

# LFS 458 – Kubernetes Administration



2019-Jun-17 to 20, Antwerp



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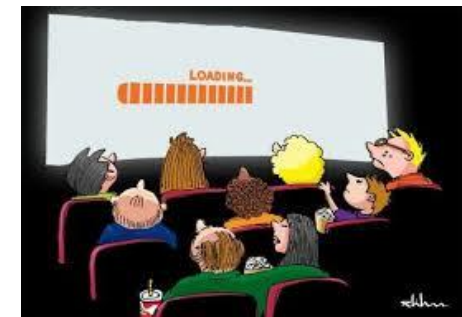


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@mjbright CONSULTING

# @mjbright Consulting

- Expérience en Recherche, Télécom (SCP, VoIP, NFV), Dev, Test, Avant-vente
- Conférencier : Docker, Kubernetes, Serverless, u-Services, Unikernels, Jupyter
- Docker Community Leader, Python Meetup Group sur Grenoble



# Round table / Expectations

## About you

- What do you (& your company) do ?
- What do you hope to get out of this training (prepn CKAD?) ?
- How familiar you are with Docker (or other engines), Kubernetes ?
- What development, deployment or other problems do you face ?
- What platforms, methods do you use?
- ... What do you do outside of work ?

# Logistics

We will spend roughly 50% time on slides, 50% time on labs.

But you are the customer !

- Feel free to spend more time on the labs if you wish
- Feel free to experiment or
- Propose problems that we can look at together.

# Logistics – Overall Timing

- **Monday:** Introduction, Concepts, Installation & Configuration
  - Registration
  - Chapters 1 - 3, then slide “Kubernetes Architecture (4.1) – Main components”
  - Labs 1 - 3
- **Tuesday:** Architecture, API, API Objects, Deployments, Services
  - Chapters 4 – 8, Labs 4 - 7
- **Wednesday:** Volumes, Intrusion, Planning, Backup/Recovery
  - Chapters 9 – 12, Labs 8 – 12
- **Thursday:** Custom Resources (CRD), Federation, Helm, Security
  - Chapters 13 – 16, Labs 13 -16
  - Survey

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Survey, Resources

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Survey, Resources



# Intro., Concepts, Installation & Configuration

1: Intro – Linux Foundation, Trainings, Certifications, Labs, Distributions

Labs – sudo, course registration

2: Basics – Kubernetes, Alternatives, History, Architecture, Terms, Tools

Labs – Online resources

Lunch

3: Installation – CLI Tools, Network, Topology, Compiling from Source

Labs – Install Master, Add Worker, Configure, Sample App, External Access

4: Kubernetes Architecture

# Intro., Concepts, Installation & Configuration

Notes on installation:

Adding “`—apiserver-cert-extra-sans <MASTER_IP>`”  
as an option to the “`kubeadm init`” command

will cause creation of a kubeconfig file which can be used from outside the cluster, e.g. from your laptop, addressing the external address `<MASTER_IP>`

