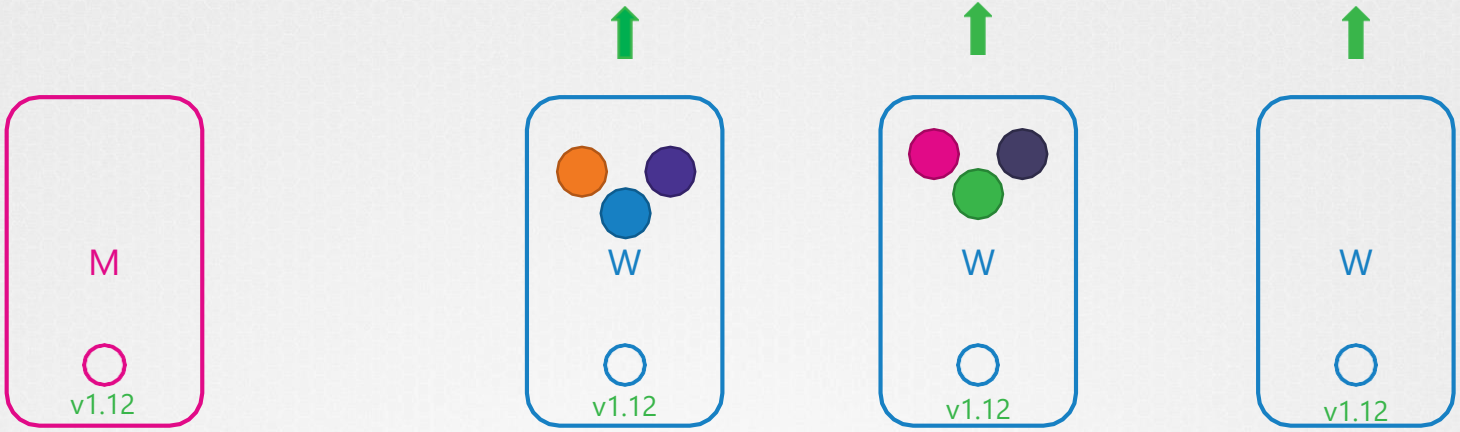
```
kubectl get nodes
NAME      STATUS    ROLES     AGE       VERSION
master  Ready  master node-    1d        v1.11.3
1    Ready    <none>  node-2    1d        v1.11.3
Ready  <none>                   1d        v1.11.3
```


```
apt-get upgrade -y kubelet=1.12.0-00
```

```
systemctl restart kubelet
```

```
kubectl get nodes
NAME      STATUS    ROLES     AGE       VERSION
master  Ready  masternode-    1d        v1.12.0
1    Ready    <none> node-2    1d        v1.11.3
Ready  <none>                   1d        v1.11.3
```

kubeadm - upgrade




```
kubectl drain node-1
kubectl uncordon node-1
kubectl drain node-2
kubectl uncordon node-2
kubectl drain node-3
kubectl uncordon node-3
```

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Backup and Restore

Backup Candidates

Resource Configuration

ETCD Cluster

Persistent Volumes

Imperative

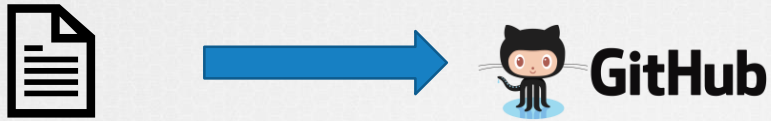
Resource Configuration

```
kubectl create namespace new-namespace
```

```
kubectl create secret
```

```
kubectl create configmap
```

Declarative



Resource Configuration

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod

metadata:
  name: myapp-pod
  labels:
    app: myapp
    type: front-end
spec:
  containers:
  - name: nginx-container
    image: nginx
```

```
kubectl apply -f pod-definition.yml
```

Backup – Resource Configs

kube-apiserver

Resource Configuration

```
kubectl get all --all-namespaces -o yaml > all-deploy-services.yaml
```

Formerly called ARK by HeptIO

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Backup - ETCD

ETCD Cluster

Backup - ETCD

ETCD Cluster

etcd.service

