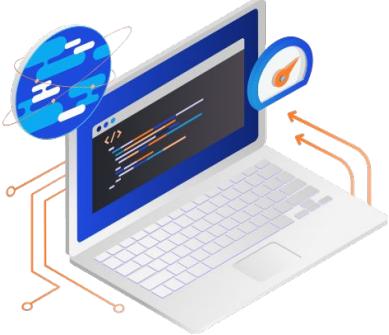


DATASTAX®



# Cassandra & Kubernetes





# Your hosts



Cédrick Lunven



Developer Advocate



DataStax happy  
Folks



Jack Fryer



Community Manager



David Jones-Gilardi   
Developer Advocate



Aleksandr Volochnev   
Developer Advocate



# Apache Cassandra™ with Kubernetes

1

**Housekeeping and Quizz**

2

**Kubernetes Basics**

3

**Kubernetes Operators**

4

**Cass Operator in Deep**

5

**Dashboarding + Grafana | Prometheus**

6

**Resources**

# Apache Cassandra™ with Kubernetes

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**Housekeeping and Quizz**

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**Kubernetes Basics**

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**Kubernetes Operators**

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**Dashboarding + Grafana | Prometheus**

6

**Resources**

# Disclaimer

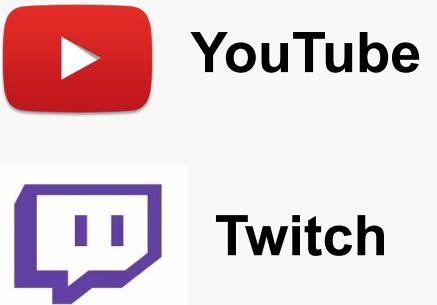
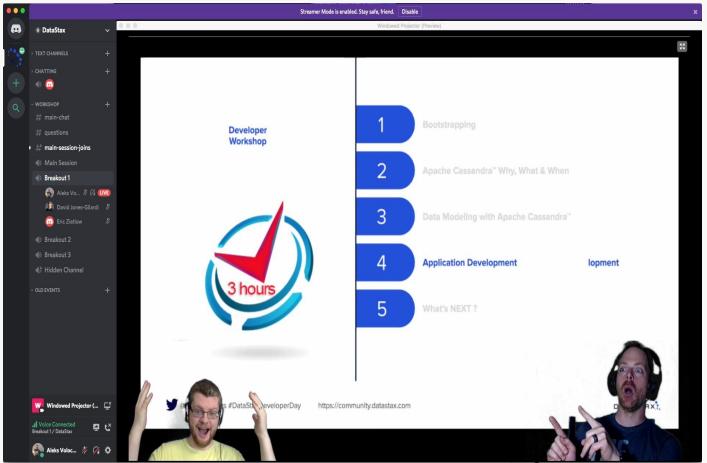
Today,

With limited time (2H), we won't introduce the basics of Apache Cassandra™ (like we do every other Wednesday).

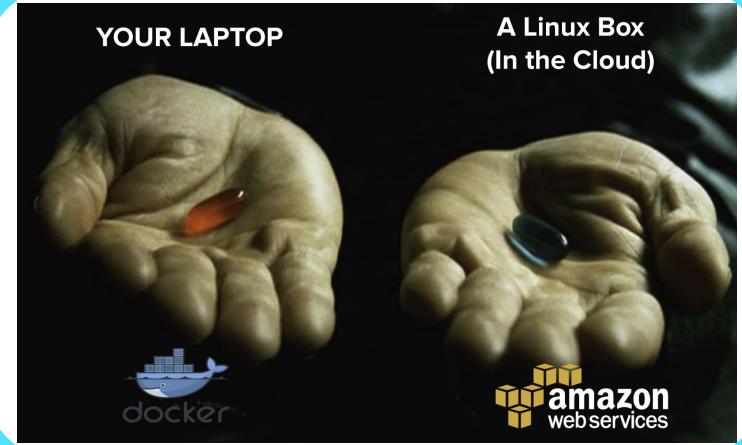
**DON'T WORRY (seriously):** You will be able to do the hands-on as we are showing step-by-steps.



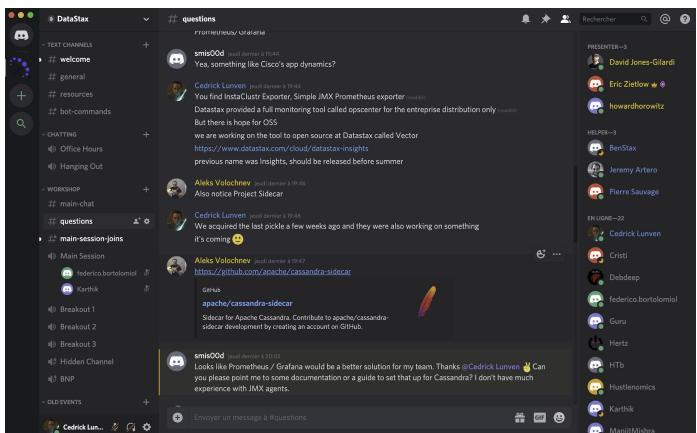
## STREAMS



## RUNTIME

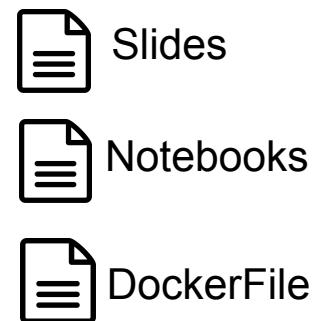


## QUESTIONS



Discord

## MATERIALS



DATASTAX

Cassandra Developer Workshop

youtube.com/watch?v=v... | 17

PERSO ff4j DATASTAX TMP Other Bookmarks

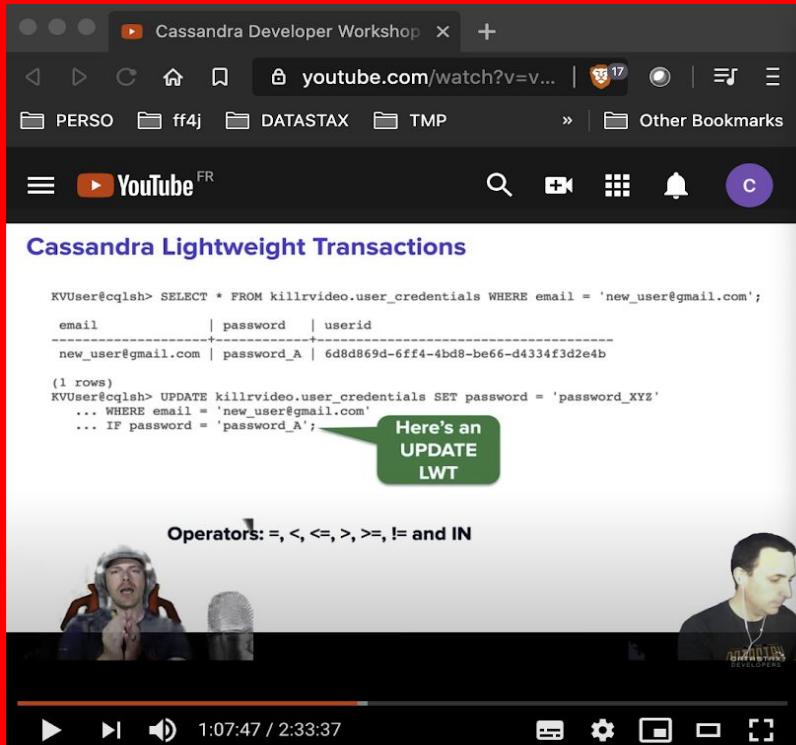
YouTube FR

Cassandra Lightweight Transactions

```
KVUser@cqlsh> SELECT * FROM killrvideo.user_credentials WHERE email = 'new_user@gmail.com';
+-----+-----+-----+
| email | password | userid |
+-----+-----+-----+
| new_user@gmail.com | password_A | 6d8d869d-6ff4-4bd8-be66-d4334f3d2e4b |
+-----+-----+-----+
(1 rows)
KVUser@cqlsh> UPDATE killrvideo.user_credentials SET password = 'password_XYZ'
... WHERE email = 'new_user@gmail.com'
... IF password = 'password_A';
```

Here's an UPDATE LWT

Operators: =, <, <=, >, >=, != and IN



DataStax-Academy/kubernetes-... +

github.com/DataStax-Academy/kubernetes-workshop-online

PERSO ff4j DATASTAX TMP wks-k8s Content Other Bookmarks

Search or jump to... Pull requests Issues Marketplace Explore

DataStax-Academy / kubernetes-workshop-online

Unwatch 11 Star 19 Fork 11

Code Issues 0 Pull requests 0 Actions Projects 0 Wiki Security 0 Insights Settings

Run a workshop on Kubernetes Operator online Edit

Manage topics

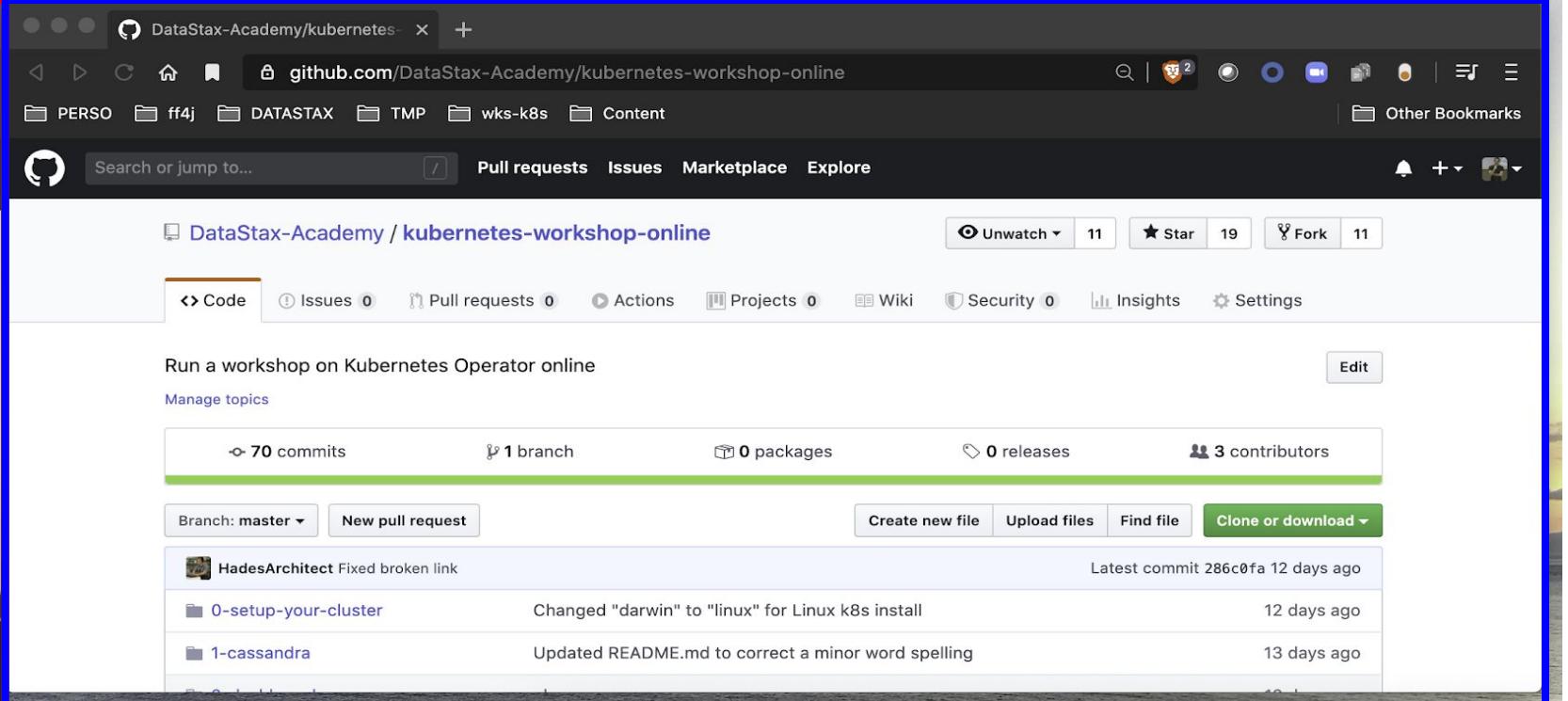
70 commits 1 branch 0 packages 0 releases 3 contributors

Branch: master New pull request Create new file Upload files Find file Clone or download

HadesArchitect Fixed broken link Latest commit 286c0fa 12 days ago

0-setup-your-cluster Changed "darwin" to "linux" for Linux k8s install 12 days ago

1-cassandra Updated README.md to correct a minor word spelling 13 days ago



#main-chat

discord.com/channels/685554030159593522/68556034541... | 17

PERSO ff4j DATASTAX TMP wks-k8s Content Other Bookmarks

Fellowship of the (Cas... Apache Cassandra

# main-chat

Rechercher

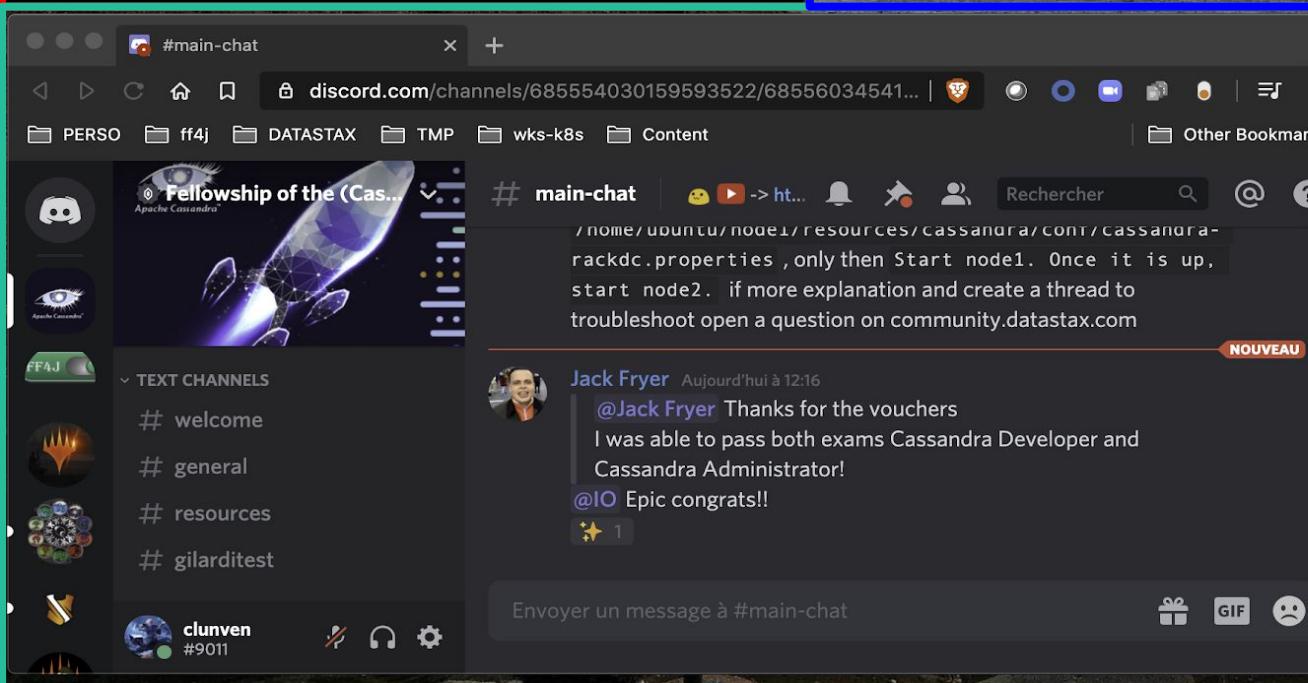
/home/ubuntu/node1/resources/cassandra/conf/cassandra-rackdc.properties , only then Start node1. Once it is up, start node2. if more explanation and create a thread to troubleshoot open a question on community.datastax.com

NOUVEAU

Jack Fryer Aujourd'hui à 12:16

@Jack Fryer Thanks for the vouchers  
I was able to pass both exams Cassandra Developer and Cassandra Administrator!  
@IO Epic congrats!!