Otherwise we can only use kubectl from the a shell on the Master node itself

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Survey, Resources

# Architecture, API& Objects, Deploys, Services

Recap Day1: Discoveries, clarifications, difficulties ? My observations

4: Architecture

Labs – 4: Resource limits, more complex deployments

5: APIs & Access

Labs – 5: Configuring TLA Access, Exploring API Calls

Lunch

6: API Objects

Labs – 6: RESTful API Access

7: Managing State with Deployments

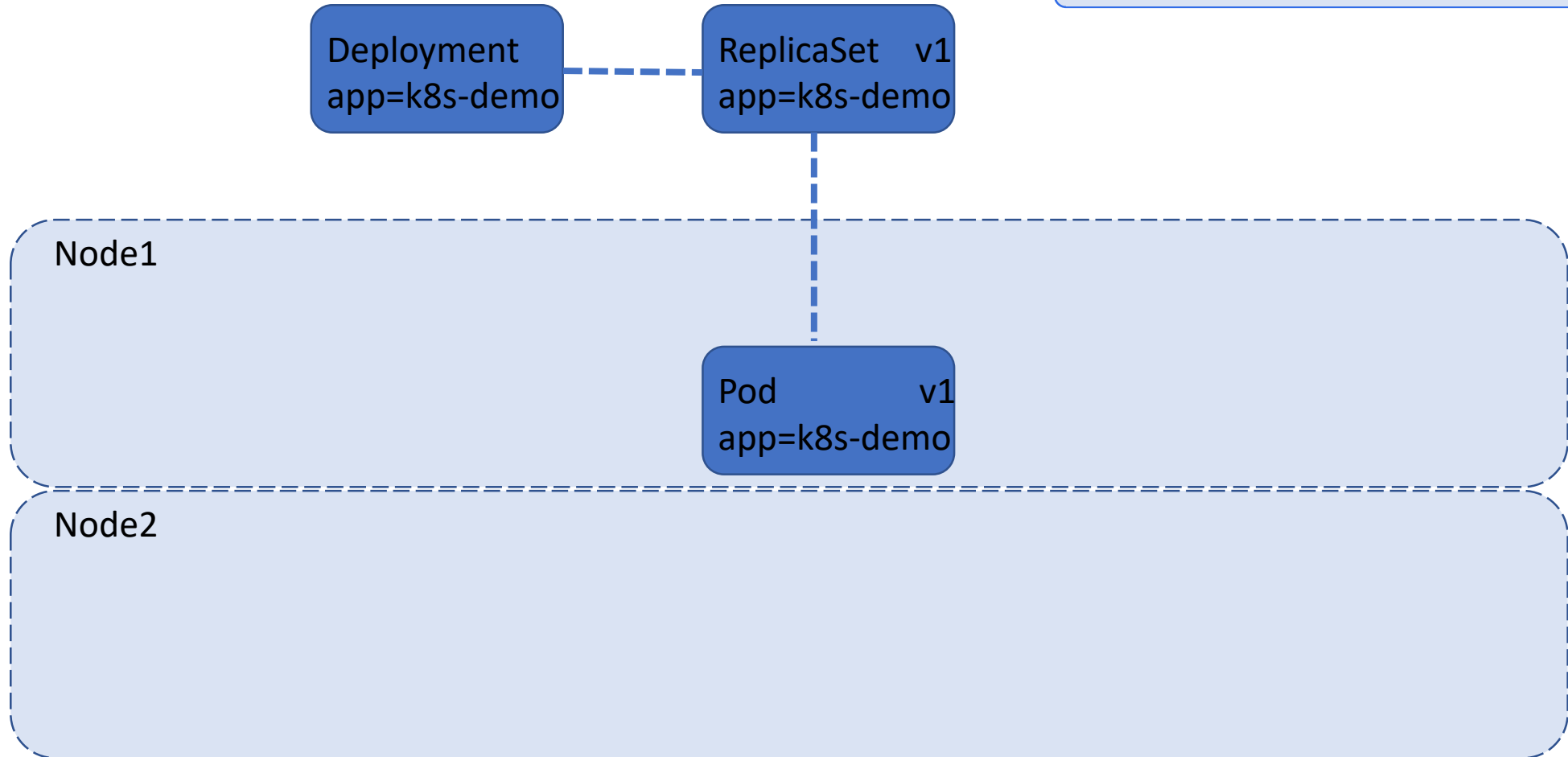
Labs – 7: ReplicaSets, DaemonSets

8: Services

# Controllers: Deployment & ReplicaSet

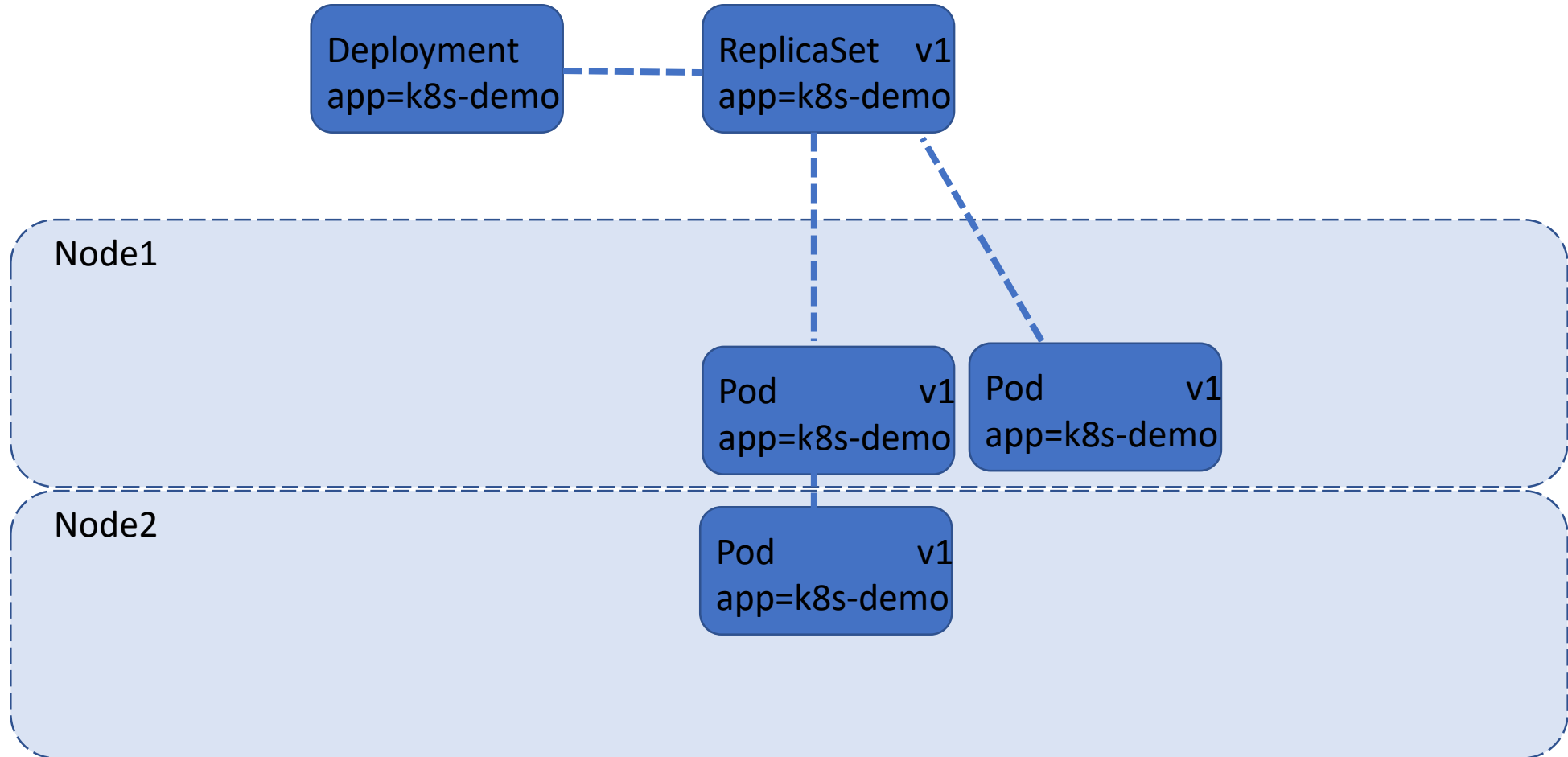
```
kubectl run --image=mjbright/k8s-demo:1 k8s-demo
```