```
ExecStart=/usr/local/bin/etcd \\
  --name ${ETCD_NAME} \\
  --cert-file=/etc/etcd/kubernetes.pem \\
  --key-file=/etc/etcd/kubernetes-key.pem \\
  --peer-cert-file=/etc/etcd/kubernetes.pem \\
  --peer-key-file=/etc/etcd/kubernetes-key.pem \\
  --trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-client-cert-auth \\
  --client-cert-auth \\
  --initial-advertise-peer-urls https://${INTERNAL_IP}:
  --listen-peer-urls https://${INTERNAL_IP}:2380 \\
  --listen-client-urls https://${INTERNAL_IP}:2379,http
  --advertise-client-urls https://${INTERNAL_IP}:2379 \
  --initial-cluster-token etcd-cluster-0 \\
  --initial-cluster controller-0=https://${CONTROLLER0_
  --initial-cluster-state new \\
  --data-dir=/var/lib/etcd
```

Backup - ETCD

ETCD Cluster


```
ETCDCTL_API=3 etcdctl \
      snapshot save snapshot.db
```

```
ls
snapshot.db
```

```
ETCDCTL_API=3 etcdctl \
      snapshot status snapshot.db
+----------+----------+------------+------------+
|   HASH   | REVISION | TOTAL KEYS | TOTAL SIZE |
+----------+----------+------------+------------+
| e63b3fc5 |   473353 |        875 |     4.1 MB |
+----------+----------+------------+------------+
```

Restore - ETCD

ETCD Cluster

```
ETCDCTL_API=3 etcdctl \
     snapshot save snapshot.db
```

```
ls
snapshot.db
```

```
service kube-apiserver stop
Service kube-apiserver stopped
```

```
ETCDCTL_API=3 etcdctl \
  snapshot restore snapshot.db \
  --data-dir /var/lib/etcd-from-backup \
  --initial-cluster master-1=https://192.168.5.11:2380,master-2=https://192.168.5.12:2380 \
  --initial-cluster-token etcd-cluster-1 \
  --initial-advertise-peer-urls https://${INTERNAL_IP}:2380
```

```
I | mvcc: restore compact to 475629
I | etcdserver/membership: added member 5e89ccdfe3 [https://192.168.5.12:2380] to cluster 894c7131f5165a78
I | etcdserver/membership: added member c8246cee7c [https://192.168.5.11:2380] to cluster 894c7131f5165a78
```

Restore - ETCD

ETCD Cluster

```
ETCDCTL_API=3 etcdctl \
    snapshot save snapshot.db
```

```
ls
snapshot.db
```

```
service kube-apiserver stop
Service kube-apiserver stopped
```

```
ETCDCTL_API=3 etcdctl \
   snapshot restore snapshot.db \
   --data-dir /var/lib/etcd-from-backup \
   --initial-cluster master-
1=https://192.168.5.11:2380,master-
2=https://192.168.5.12:2380 \
   --initial-cluster-token etcd-cluster-1 \
   --initial-advertise-peer-urls
https://${INTERNAL_IP}:2380
```

```
I | mvcc: restore compact to 475629
I | etcdserver/membership: added member 5e89ccdfe3
[https://192.168.5.12:2380] to cluster 894c7131f5165a78
I | etcdserver/membership: added member c8246cee7c
[https://192.168.5.11:2380] to cluster 894c7131f5165a78
```

```
systemctl daemon-reload
```

```
service etcd restart
Service etcd restarted
```

etcd.service

```
ExecStart=/usr/local/bin/etcd \\
  --name ${ETCD_NAME} \\
  --cert-file=/etc/etcd/kubernetes.pem \\
  --key-file=/etc/etcd/kubernetes-key.pem \\
  --peer-cert-file=/etc/etcd/kubernetes.pem \\
  --peer-key-file=/etc/etcd/kubernetes-key.pem \\
  --trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-client-cert-auth \\
  --client-cert-auth \\
  --initial-advertise-peer-urls https://${INTERNAL_
  --listen-peer-urls https://${INTERNAL_IP}:2380 \\
  --listen-client-urls https://${INTERNAL_IP}:2379,
  --advertise-client-urls https://${INTERNAL_IP}:23
  --initial-cluster-token etcd-cluster-1    \
  --initial-cluster controller-0=https://${CONTROLL
  --initial-cluster-state new \\
  --data-dir=/var/lib/etcd-from-backup
```

Restore - ETCD

ETCD Cluster