Envoyer un message à #main-chat

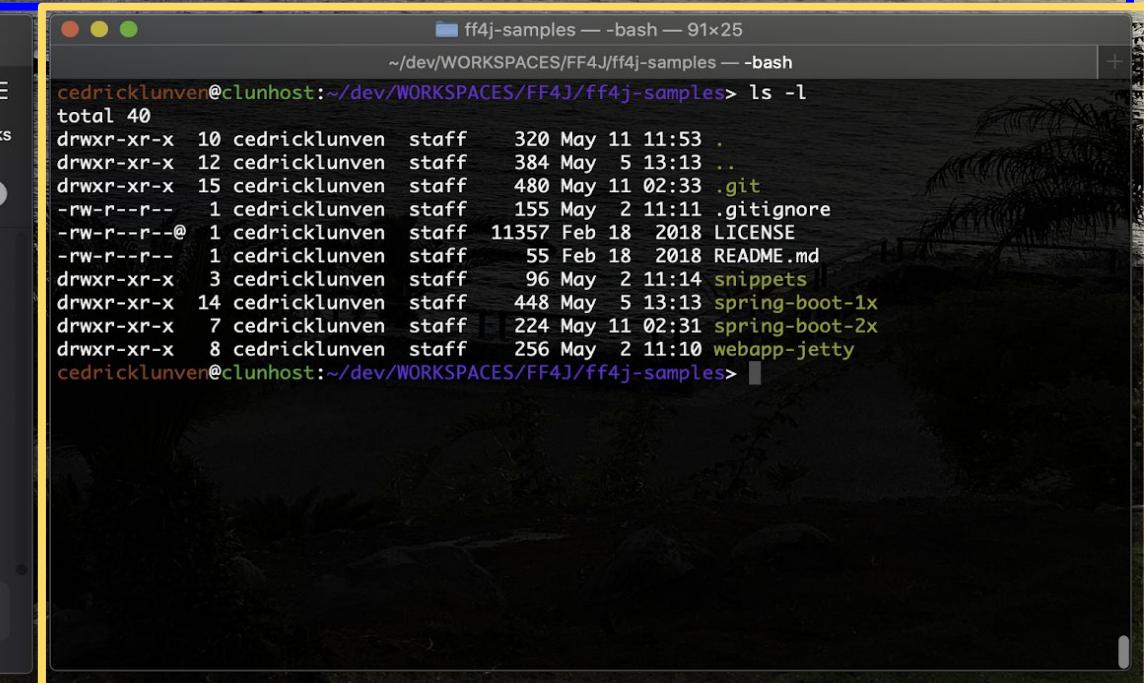


ff4j-samples — bash — 91x25

~/dev/WORKSPACES/FF4J/ff4j-samples — bash

```
cedricklunven@clunhost:~/dev/WORKSPACES/FF4J/ff4j-samples> ls -l
total 40
drwxr-xr-x 10 cedricklunven staff 320 May 11 11:53 .
drwxr-xr-x 12 cedricklunven staff 384 May 5 13:13 ..
drwxr-xr-x 15 cedricklunven staff 480 May 11 02:33 .gitignore
-rw-r--r-- 1 cedricklunven staff 155 May 2 11:11 .gitignore
-rw-r--r--@ 1 cedricklunven staff 11357 Feb 18 2018 LICENSE
-rw-r--r-- 1 cedricklunven staff 55 Feb 18 2018 README.md
drwxr-xr-x 3 cedricklunven staff 96 May 2 11:14 snippets
drwxr-xr-x 14 cedricklunven staff 448 May 5 13:13 spring-boot-1x
drwxr-xr-x 7 cedricklunven staff 224 May 11 02:31 spring-boot-2x
drwxr-xr-x 8 cedricklunven staff 256 May 2 11:10 webapp-jetty
```

cedricklunven@clunhost:~/dev/WORKSPACES/FF4J/ff4j-samples>



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# 47 90 51



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# Apache Cassandra™ with Kubernetes

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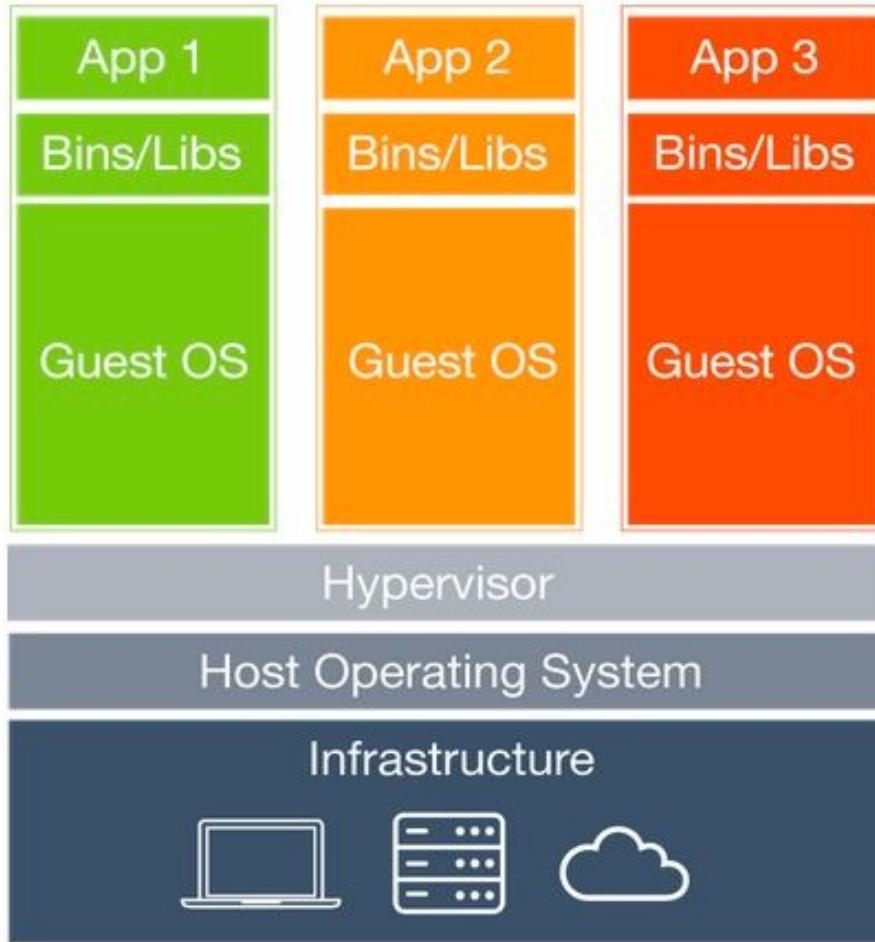
5

**Dashboarding + Grafana | Prometheus**

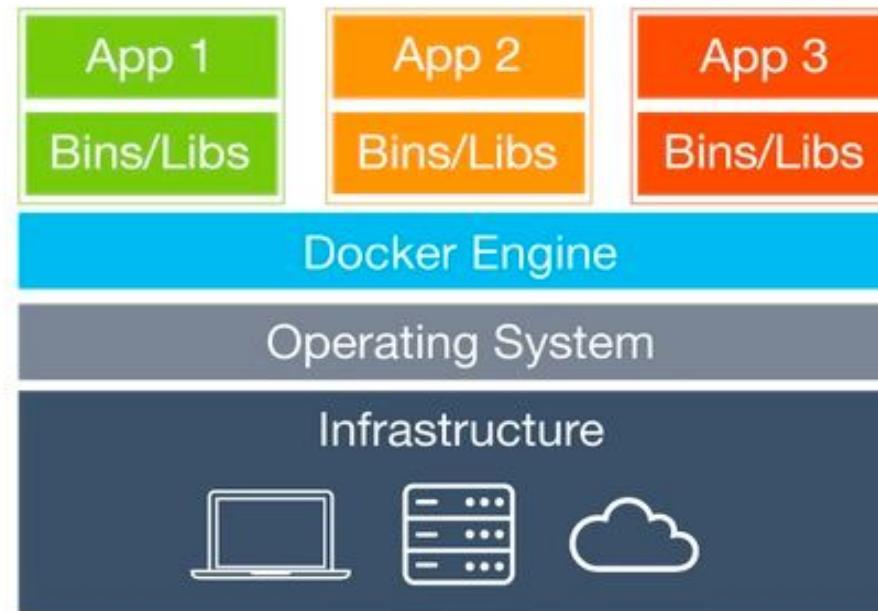
6

**Resources**

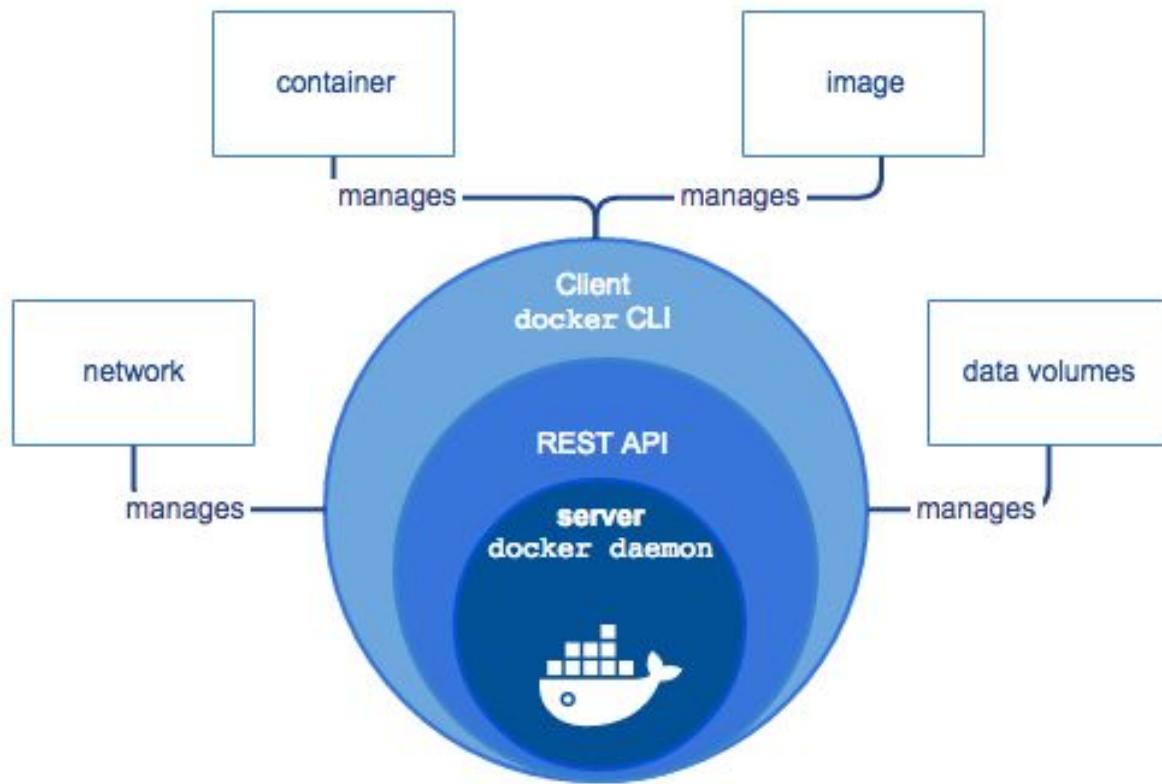
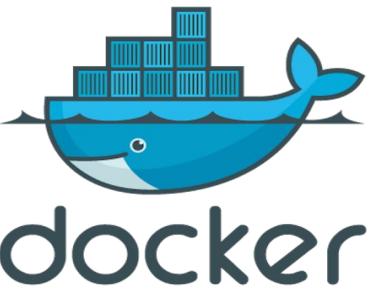
# Virtual Machines vs Containers



**Virtual Machines**



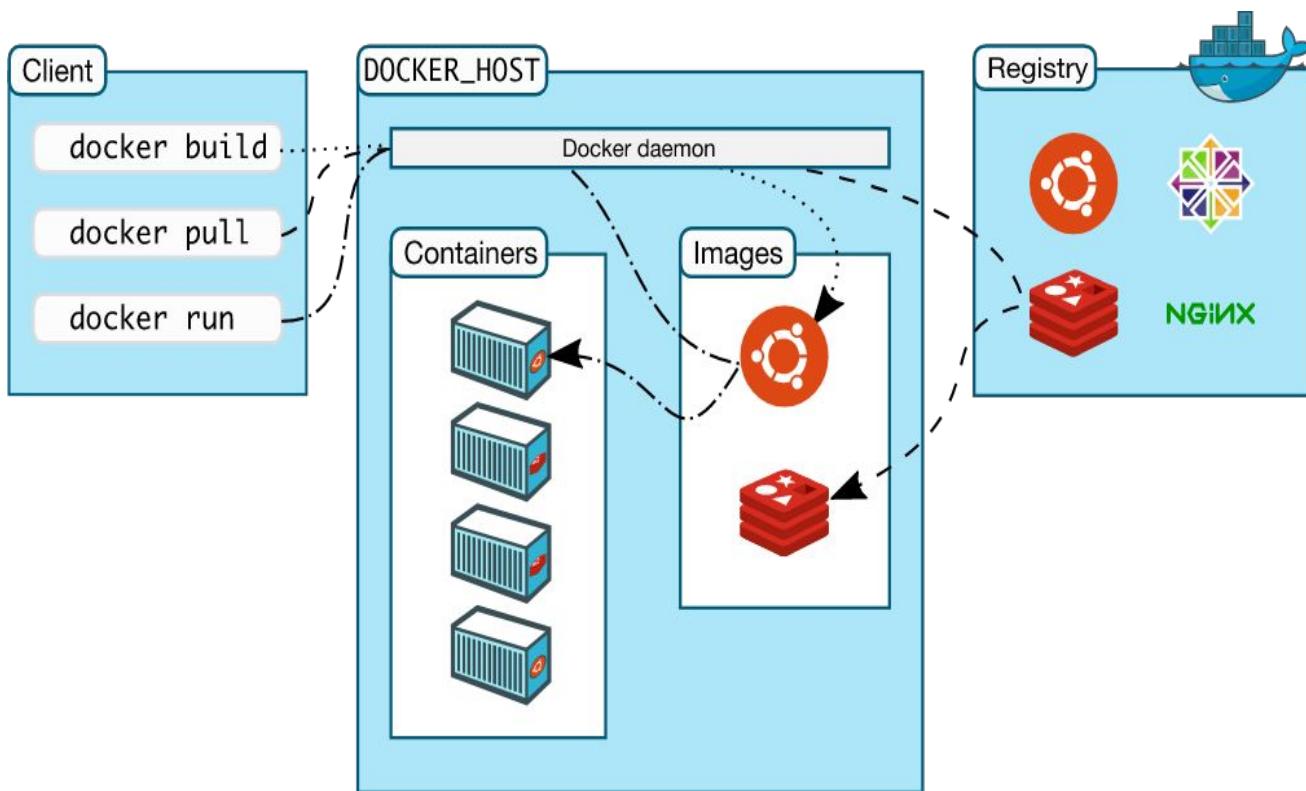
**Containers**



## Docker Engine is Client-server application with :

- A server which is a type of long-running program called a daemon process (**the dockerd command**).
- **A REST API** which specifies interfaces that programs can use to talk to the daemon and instruct it what to do.
- **A command line interface (CLI)** client (the docker command).

# Docker Architecture



## Some Docker client commands

- We move immutable **images** (build/pull/push)
- Docker Daemon start containers based on images (run)
  - *Adding Env Var*
  - *Adding Storage (volumes)*
  - *Adding Network*
  - *Exposing port*
- We interact with **running containers** (ps, exec...)



# cassandra ☆

Docker Official Images

Apache Cassandra is an open-source distributed storage system.

100M+

Container

Linux

PowerPC 64 LE

ARM

ARM 64

386

x86-64

Databases

Official Image

Linux - x86 ( latest )

Copy and paste to pull this image

`docker pull cassandra`



[View Available Tags](#)

## Running Cassandra in Docker

- Define a proper **network**
- **Env variables** can be defined to override keys in `cassandra.yaml`.
- Export ports **7000, 9042, ...**
- Define volumes to stores data
  - **/var/lib/cassandra**

```
$ docker run
--name some-cassandra -d \
-e CASSANDRA_BROADCAST_ADDRESS=10.42.42.42 \
-p 7000:7000,9042:9042
-v /my/own/datadir:/var/lib/cassandra \
cassandra:tag
```

# Docker-Compose

```
docker-compose -f docker-compose.yml up -d --scale cassandra-node=2
```

Define and run multi-container Docker applications through the use of a **YAML** file to configure your applications

```
version: '2'
services:

cassandra-seed:
  container_name: cassandra-seed-node
  image: cassandra: 3.11.6
  ports:
    - "9042:9042"    # Native transport
    - "7199:7199"    # JMX
    - "9160:9160"    # Thrift clients

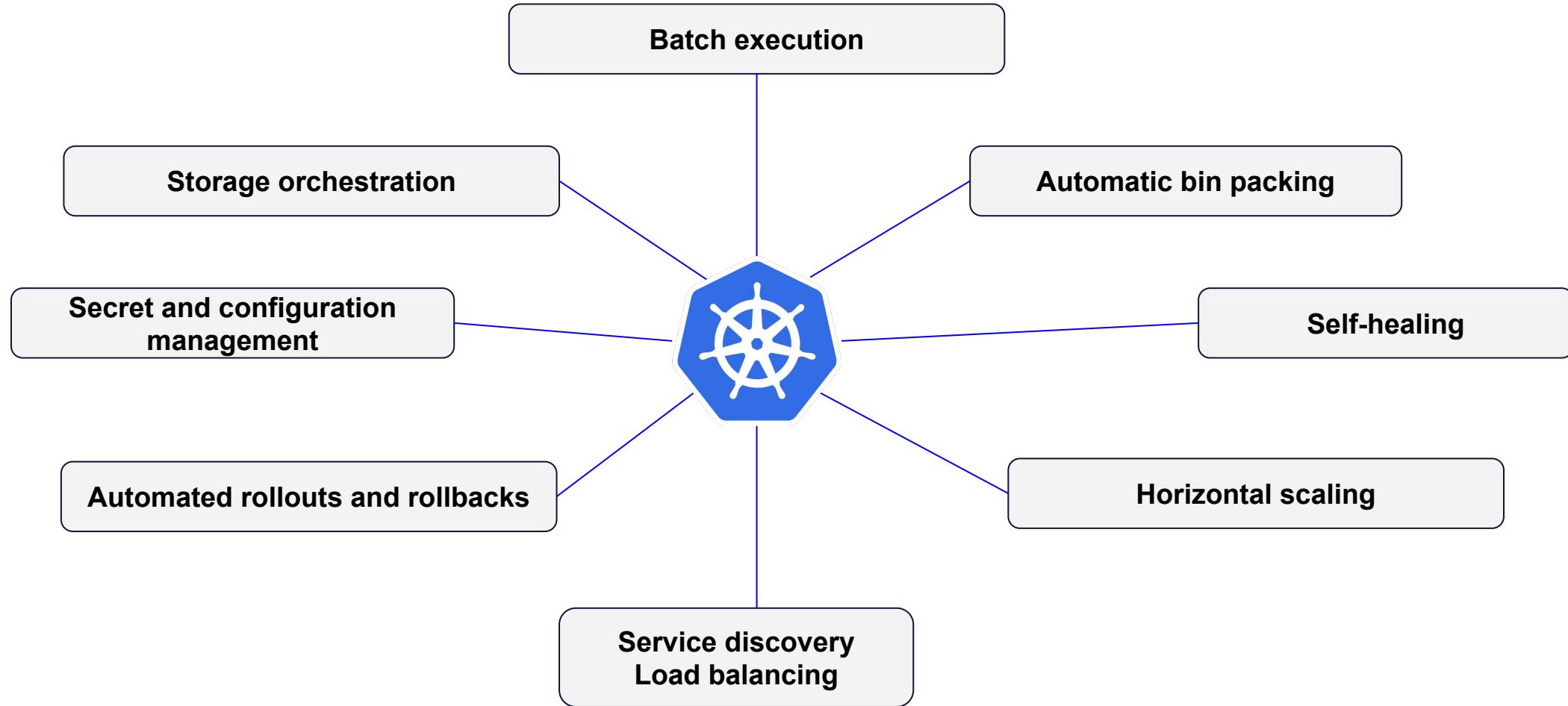
cassandra-node:
  image: cassandra: 3.11.6
  command: /bin/bash -c "echo 'Waiting for seed node' && sleep 30 && /docker-entrypoint.sh cassandra -f"
  environment:
    - "CASSANDRA_SEEDS=cassandra-seed-node"
  depends_on:
    - "cassandra-seed"
```