Objects are loosely-coupled by labelling

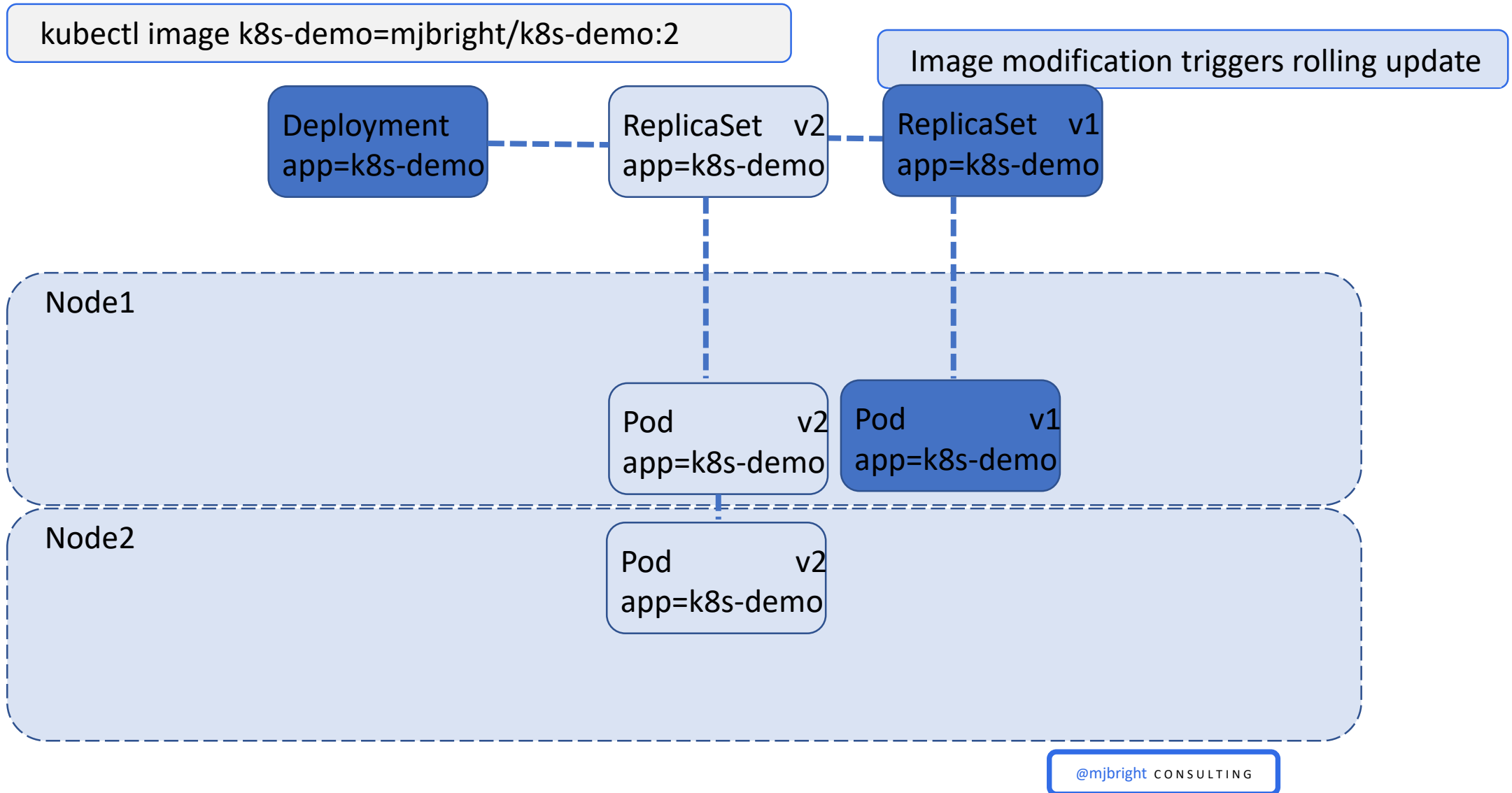


# Controllers: Deployment & ReplicaSet

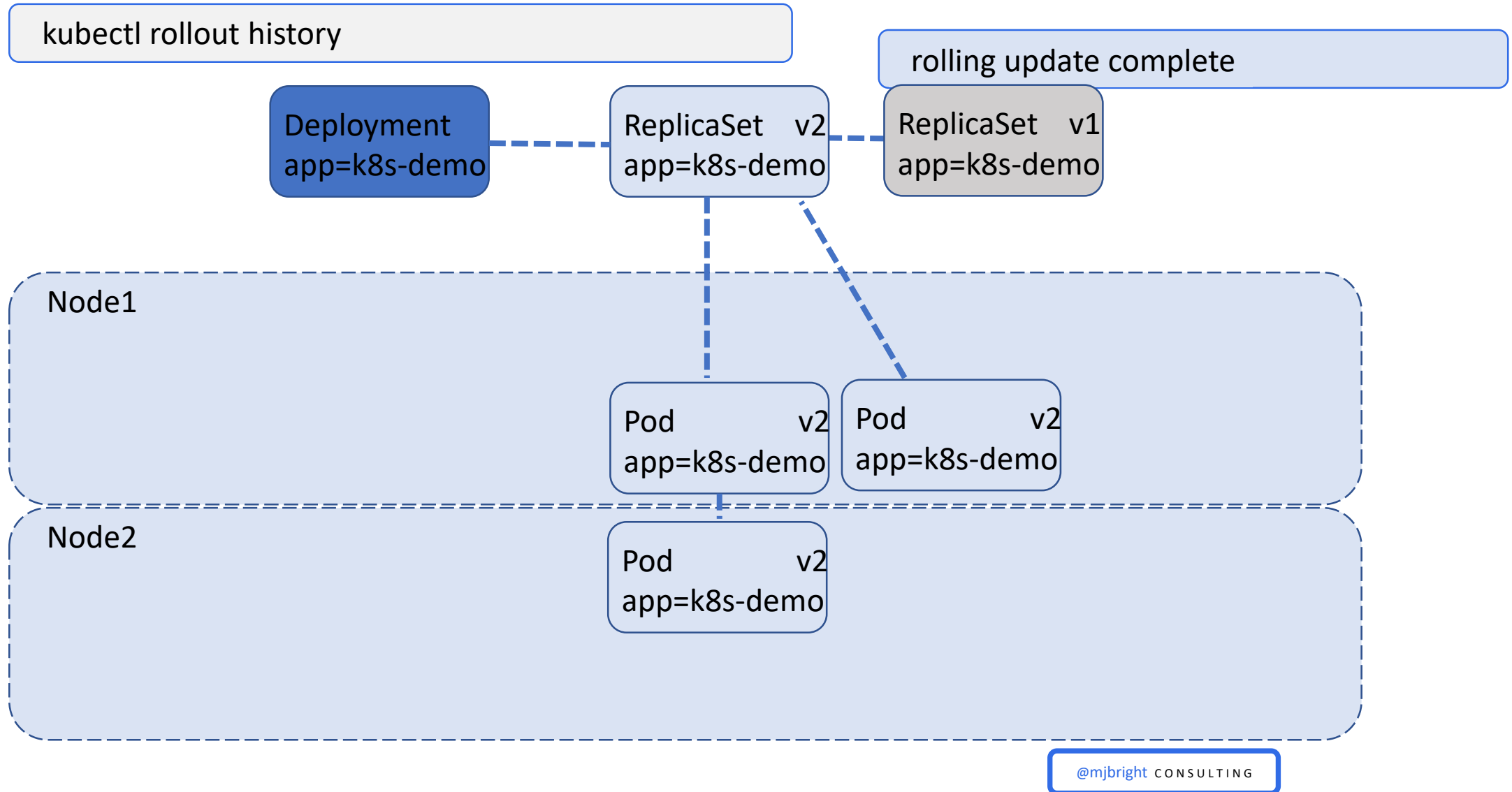
```
kubectl scale deploy/k8s-demo --replicas=3
```