```
ETCDCTL_API=3 etcdctl \
    snapshot save snapshot.db
```

```
ls
snapshot.db
```

```
service kube-apiserver stop
Service kube-apiserver stopped
```

```
ETCDCTL_API=3 etcdctl \
  snapshot restore snapshot.db \
  --data-dir /var/lib/etcd-from-backup \
  --initial-cluster master-1=https://192.168.5.11:2380,master-2=https://192.168.5.12:2380 \
  --initial-cluster-token etcd-cluster-1 \
  --initial-advertise-peer-urls https://${INTERNAL_IP}:2380
I | mvcc: restore compact to 475629
I | etcdserver/membership: added member 5e89ccdfe3 [https://192.168.5.12:2380] to cluster 894c7131f5165a78
I | etcdserver/membership: added member c8246cee7c [https://192.168.5.11:2380] to cluster 894c7131f5165a78
```

```
service kube-apiserver start
Service kube-apiserver started
```

```
systemctl daemon-reload
```

```
service etcd restart
```

```
Service etcd restarted
```

```
ETCDCTL_API=3 etcdctl \
     snapshot save snapshot.db \

     --endpoints=https://127.0.0.1:2379 \
     --cacert=/etc/etcd/ca.crt \
     --cert=/etc/etcd/etcd-server.crt \
     --key=/etc/etcd/etcd-server.key
```


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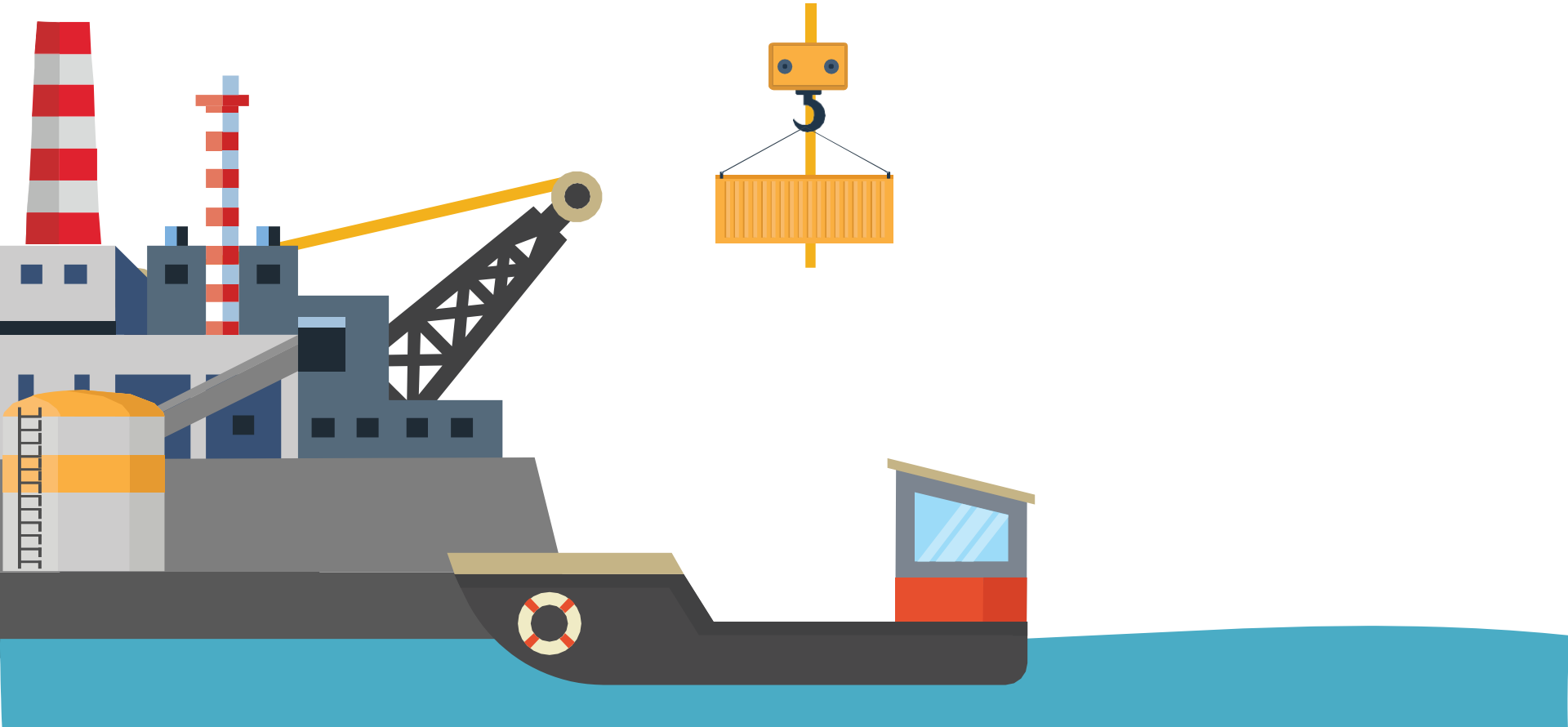
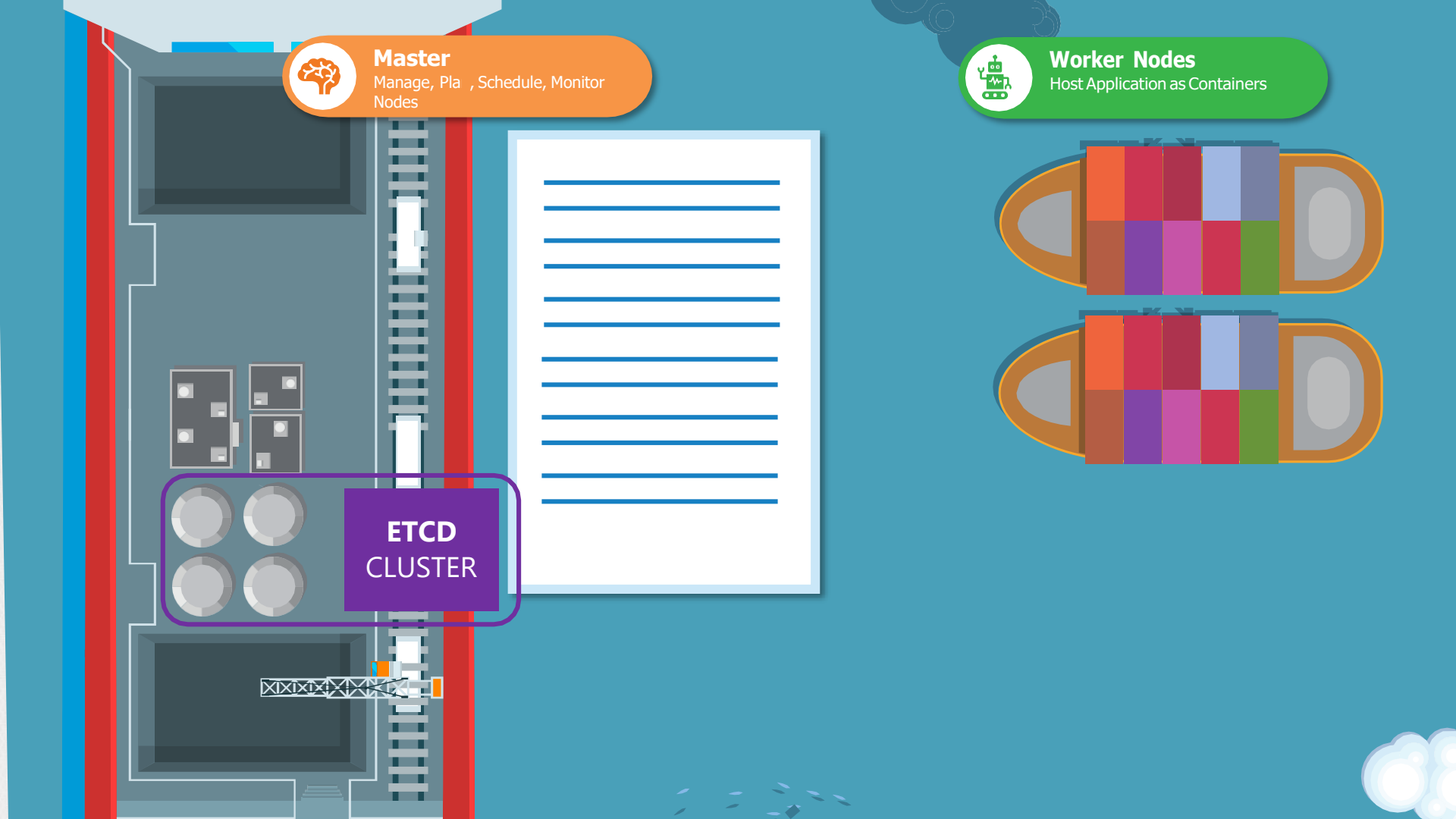
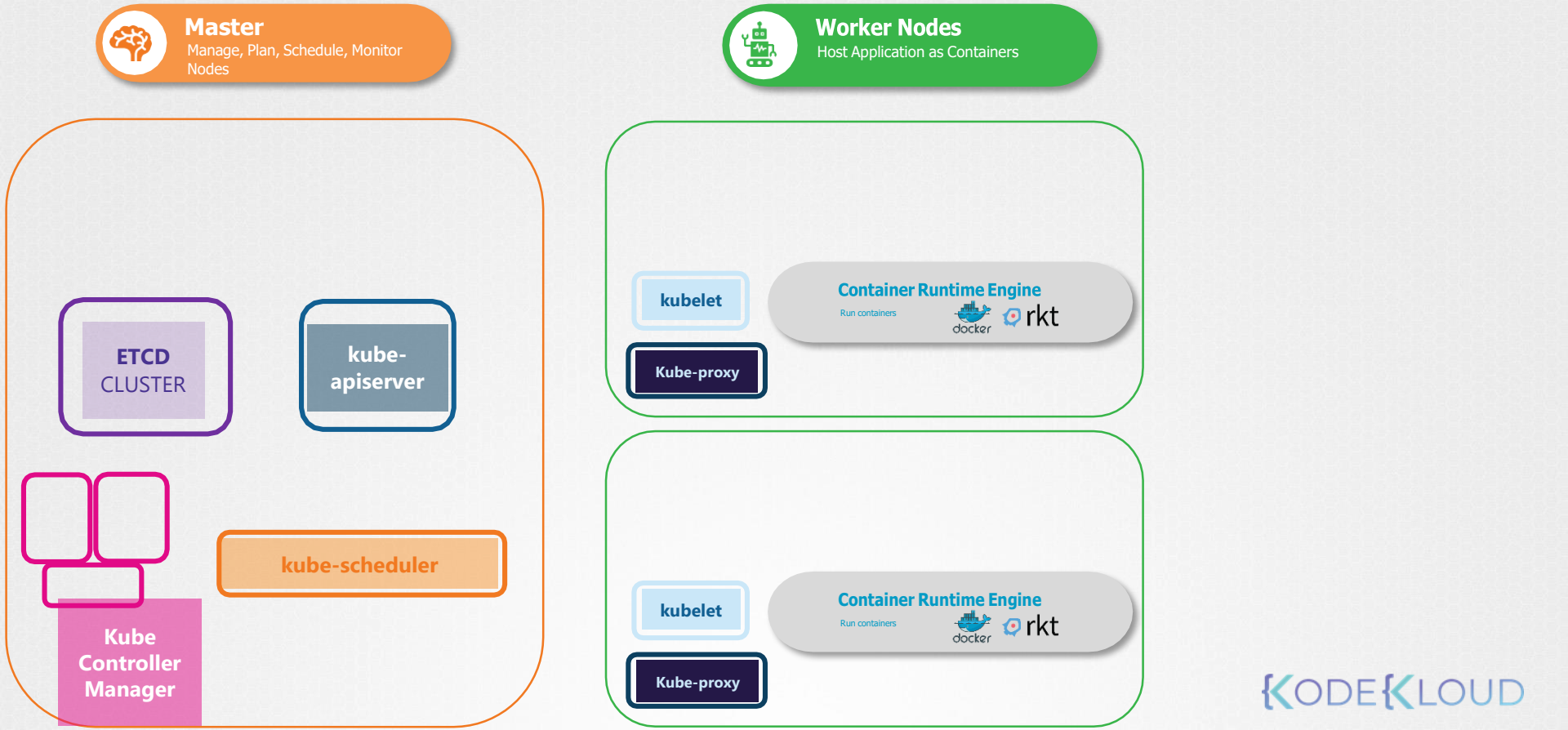
KUBERNETES ARCHITECTURE




Master
Manage, Pla , Schedule, Monitor Nodes
Worker Nodes
Host Application as Containers
ETCD
CLUSTER

Kubernetes Architecture



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