# kubernetes

*"Kubernetes is an open-source system for  
automating deployment, scaling, and management  
of containerized applications."*

# Kubernetes Features



# Kubernetes Infrastructure



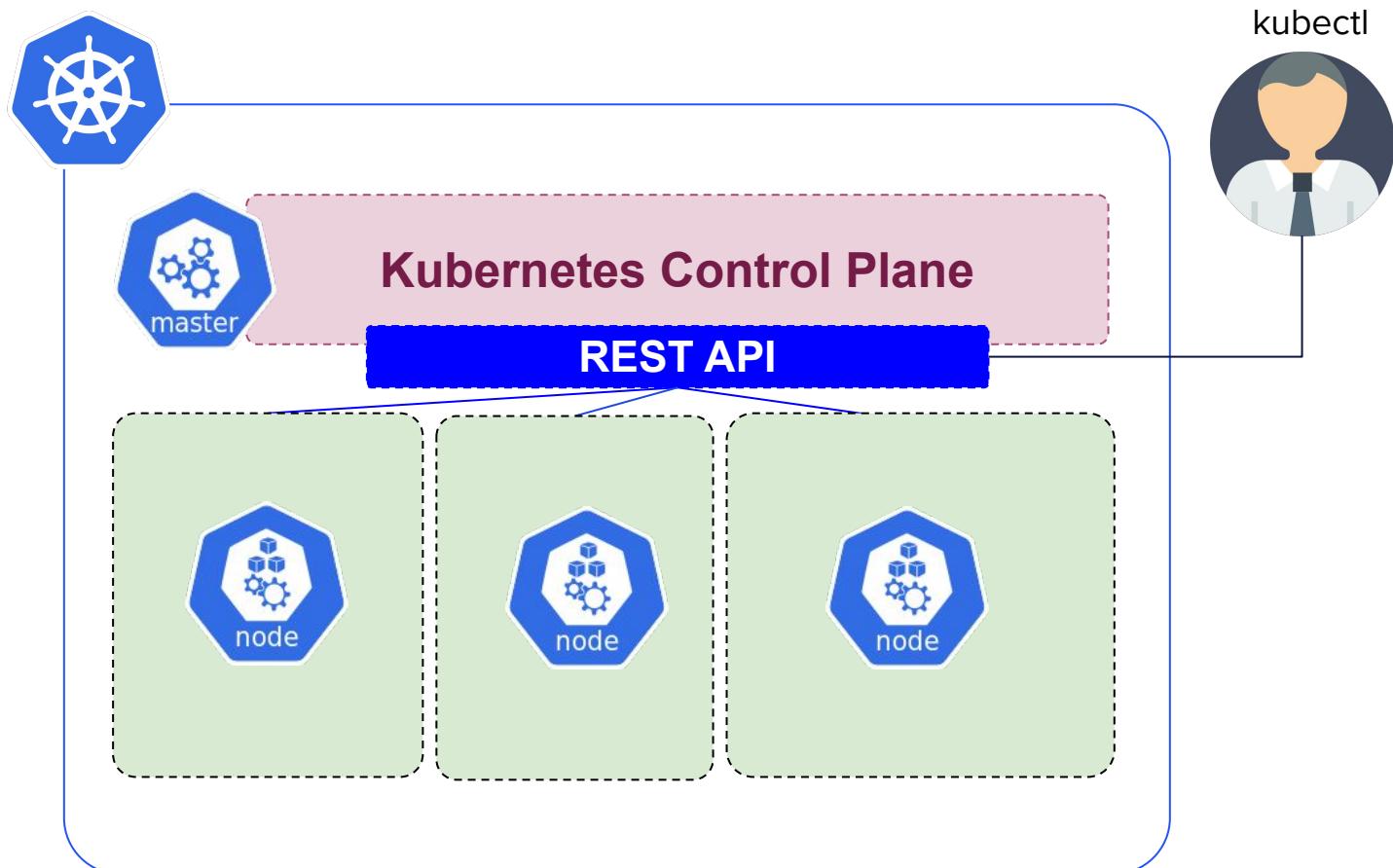
**Cluster:**  
Kubernetes cluster.



**Master:**  
Kubernetes Control Plane.



**Node:**  
Worker machine in Kubernetes cluster.



# Kubernetes Control Plane (master)



**K8s API Server**  
Kubernetes API.



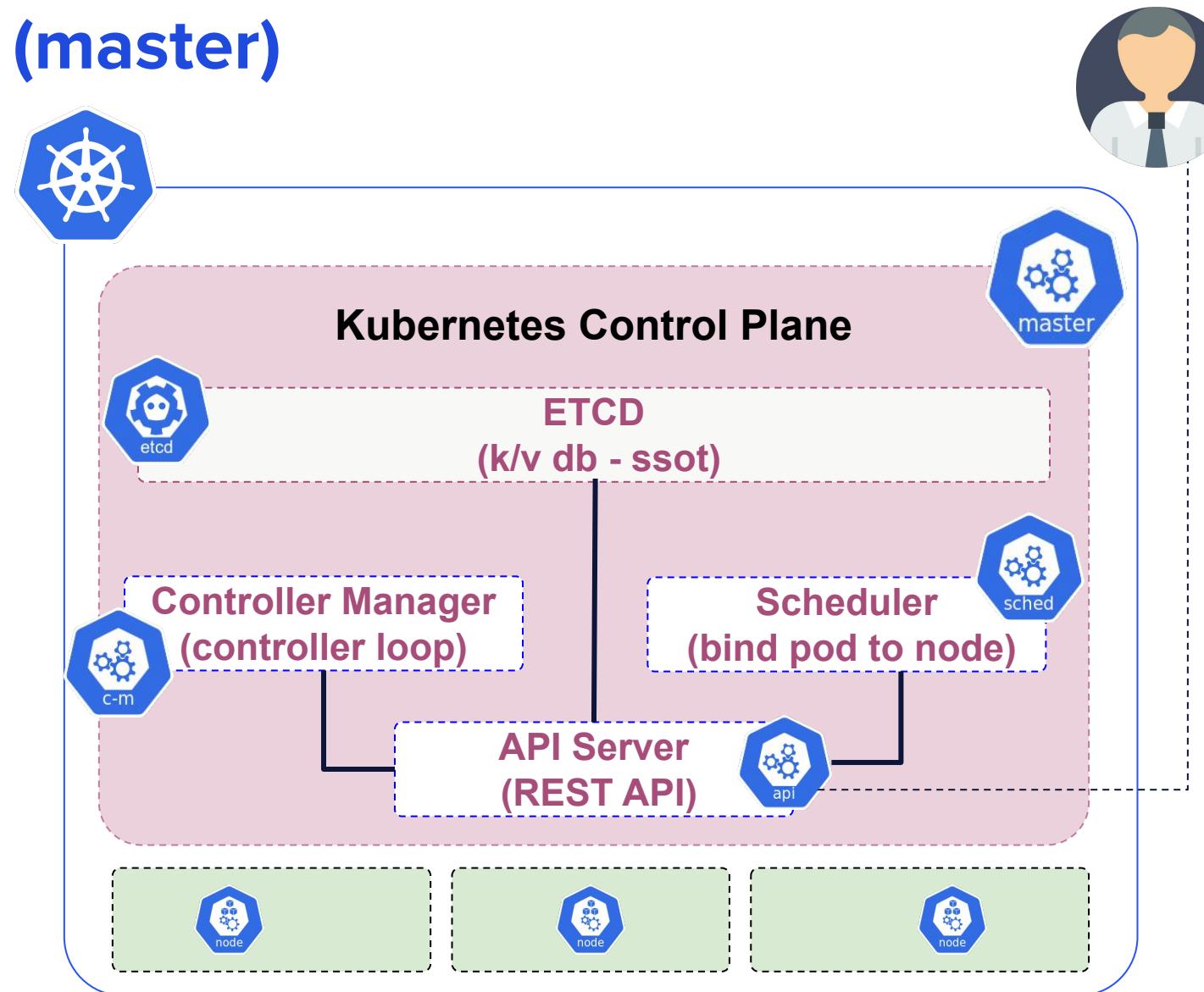
**Controller Manager**  
Kubernetes controller manager.



**Scheduler**  
In charge of ensuring Pods placement.



**ETCD**  
Kubernetes' backing store.



# Kubernetes Worker (Node, Minions)



## Kubelet:

The kubelet is the primary “node agent” that runs on each node.



## Kube-proxy

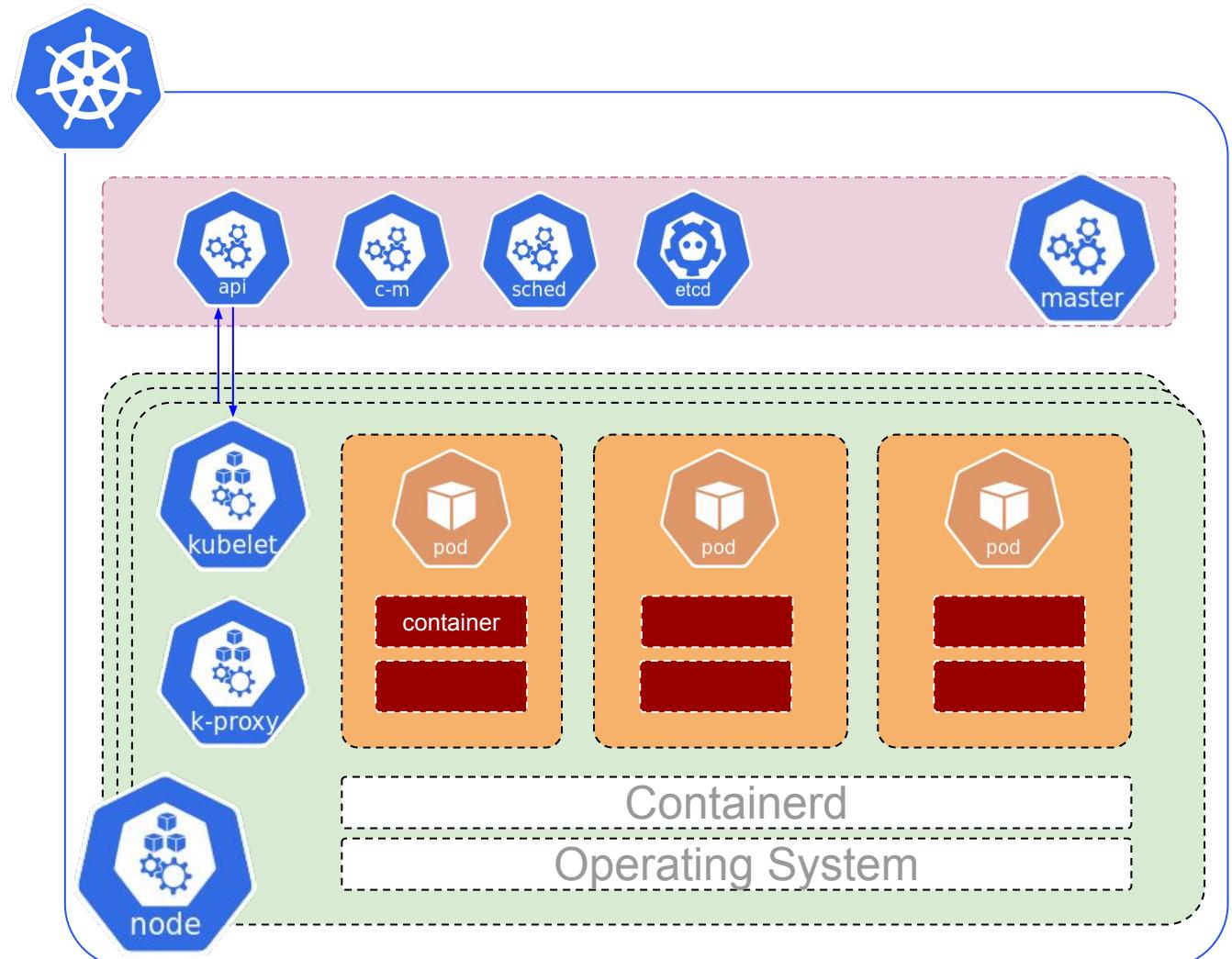
The Kubernetes network proxy runs on each node. This reflects services as defined in the Kubernetes API on each node.



## POD

Collection of containers that can run on a host.

This resource is created by clients and scheduled onto hosts.

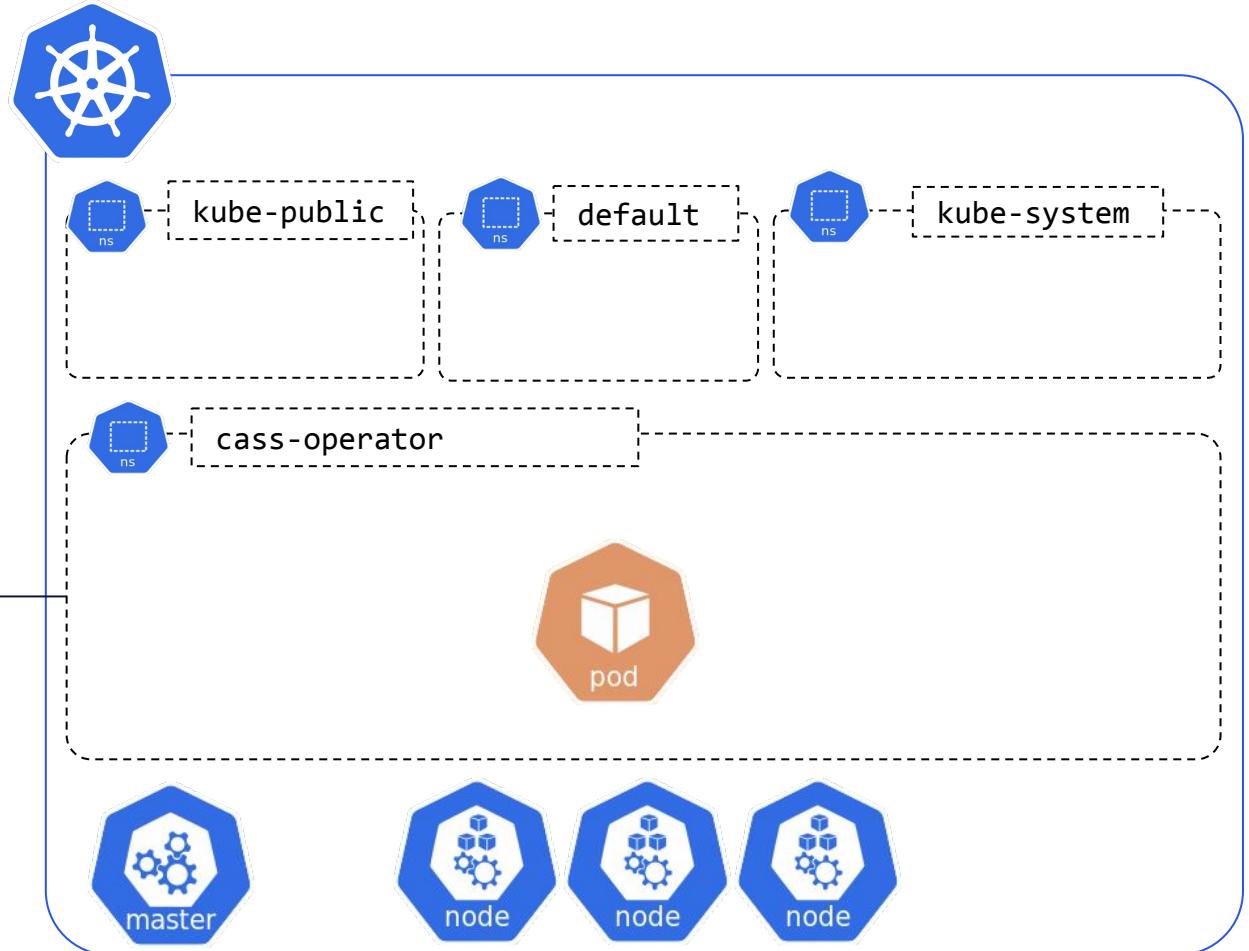


# Kubernetes Namespace



**Namespace:** Namespace provides a scope for Names. Use of multiple namespaces is optional.

We create resources in  
**namespaces** span across node.