# Controllers: Deployment & ReplicaSet

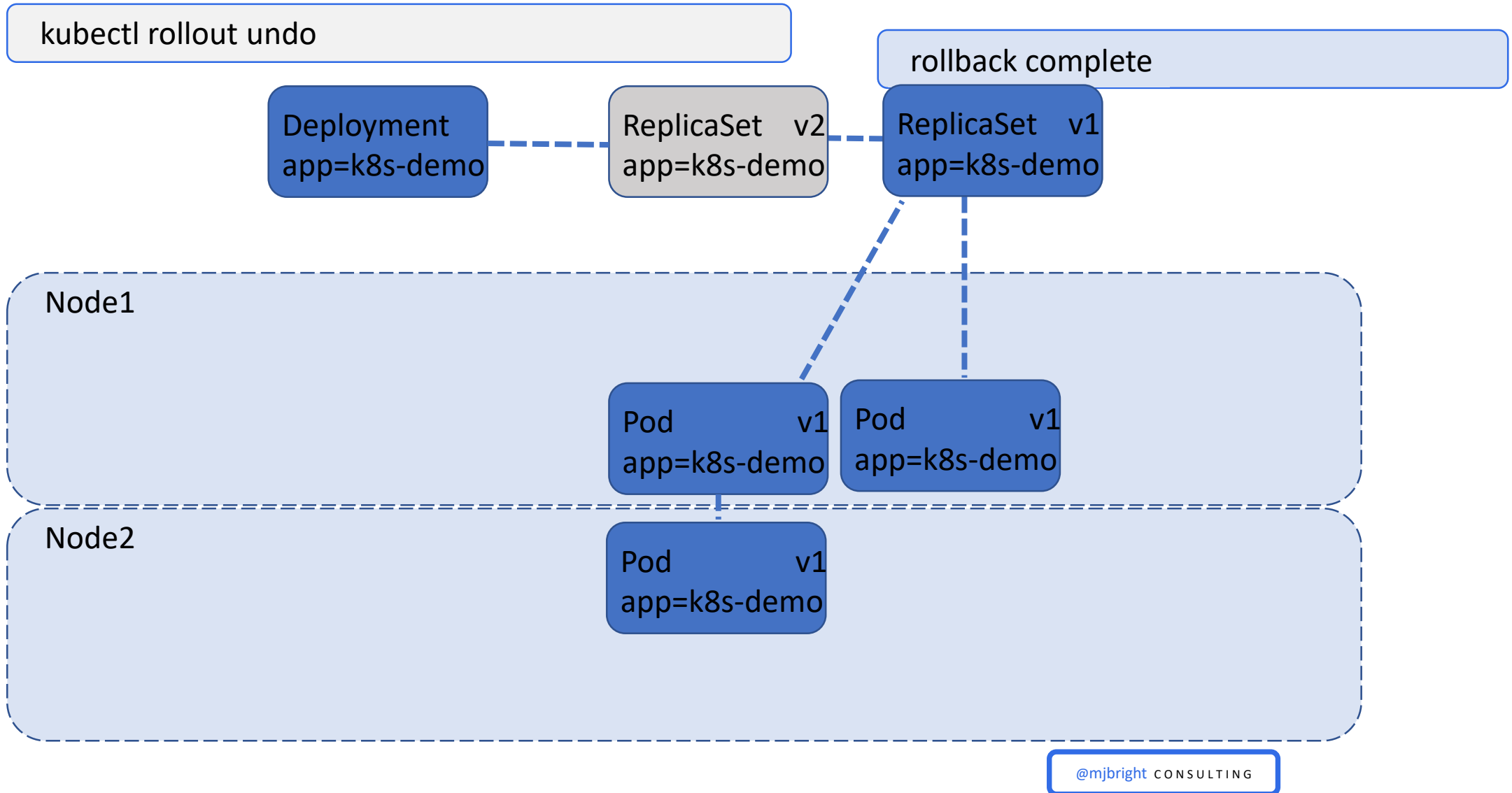


# Controllers: Deployment & ReplicaSet





# Controllers: Deployment & ReplicaSet



# Controllers: DaemonSet

```
kubectl create -f daemonset.yaml
```

DaemonSet  
k8s-demo

```
apiVersion: v1beta1
Kind: DaemonSet
Metadata:
  name: k8s-demo
Specs:
  container:
    -image: mjbright/k8s-demo:1
```