# K8s Primitives : Storage



**PersistentVolume:** is a storage resource provisioned by an administrator.

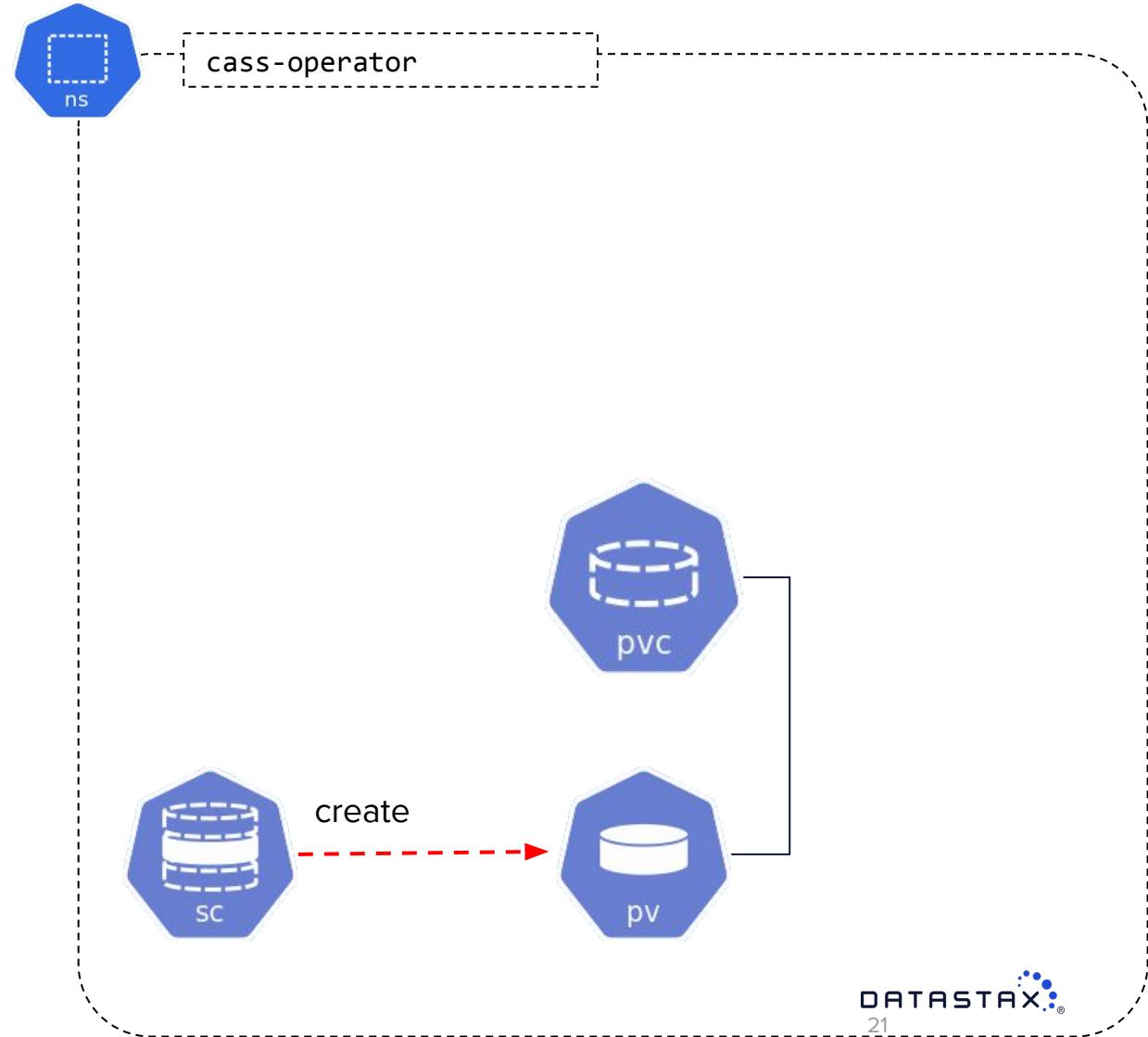


**PersistentVolumeClaim:**

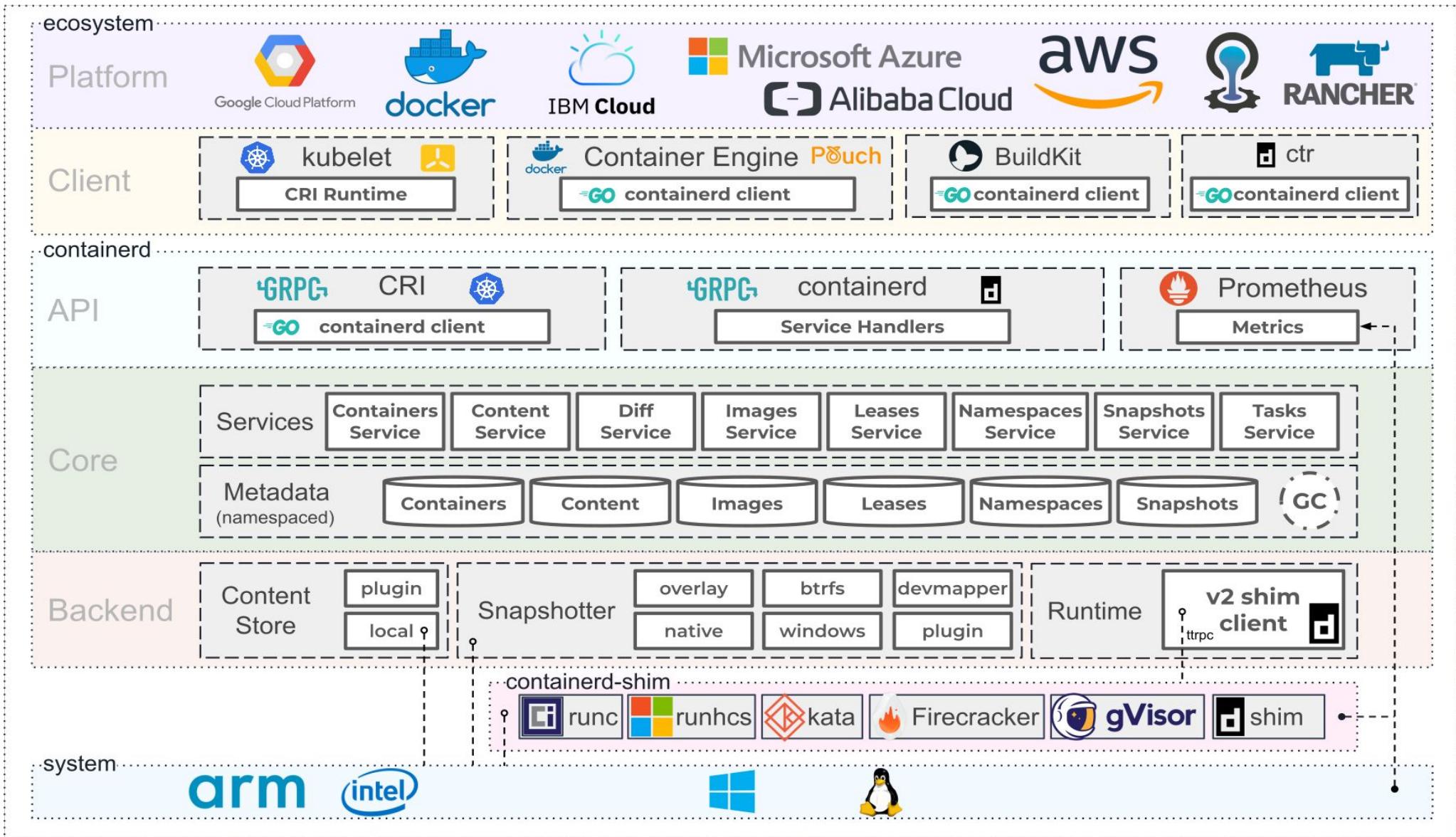
PersistentVolumeClaim is a user's request for and claim to a persistent volume.

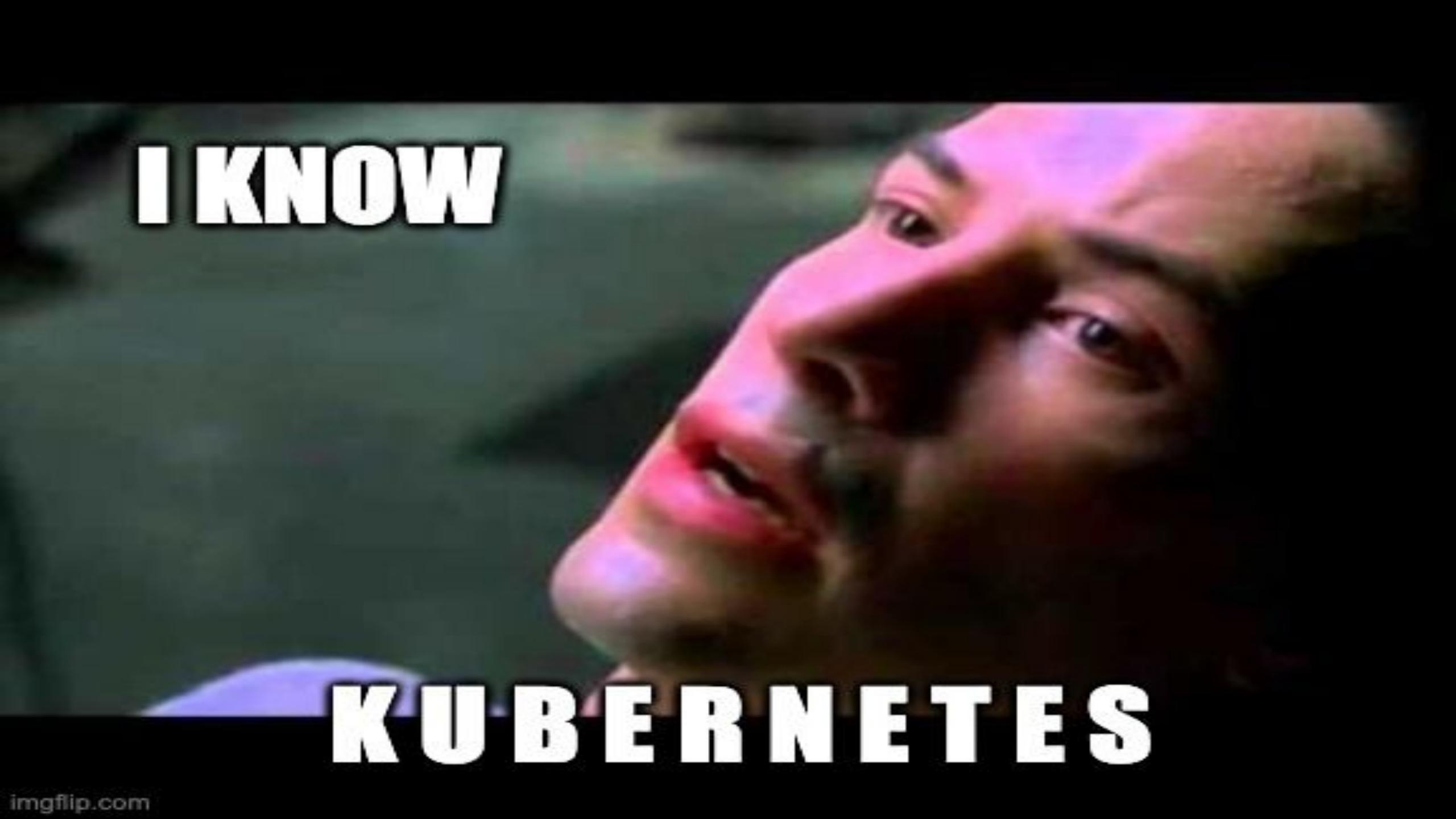


**StorageClass:** StorageClass describes the parameters for a class of storage for which *PersistentVolumes* can be dynamically provisioned.



# Open specification they said...



A close-up photograph of a pink flamingo's head and neck. The flamingo is facing towards the right of the frame, with its long, curved beak slightly open. Its feathers are a vibrant pink color, and its eyes are dark and expressive. The background is blurred, showing hints of green and blue, suggesting a natural outdoor setting.

**I KNOW**

**KUBERNETES**

# Kubernetes Distributions



Azure Kubernetes Service (AKS)



Amazon EKS



Google Kubernetes Engine (GKE)



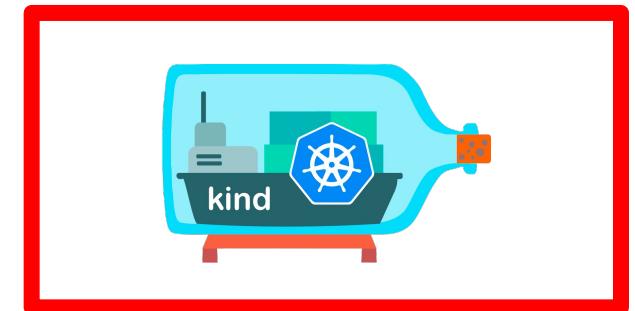
## Clouds



OpenShift



**Red Hat**  
CodeReady  
Containers



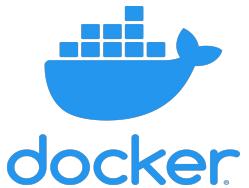
DATASTAX®

## Local Environment



# YOUR LAPTOP

Your Laptop



docker



kind



kubernetes



# CLOUD INSTANCE



Cloud Env



docker



CentOS



kubernetes



kind



# Online Workshops



## Section #1 : Setup Your Cluster

<https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/0-setup-your-cluster/README.MD>

### 5. Install Kind

kind ( kind ) is a tool for running local Kubernetes clusters using Docker container "nodes". kind was primarily designed for testing Kubernetes itself, but may be used for local development or CI. Please refer to [Reference Documentation](#) for more detailed instructions.



: To install on windows please download the [executable](#) and place it on the PATH. You can also use [Chocolatey](#) very clever package manager for windows.

```
choco install kind
```



: To install on MAC OS please use the following [homebrew](#) commands:

```
brew install kubectl
```



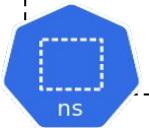
: To install on linux (centOS) you can use the following commands

```
curl -Lo ./kind https://github.com/kubernetes-sigs/kind/releases/download/v0.7.0/kind-$(uname)-amd64  
chmod +x ./kind  
sudo mv ./kind /usr/local/bin/kind
```

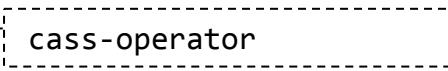
Check that the installation is successful. Starting from now all command will be the same on each platform, as such we will keep providing a single command. We will mark with a blue book the command ( ) and a green book ( ) to show expected result.

# Setup your cluster

Nothing Here :)



ns



server-storage

# Apache Cassandra™ with Kubernetes

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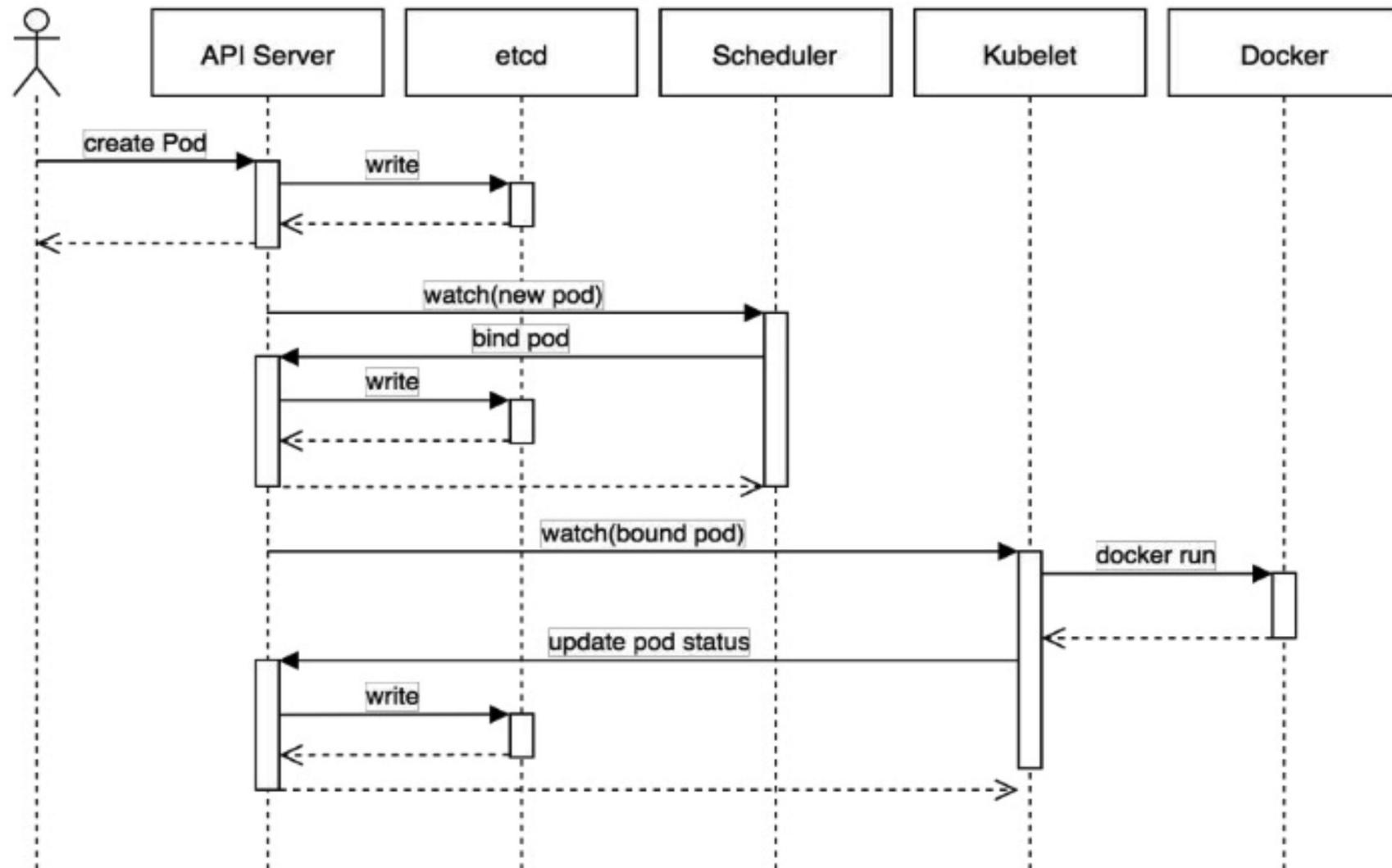
Dashboarding + Grafana | Prometheus

6

Resources

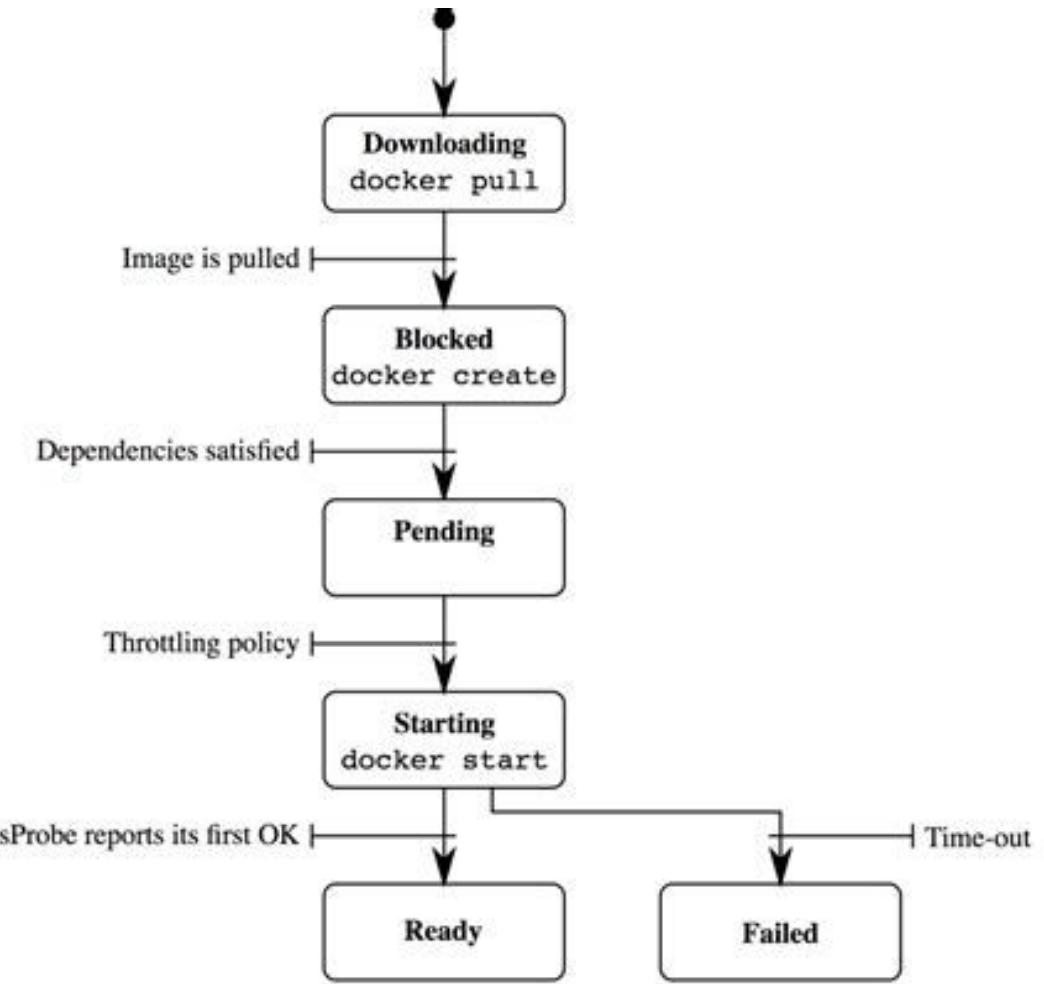
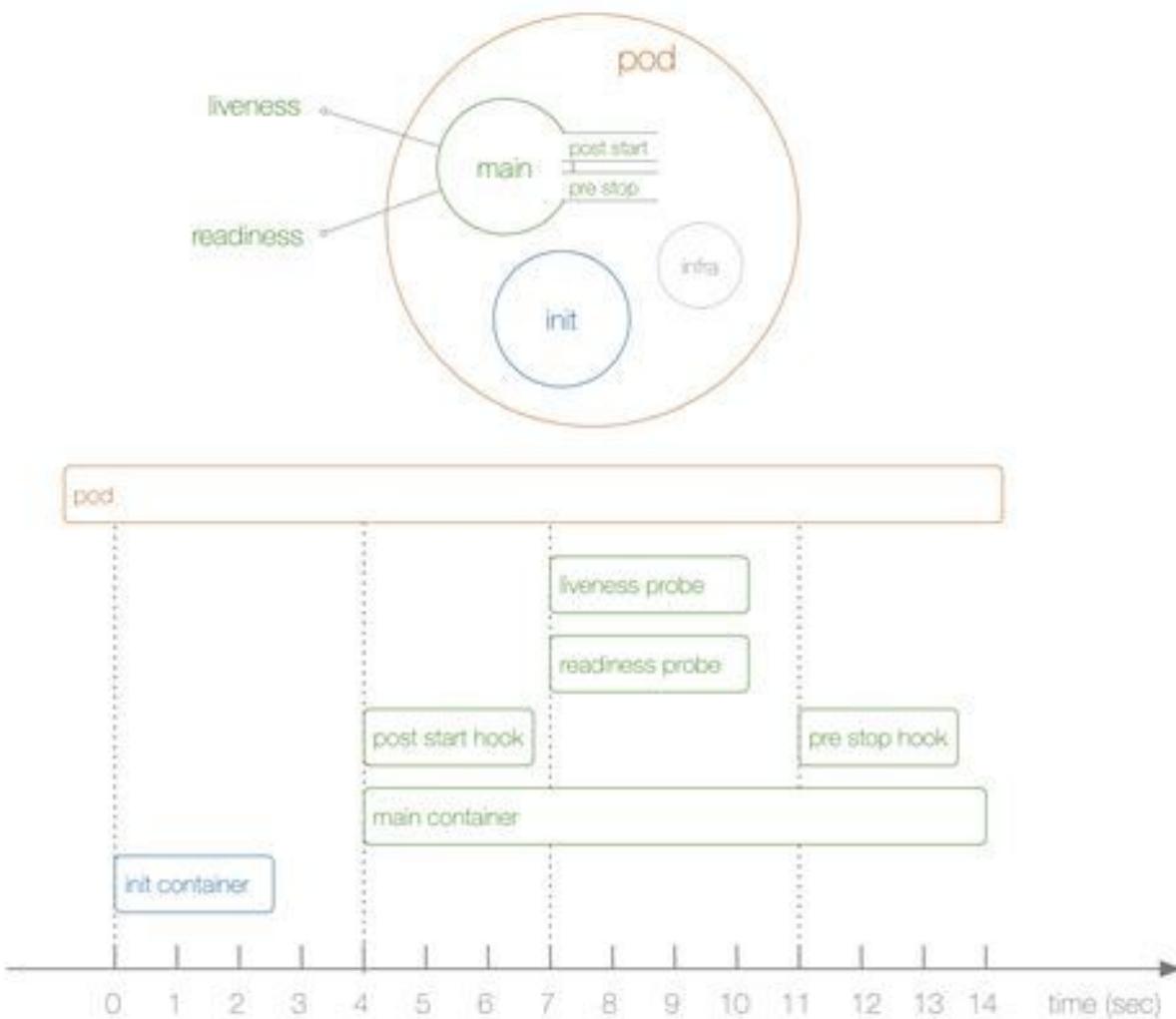


# Pod Lifecycle





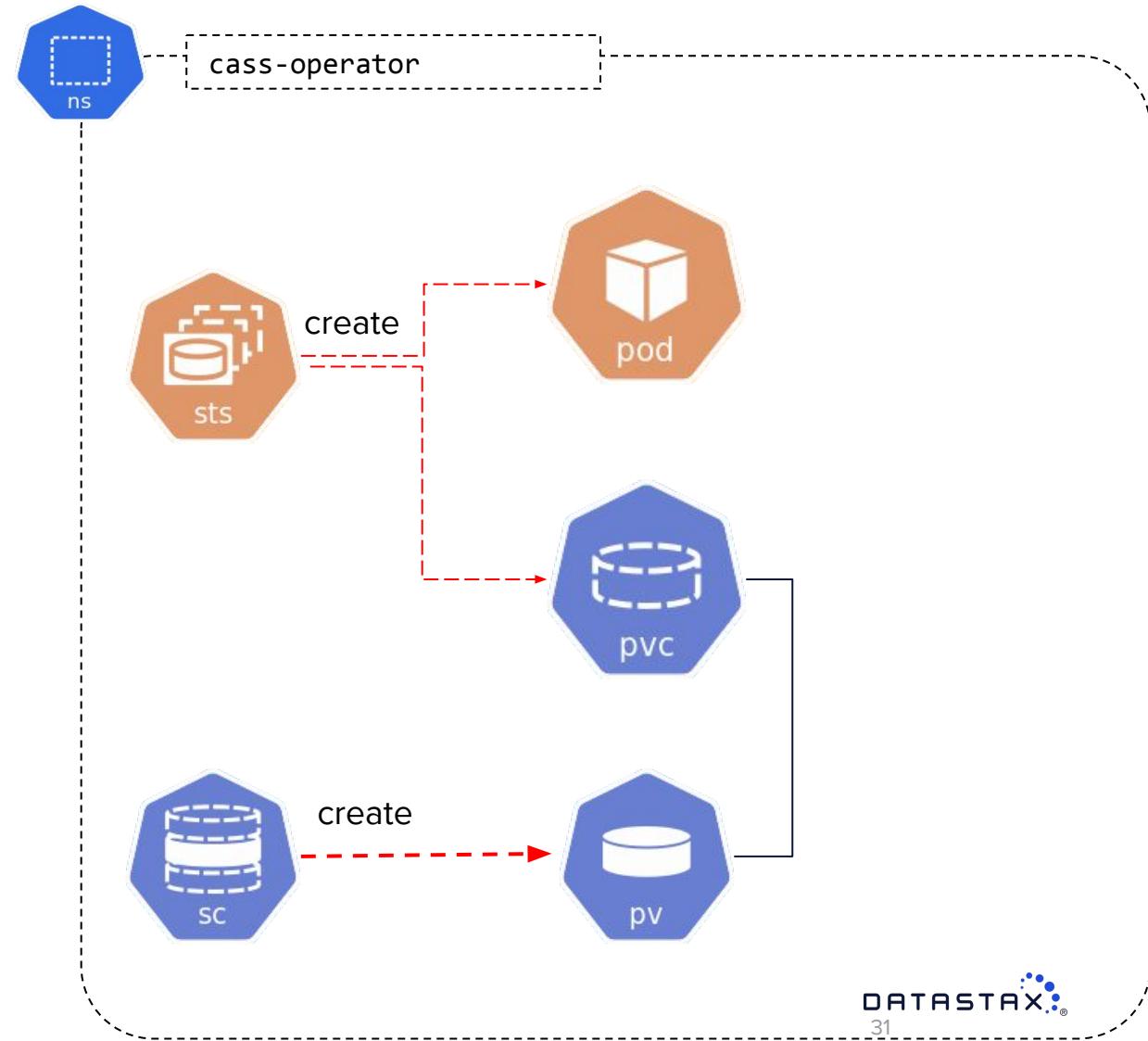
# Pod Lifecycle



# K8s Primitives : StatefulSet



**StatefulSet:** StatefulSet represents a set of pods with consistent identities. Identities are defined as: network, storage.



# K8s Primitives : Service



**Ingress** is a collection of rules that allow inbound connections to reach the endpoints defined by a backend.



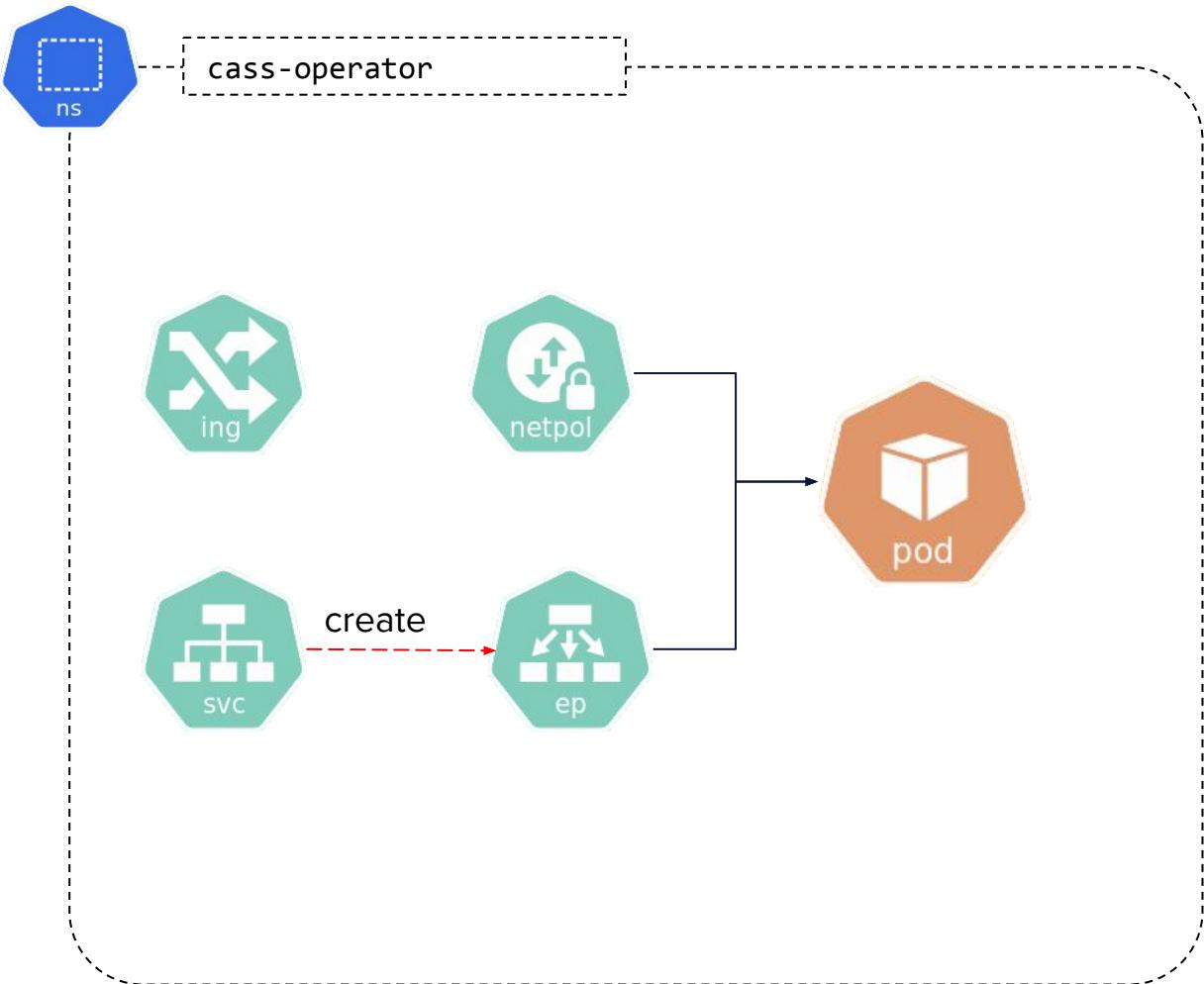
**Service** is a named abstraction of software service with ports to listen on and selector to determine which pods will answer requests.