Node1

Pod v1  
app=k8s-demo

Node2

Pod v1  
app=k8s-demo

# Controllers: StatefulSet

StatefulSet  
app=k8s-demo

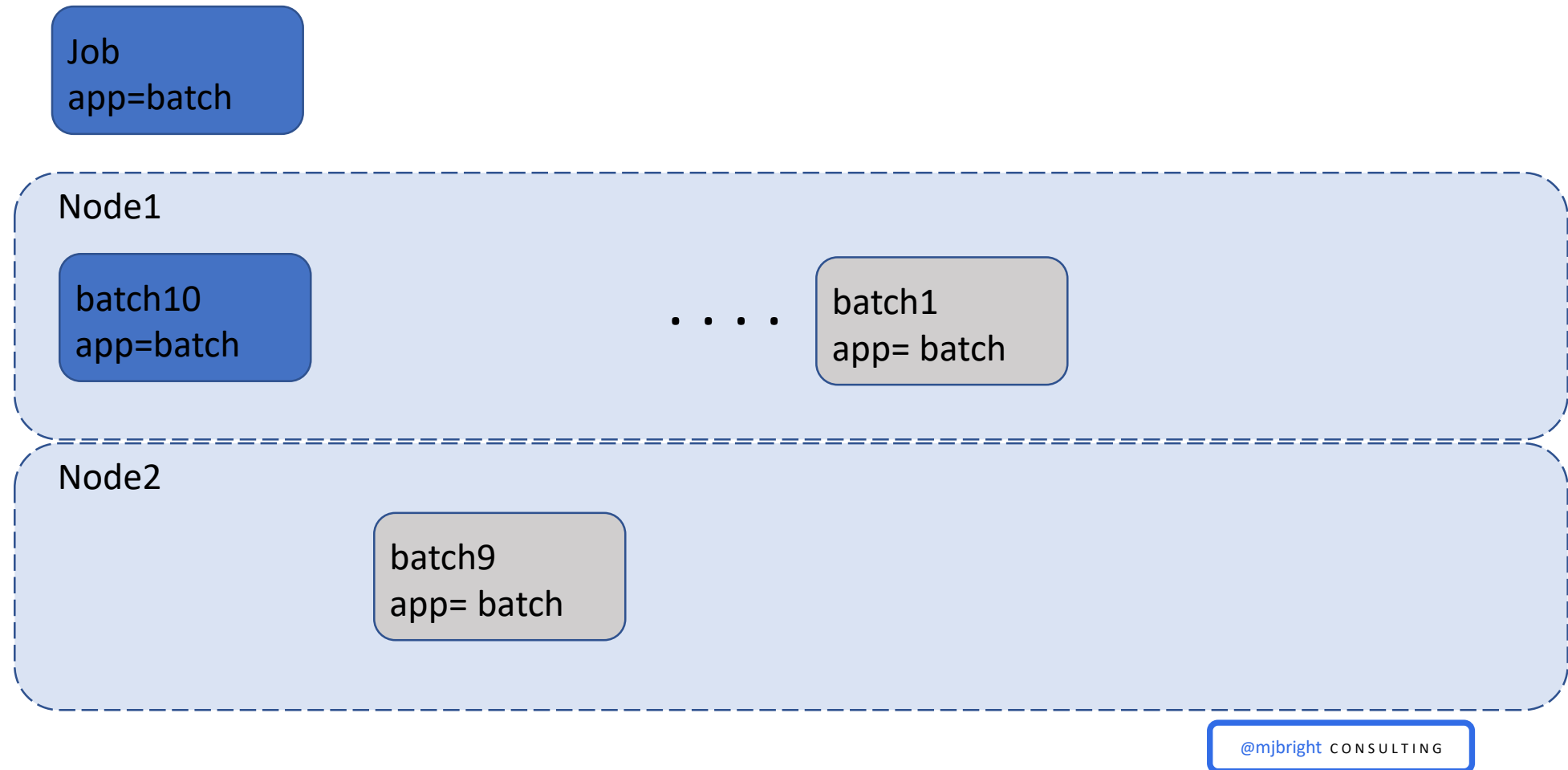
Node1

Pod -01      v1  
app=k8s-demo

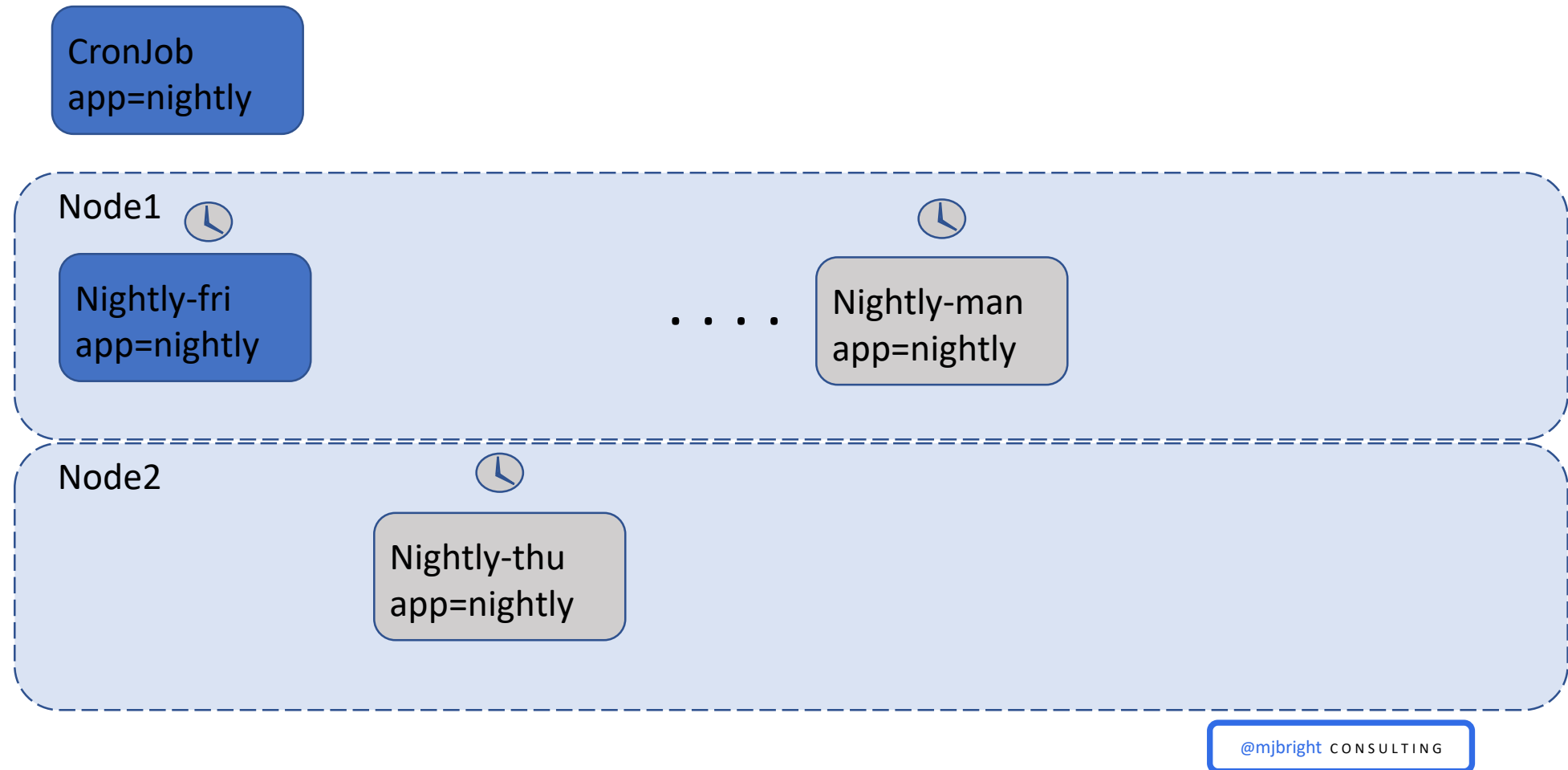


Node2

# Controllers: Jobs (Batch) & CronJob



# Controllers: Jobs (Batch) & CronJob



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Survey, Resources

# Volumes, Ingress, Scheduling, Log/Troubleshoot

Recap Day2: Discoveries, clarifications, difficulties ? My observations

Labs – 8: ClusterIP, NodePort

9: Volumes

Labs – 9: ConfigMap, NFS PV, PVC, Resource Quota/PVC Usage

10: Ingress



Lunch

Labs – 10: Ingress – advanced Service Exposure

11: Scheduling

Labs – 11: Assigning Pods using Labels, Using Taints

12: Logging & Troubleshooting

# Troubleshooting

If Pods fail and redeploy too quickly (so log is always empty), you can view the previous Pod by using the `-p` option, e.g.

```
# Return snapshot of previous terminated ruby container logs from pod web-1  
kubectl logs -p -c ruby web-1
```

Also look at log aggregation tools like Stern, or use Fluentd.

Kubectl get events

Kubectl plugins; krew



# Webinars

With the release of Kubernetes 1.15 (2019-Jun-20), there will be webinars and blog posts describing the new features and changes.

<https://github.com/kubernetes/kubernetes/blob/master/CHANGELOG-1.15.md>

<https://relnotes.k8s.io/?releaseVersions=1.15.0>

Mirantis “What’s new in Kubernetes 1.15”: Thursday, June 20, 2019, 18:00 CEST  
Sign up below and you will receive a link to the recording

<https://info.mirantis.com/webinar-kubernetes-1-15>

CNCF also run “What’s new in Kubernetes” webinars, for which the recording will become available at:

<https://www.cncf.io/community/recorded-events/>