**EndPoint** is a collection of endpoints that implement the actual service..



**NetworkPolicy**: Describes what network traffic is allowed for a set of Pods.



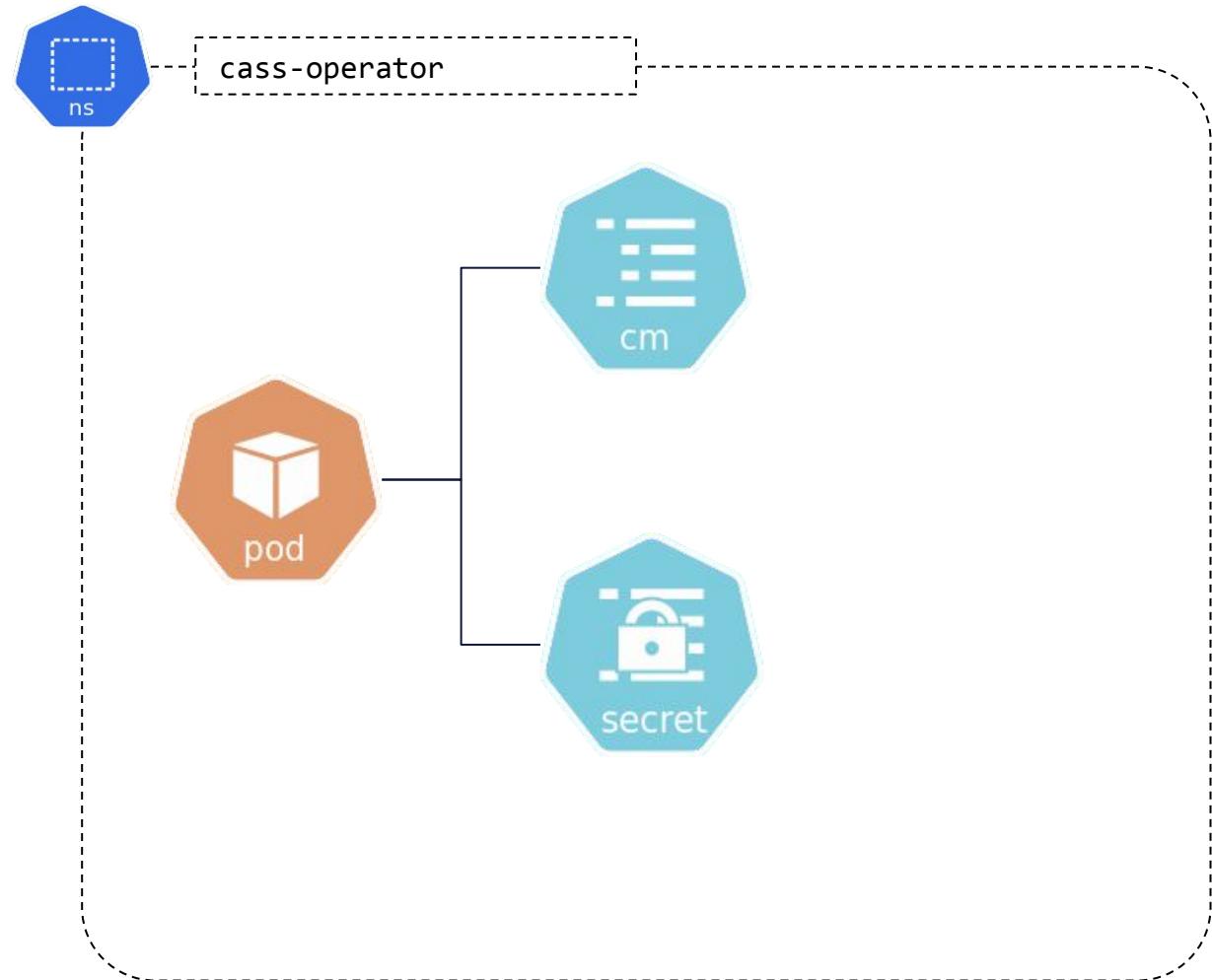
# K8s Primitives : Configuration



**ConfigMap:** ConfigMap holds configuration data for pods to consume..



**Secret:** Secret holds secret data of a certain type..



# K8s Primitives : Custom Resources



**Custom Resource Definition :**  
Extensions of the Kubernetes API.  
Customization making K8s more modular

- **Spec** declares the desired state of a resource
  - **Configuration settings** provided by the user
  - **Default values** expanded by the system
  - **Other properties** initialized by other internal components after resource creation.
- **Status** : describes the object's current, observed state.
  - Kubernetes API server provides a REST API to clients. A Kubernetes object or resource is a REST resource.
  - The status of a Kubernetes resource is typically implemented as a **REST subresource** that can only be modified by internal, system components

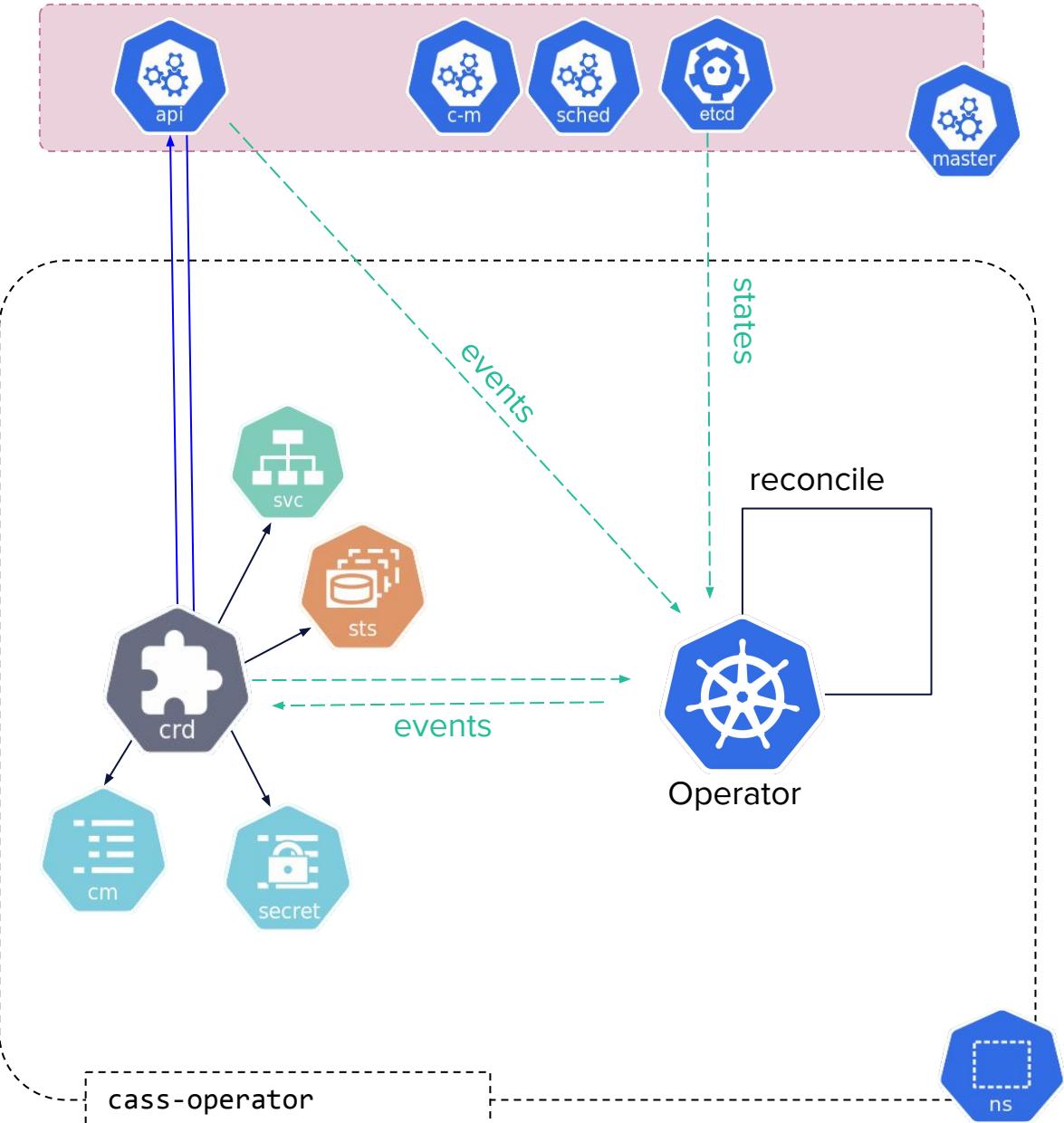
```
apiVersion: apiextensions.k8s.io/v1
kind: CustomResourceDefinition
metadata:
  name: crontabs.stable.example.com
spec:
  # group name to use for REST API: /apis/<group>/<version>
  group: stable.example.com
  # list of versions supported by this CustomResourceDefinition
  versions:
    - name: v1
      # Each version can be enabled/disabled by Served flag.
      served: true
      # One and only one version must be marked as the storage version.
      storage: true
      schema:
        openAPIV3Schema:
          type: object
          properties:
            spec:
              type: object
              properties:
                cronSpec:
                  type: string
                image:
                  type: string
                replicas:
                  type: integer
                  # either Namespaced or Cluster
                scope: Namespaced
                names:
                [...]
```

# K8s Primitives : Operator

**Building** an application and driving an application on top of Kubernetes, behind Kubernetes APIs

*A Kubernetes Operator helps extend the types of applications that can run on Kubernetes by allowing developers to provide additional knowledge to applications that need to maintain state.” —Jonathan S. Katz*

- **Reconcile** CRD instances which states defined within the “**spec**” attribute.
- **Listen events** and **status evolution** to react accordingly.



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# 47 90 51



Kubernetes Quiz Time! - 6 questions



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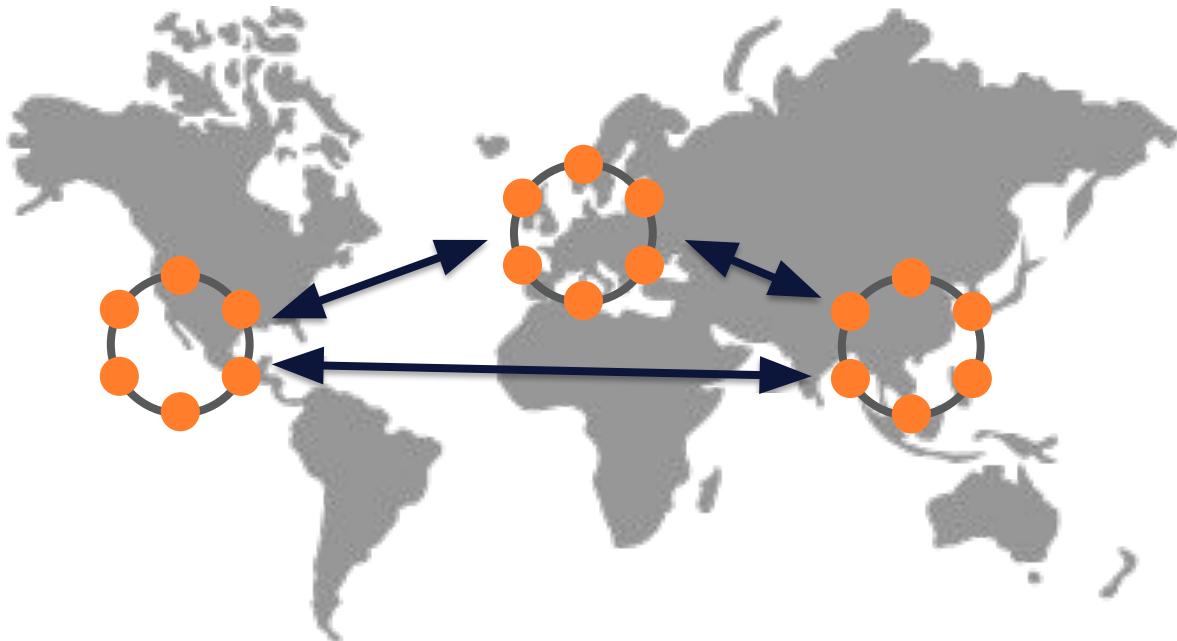
6

Resources

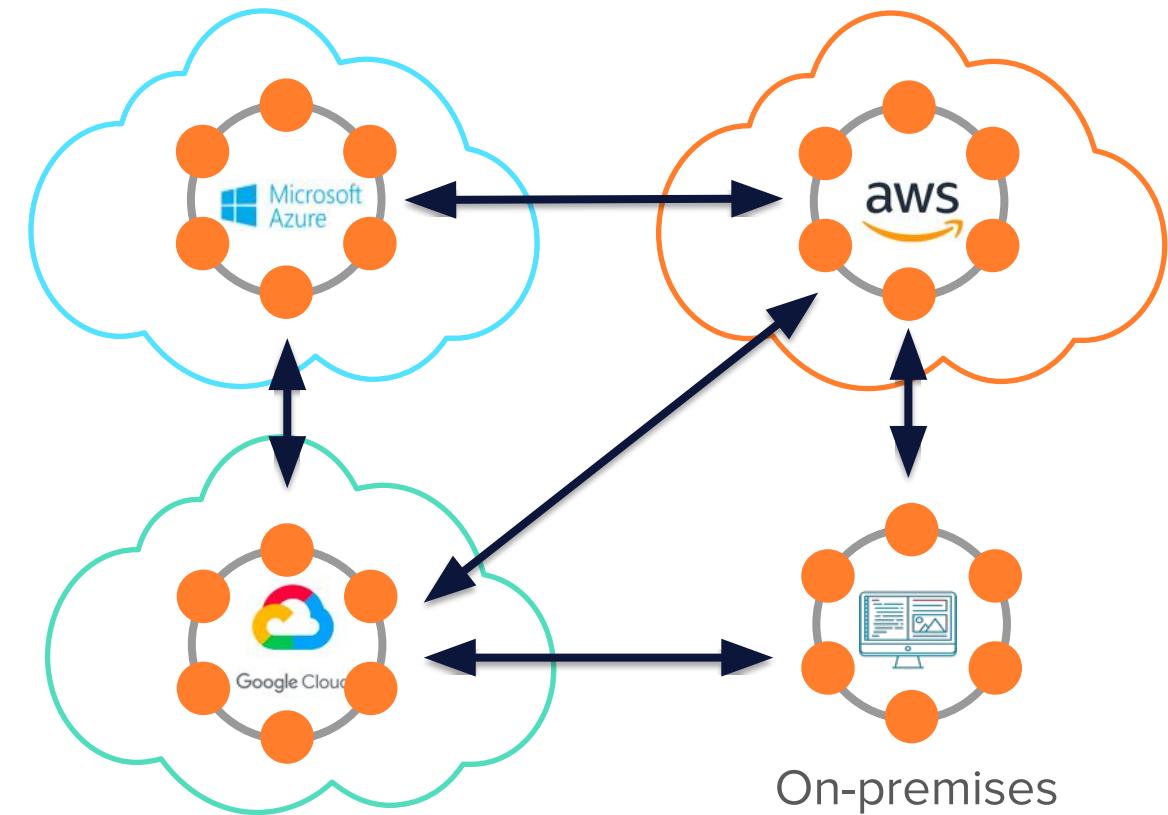
# Apache Cassandra™ is a NoSQL Distributed Database



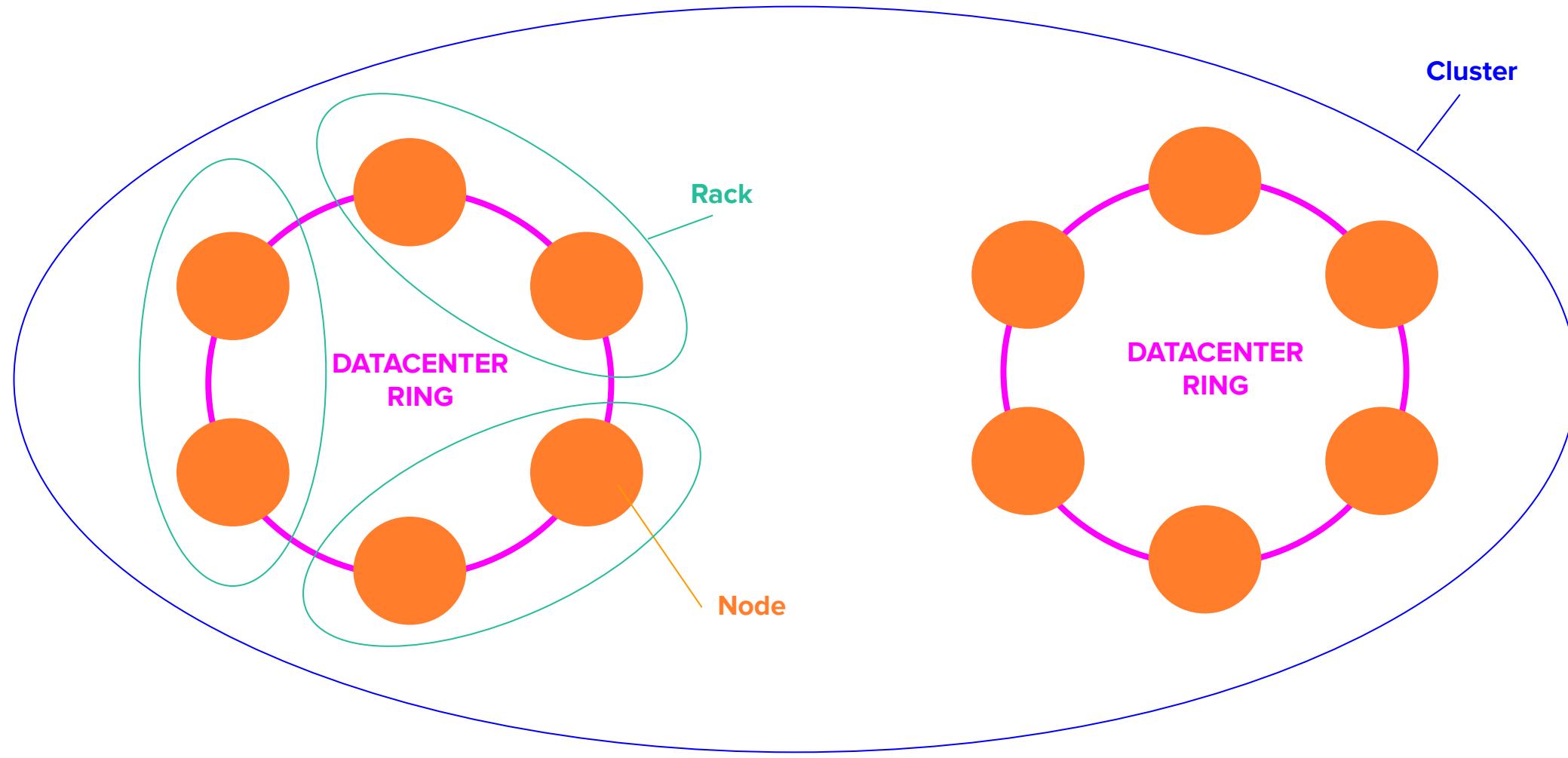
Geographic Distribution



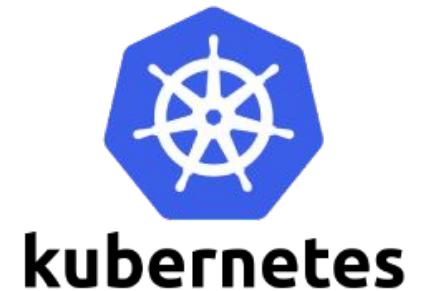
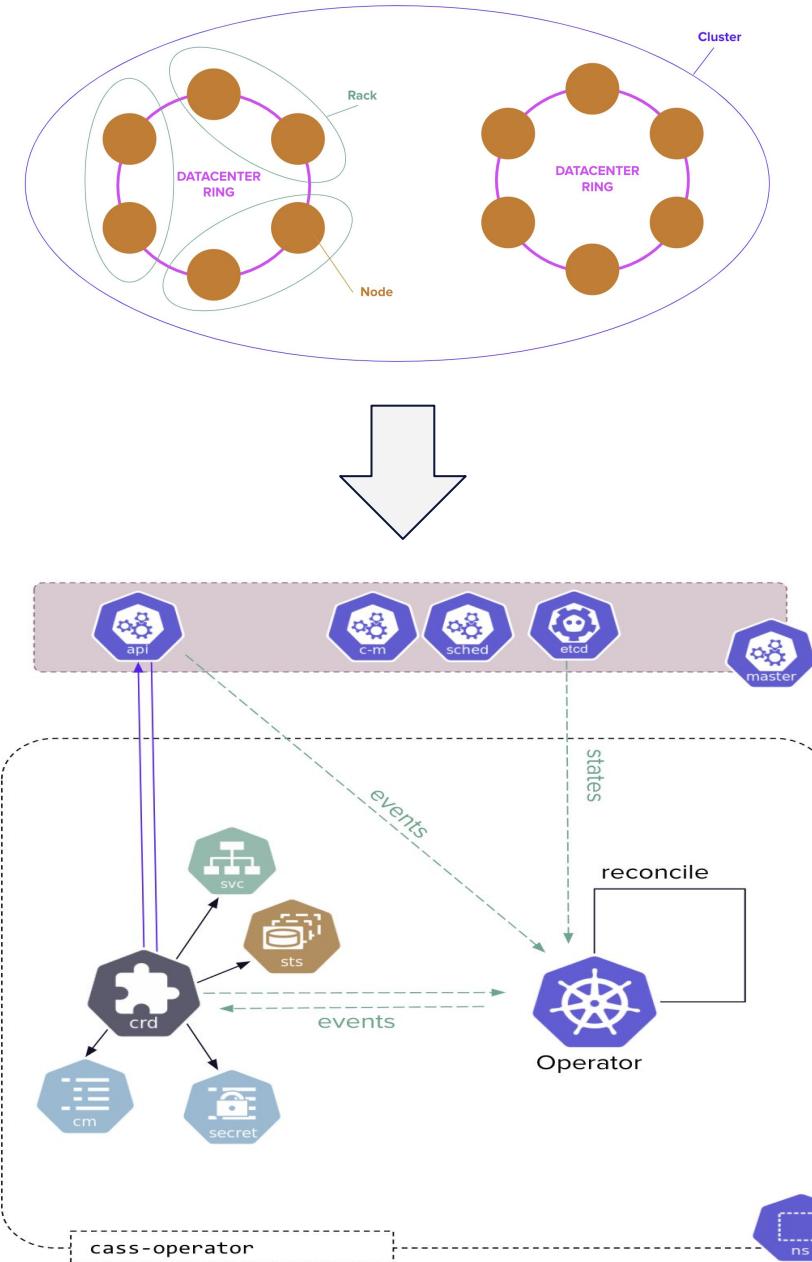
Hybrid-Cloud and Multi-Cloud



# Apache Cassandra™ Vocabulary



# YOUR MISSION SHOULD YOU CHOOSE TO ACCEPT IT



# Cass Operator : Features

- Proper token **ring initialization**, with only one node bootstrapping at a time
- **Seed node** management -
  - one per rack, or three per datacenter, whichever is more
- Server configuration integrated into the **CassandraDatacenter CRD**
  - Rolling reboot nodes by changing the CRD
  - Store data in a rack-safe way - one replica per cloud AZ
  - Scale up racks evenly with new nodes
  - Replace dead/unrecoverable nodes
- Multi DC clusters (limited to one Kubernetes namespace)

# Online Workshops



## Section #2 : Cass Operator

<https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/1-cassandra/README.MD>

### 2. Create a single node cluster

Apply this file via `kubectl` and watch the list of pods as the operator deploys them. Completing a deployment may take several minutes per node.

#### 2a. Create the cluster

```
kubectl -n cass-operator apply -f ./1-cassandra/12-cassandra-cluster-1nodes.yaml
```

#### 2b. Watch progression

```
watch kubectl -n cass-operator get pod
```

#### Expected output

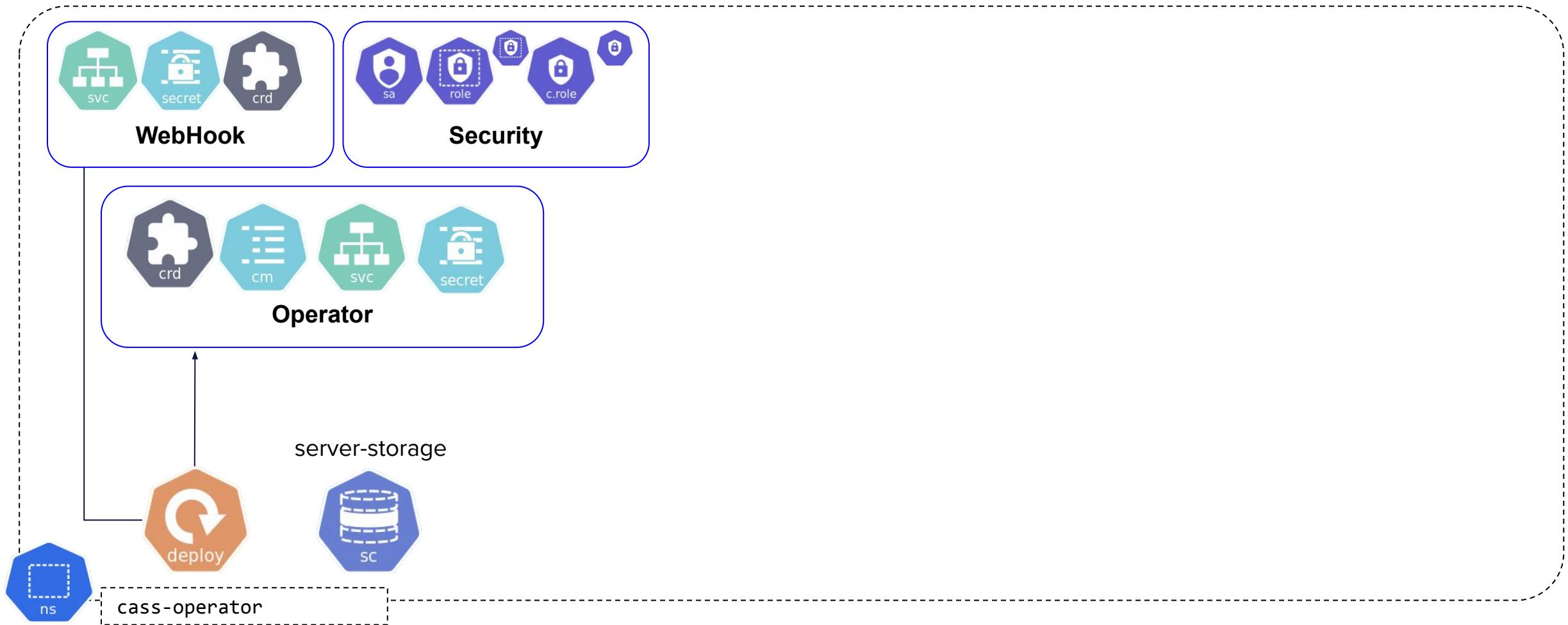
NAME	READY	STATUS	RESTARTS	AGE
cass-operator-657cb5c695-q9psl	1/1	Running	0	5m22s
cluster1-dc1-default-sts-0	1/2	Running	0	50s

#### 2c. Execute the command to describe the datacenter

```
kubectl -n cass-operator describe cassdc dc1
```

#### Expected output

# Installing the Cass Operator Manifest



YAML :

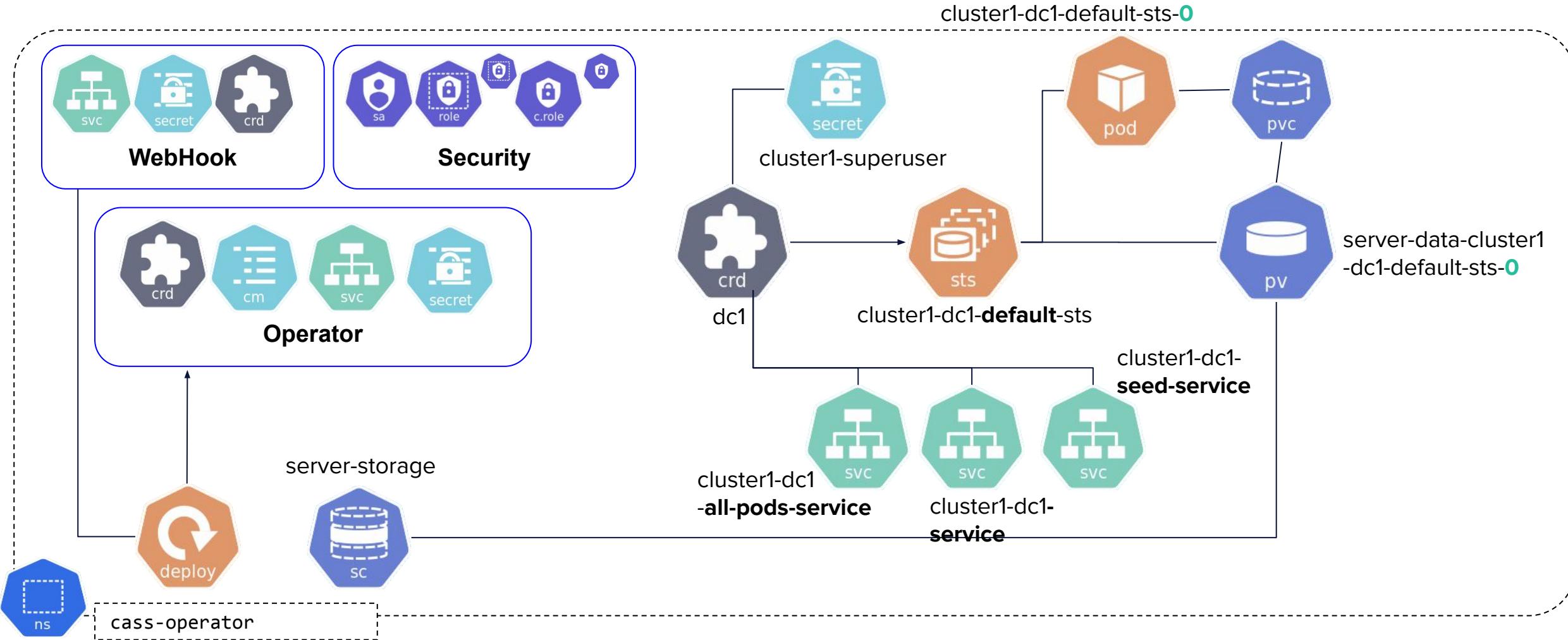
<https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/1-cassandra/11-install-cass-operator-v1.1.yaml>

# CRD CassandraDataCenter

```
apiVersion: cassandra.datastax.com/v1beta1
kind: CassandraDatacenter
metadata:
  name: dc1
spec:
  clusterName: cluster1
  serverType: cassandra
  serverVersion: "3.11.6"
  managementApiAuth:
    insecure: {}
  size: 1
  storageConfig:
    cassandraDataVolumeClaimSpec:
      storageClassName: server-storage
      accessModes:
        - ReadWriteOnce
    resources:
      requests:
        storage: 5Gi
config:
  cassandra-yaml:
    authenticator: org.apache.cassandra.auth.PasswordAuthenticator
    authorizer: org.apache.cassandra.auth.CassandraAuthorizer
    role_manager: org.apache.cassandra.auth.CassandraRoleManager
  jvm-options:
    initial_heap_size: "800M"
    max_heap_size: "800M"
```

```
apiVersion: cassandra.datastax.com/v1beta1
kind: CassandraDatacenter
metadata:
  name: multi-rack
spec:
  clusterName: multi-rack
  serverType: cassandra
  serverVersion: 3.11.6
  managementApiAuth:
    insecure: {}
  size: 9
  racks:
    - name: us-east1-b
      zone: us-east1-b
    - name: us-east1-c
      zone: us-east1-c
    - name: us-east1-d
      zone: us-east1-d
  storageConfig:
    cassandraDataVolumeClaimSpec:
      storageClassName: standard
      accessModes:
        - ReadWriteOnce
    resources:
      requests:
        storage: 5Gi
```

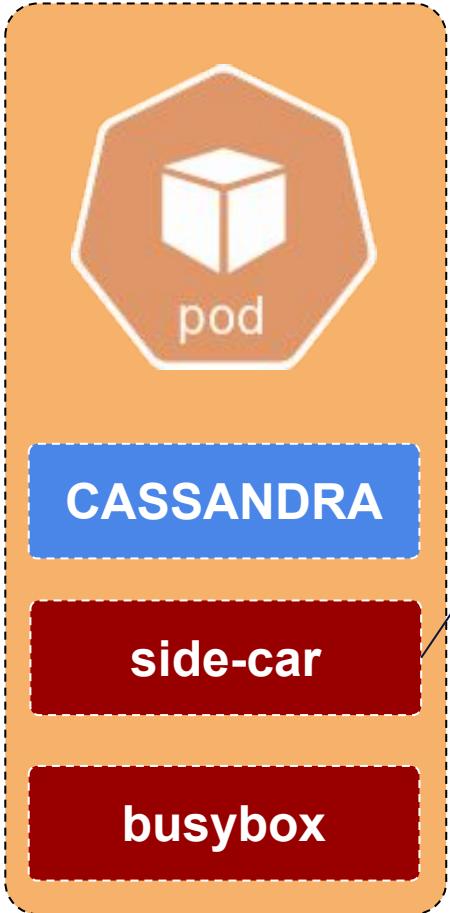
# Creating DataCenter dc1



YAML :

<https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/1-cassandra/11-install-cassandra-operator-v1.1.yaml>

# Our Pods



## Cassandra Management API Service

<https://github.com/datastax/management-api-for-apache-cassandra>

### Management API for Apache Cassandra 0.1 OAS3

<https://raw.githubusercontent.com/datastax/management-api-for-apache-cassandra/master/management-api-server/doc/openapi.json>

This is a Restful service for operating Apache Cassandra. You can find out more about the Management API on [Github](#)

Apache 2.0

#### default

`POST /api/v0/ops/auth/role` Creates a new user role

`GET /api/v0/probes/liveness` Indicates whether this service is running

`GET /api/v0/probes/readiness` Indicates whether the Cassandra service is ready to service requests

`GET /api/v0/probes/cluster` Indicated whether the Cassandra cluster is able to achieve the specified consistency

`POST /api/v0/ops/seeds/reload`

`POST /api/v0/ops/keyspace/refresh` Load newly placed SSTables to the system without restart

`POST /api/v0/ops/keyspace/cleanup` Triggers the immediate cleanup of keys no longer belonging to a node. By default, clean all keyspaces

`POST /api/v0/lifecycle/start`

`POST /api/v0/lifecycle/stop`

`POST /api/v0/lifecycle/configure`

`GET /api/v0/lifecycle/pid`

`GET /api/v0/metadata/versions/release` Returns the Cassandra release version

`GET /api/v0/metadata/endpoints` Returns this nodes view of the endpoint states of nodes

`POST /api/v0/ops/node/drain` Drain the node (stop accepting writes and flush all tables)

# Cassandra Management API SideCar

<https://petstore.swagger.io/>

<https://raw.githubusercontent.com/datastax/management-api-for-apache-cassandra/master/management-api-server/doc/openapi.json>

<https://github.com/datastax/management-api-for-apache-cassandra>

The Management API is a sidecar service layer that attempts to build a well supported set of operational actions on Cassandra® nodes that can be administered centrally. It currently works with official Apache Cassandra® 3.11.x and 4.0 via a drop in java agent.