e.g. for Kubernetes 1.14:

<https://www.cncf.io/community/webinars/kubernetes-1-14-release/>

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Survey, Resources

# Custom Resources, Federation, Helm, Security

Recap Day3: Discoveries, clarifications, difficulties ? My observations

Labs – 12: Log file locations, viewing logs, monitoring tools

13: Custom Resource Definitions (CRD)

Labs – 13: Creating a CRD

Lunch

14: Kubernetes Federation

15: Helm

Labs – 15: Working with Helm & Charts

16: Security

Labs – 16: Working with TLS, Authn/Authorization, Admission Controllers

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Survey, Resources

# Survey

# Thank you !



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# Resources

Resource	URL
CLI Tools	
Kubectl	The official command-line Kubernetes tool <a href="https://kubernetes.io/docs/tasks/tools/install-kubectl/">https://kubernetes.io/docs/tasks/tools/install-kubectl/</a>
Kubectl Plugins	Extensions to kubectl <a href="https://kubernetes.io/docs/tasks/extend-kubectl/kubectl-plugins/">https://kubernetes.io/docs/tasks/extend-kubectl/kubectl-plugins/</a>
Ketall Plugin	Kubectl plugin with extended 'get all' functionality <a href="https://github.com/corneliusweig/ketall">https://github.com/corneliusweig/ketall</a>
Kubens, Kubectlx	Useful namespace or context switch tools <a href="https://github.com/ahmetb/kubectx">https://github.com/ahmetb/kubectx</a>

# Resources

Resource	URL
CLI Tools	
Stern	Multi pod and container log tailing for Kubernetes <a href="https://github.com/wercker/stern">https://github.com/wercker/stern</a>
K9s	TUI for Kubernetes - Kubernetes CLI To Manage Your Clusters In Style! <a href="https://github.com/derailed/k9s">https://github.com/derailed/k9s</a>



# Resources

Resource	URL
GUI Tools	
Kubeview	Visualization of Deployments, ReplicaSets, Pods, Services ... <a href="https://github.com/mjbright/kubeview">https://github.com/mjbright/kubeview</a>
Kube-ops-view	Kubernetes Operational View <a href="https://github.com/hjacobs/kube-ops-view">https://github.com/hjacobs/kube-ops-view</a>

# Resources

Resource	URL
	Documents, Blogs ...
Kubernetes.io	Official Kubernetes Documentation <a href="https://kubernetes.io">https://kubernetes.io</a>
@learnk8s	LearnK8S blog – or twitter feed – full of useful Kubernetes info <a href="https://learnk8s.io/blog/">https://learnk8s.io/blog/</a>
@kubelist	Full of useful Kubernetes info <a href="https://kubelist.com">https://kubelist.com</a>
AppOps Reloaded	Michael Hausenblas' AppOps Reloaded Newsletter <a href="https://tinyletter.com/mhausenblas/archive">https://tinyletter.com/mhausenblas/archive</a>

# Resources

Resource	URL
	Documents, Blogs ...
“Kubernetes failure stories”	Compilation of public failure/horror stories related to Kubernetes <a href="https://github.com/hjacobs/kubernetes-failure-stories">https://github.com/hjacobs/kubernetes-failure-stories</a>
Kube Weekly @kubeweekly	The weekly newsletters for all things Kubernetes <a href="https://kubeweekly.io/">https://kubeweekly.io/</a>
Kube.News	<a href="https://kube.news/">https://kube.news/</a>

# Resources

Resource	URL
	Images ...
mjbright/ Kubelab	Jupyter image with kubectl installed <a href="https://hub.docker.com/r/mjbright/kubelab">https://hub.docker.com/r/mjbright/kubelab</a> [
mjbright/ k8s-demo	Small static go web server with text or graphic kubernetes logo for demos <a href="https://hub.docker.com/r/mjbright/k8s-demo">https://hub.docker.com/r/mjbright/k8s-demo</a>

# Resources

Resource	URL
	CKA, CKAD Resources
CNCF CKAD Resources	Certified Kubernetes Application Developer (CKAD), 2 hour exam <a href="https://www.cncf.io/certification/ckad/">https://www.cncf.io/certification/ckad/</a>
CKAD Exercises	Very useful exercises for preparing the CKAD exam <a href="https://github.com/dgkanatsios/CKAD-exercises">https://github.com/dgkanatsios/CKAD-exercises</a>
CNCF CKA Resources	Certified Kubernetes Administrator (CKA), 3 hour exam <a href="https://www.cncf.io/certification/cka/">https://www.cncf.io/certification/cka/</a>
KTHW	Kelsey Hightower's – "Kubernetes the Hard Way" <a href="https://github.com/kelseyhightower/kubernetes-the-hard-way">https://github.com/kelseyhightower/kubernetes-the-hard-way</a>

# Resources

Resource	URL
	Helm
Helm	The Kubernetes Package Manager <a href="https://helm.sh/">https://helm.sh/</a>
Helm Hub	743 charts ready to deploy <a href="https://hub.helm.sh/">https://hub.helm.sh/</a>
Helm with Ansible	<a href="https://blog.openshift.com/automating-helm-charts-with-ansible/">https://blog.openshift.com/automating-helm-charts-with-ansible/</a>
Creating Charts	Creating your first Helm Chart: <a href="https://docs.bitnami.com/kubernetes/how-to/create-your-first-helm-chart/#helpers-and-other-functions">https://docs.bitnami.com/kubernetes/how-to/create-your-first-helm-chart/#helpers-and-other-functions</a>

# Resources

Resource	URL
	Operators
Operators vs. Alternatives	<a href="https://medium.com/@cloudark/why-to-write-kubernetes-operators-9b1e32a24814">https://medium.com/@cloudark/why-to-write-kubernetes-operators-9b1e32a24814</a>
Operator Hub	Recent catalog of (52) Kubernetes Operators <a href="https://operatorhub.io/">https://operatorhub.io/</a>
Operator in 15 mins	Make a Kubernetes Operator in 15 minutes with Helm <a href="https://blog.openshift.com/make-a-kubernetes-operator-in-15-minutes-with-helm/">https://blog.openshift.com/make-a-kubernetes-operator-in-15-minutes-with-helm/</a>

# Resources

Resource	URL
	Security
Network Policies	Blog post + Github repo covering a myriad of network policies <a href="https://ahmet.im/blog/kubernetes-network-policy/">https://ahmet.im/blog/kubernetes-network-policy/</a>
Network Policies	Blog post + Video <a href="https://octetz.com/posts/k8s-network-policy-apis">https://octetz.com/posts/k8s-network-policy-apis</a>
RBAC	“Asking for Forgiveness or Getting Permission” <a href="https://blog.aquasec.com/kubernetes-rbac">https://blog.aquasec.com/kubernetes-rbac</a>





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