- Lifecycle Management
  - Start Node
  - Stop Node
- Configuration Management (alpha)
  - Change YAML
  - Change jvm-opts
- Health Checks
  - Kubernetes liveness/readiness checks
  - Consistency level checks
- Per node actions
  - All nodetool commands

**Management API for Apache Cassandra** 0.1 OAS3

<https://raw.githubusercontent.com/datastax/management-api-for-apache-cassandra/master/management-api-server/doc/openapi.json>

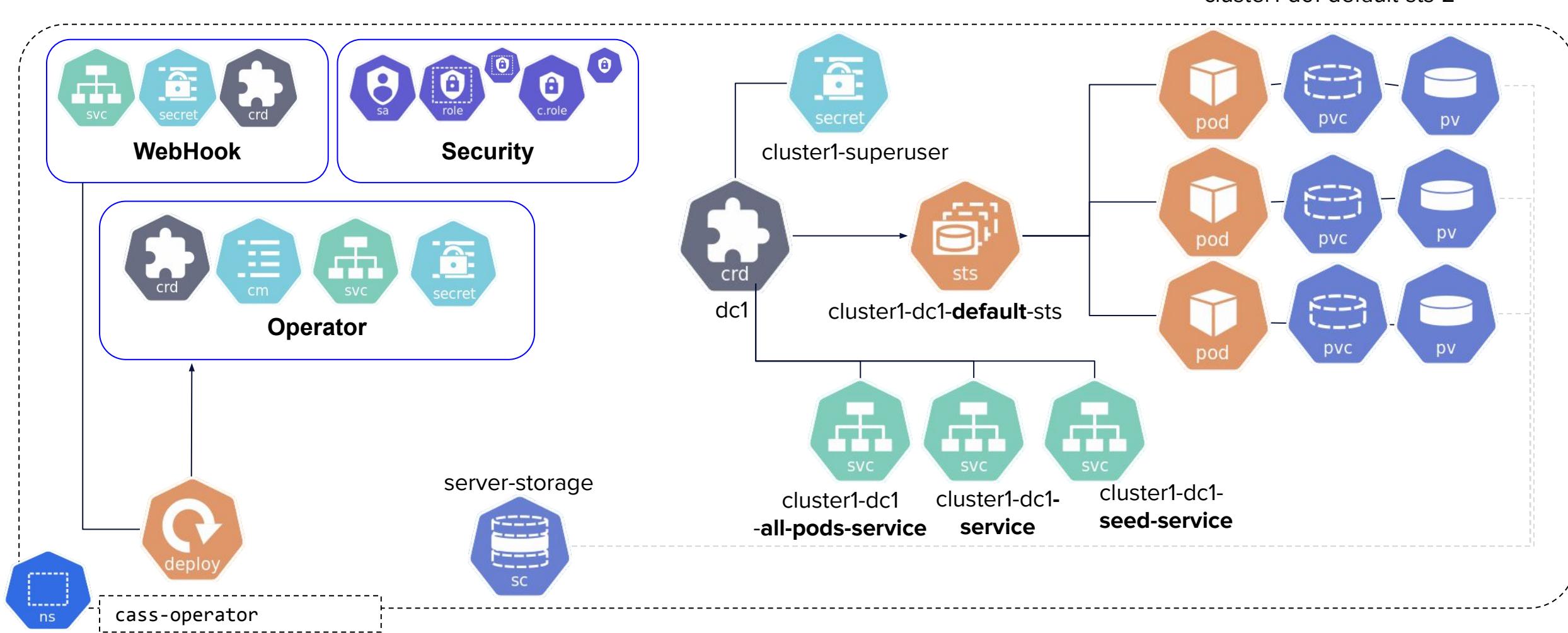
This is a Restful service for operating Apache Cassandra. You can find out more about the Management API on [Github](#)

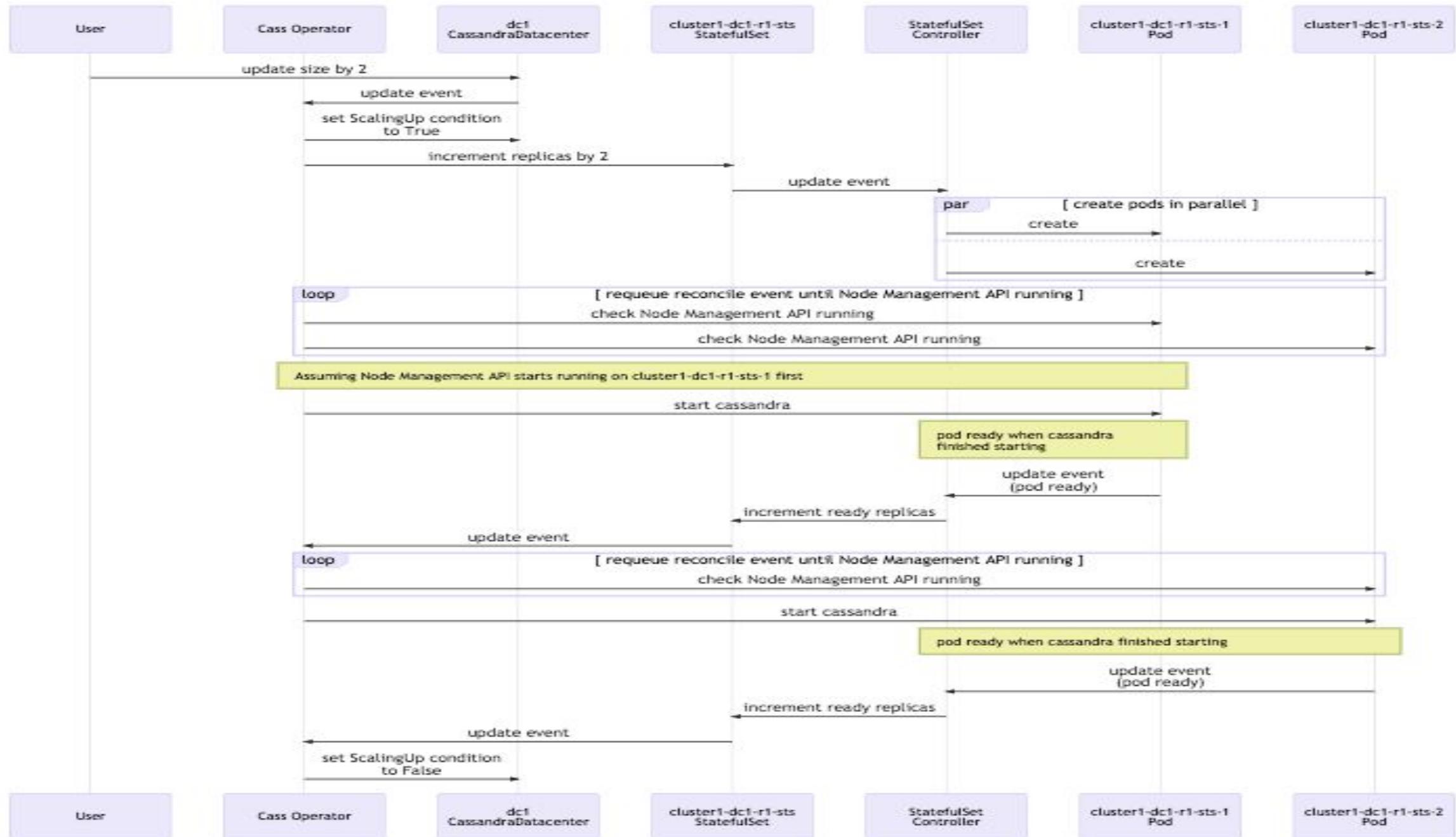
Apache 2.0

default

Method	Path	Description
POST	/api/v0/ops/auth/role	Creates a new user role
GET	/api/v0/probes/liveness	Indicates whether this service is running
GET	/api/v0/probes/readiness	Indicates whether the Cassandra service is ready to service requests
GET	/api/v0/probes/cluster	Indicated whether the Cassandra cluster is able to achieve the specified consistency
POST	/api/v0/ops/seeds/reload	
POST	/api/v0/ops/keyspace/refresh	Load newly placed SSTables to the system without restart
POST	/api/v0/ops/keyspace/cleanup	Triggers the immediate cleanup of keys no longer belonging to a node. By default, clean all keyspaces
POST	/api/v0/lifecycle/start	
POST	/api/v0/lifecycle/stop	
POST	/api/v0/lifecycle/configure	
GET	/api/v0/lifecycle/pid	
GET	/api/v0/metadata/versions/release	Returns the Cassandra release version
GET	/api/v0/metadata/endpoints	Returns this nodes view of the endpoint states of nodes
POST	/api/v0/ops/node/drain	Drain the node (stop accepting writes and flush all tables)

# Scale up DataCenter dc1





# Apache Cassandra™ with Kubernetes

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Housekeeping and Quizz

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Kubernetes Basics

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# Online Workshops



## Section #3 : Dashboard

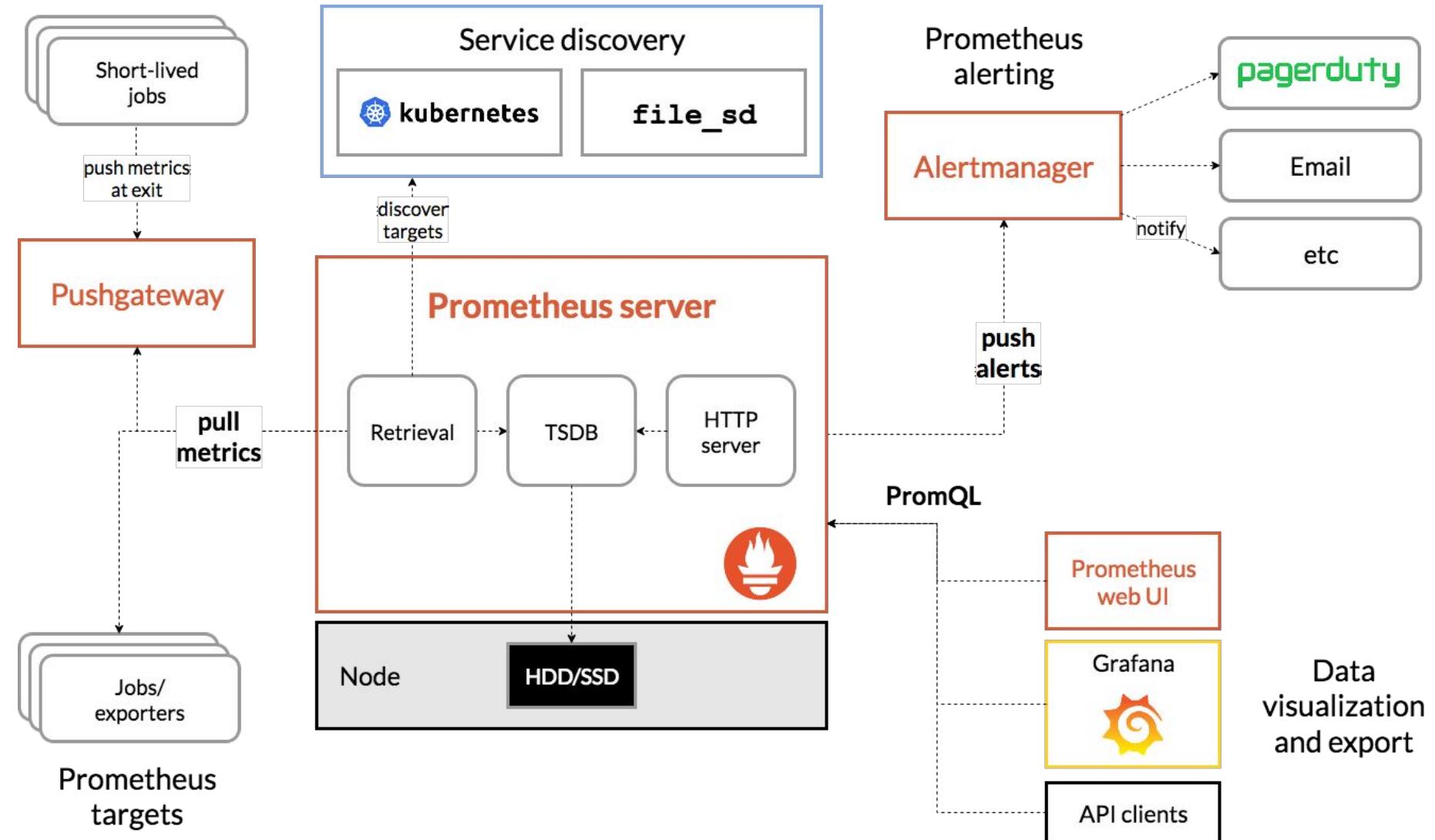
<https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/2-dashboard/README.MD>

The screenshot shows a Kubernetes dashboard interface. On the left, a sidebar lists various cluster components: Cluster, Cluster Roles, Namespaces, Nodes, Persistent Volumes, Storage Classes, and several sections under Workloads (Cron Jobs, Daemon Sets, Deployments, Jobs, Pods, Replica Sets, Replication Controllers, Stateful Sets), Discovery and Load Balancing (Ingresses, Services), Config and Storage (Config Maps, Persistent Volume Claims, Secrets), and Custom Resource Definitions. The main area is titled 'Overview' and contains a 'Workloads' section with four green circular icons labeled 'Deployments', 'Pods', 'Replica Sets', and 'Stateful Sets'. Below this is a 'Deployments' table with one entry for 'cassandra-operator'. The 'Pods' section shows three pods named 'cluster1-dct1-default-sts-0', 'cluster1-dct1-default-sts-1', and 'cluster1-dct1-default-sts-2', all running on 'kind-cassandra-worker3' and 'kind-cassandra-worker4' with 0 restarts and 13 minutes of age. A status bar at the bottom right indicates '1 - 1 of 1' and shows navigation icons.

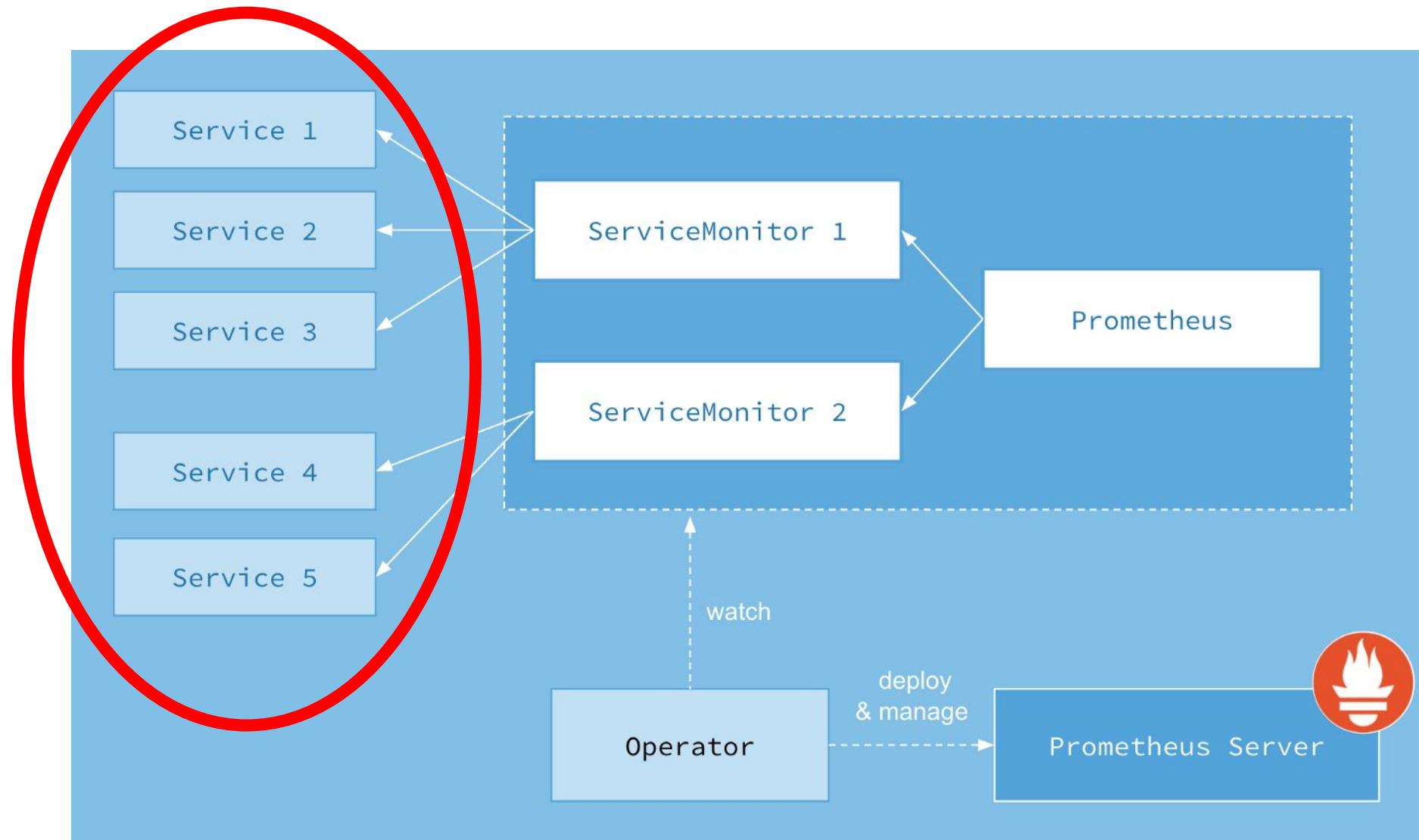
Name	Labels	Pods	Age	Images
cassandra-operator	-	1 / 1	an hour	datastax/cassandra:1.1.0

Name	Labels	Node	Status	Restarts	CPU Usage (cores)	Memory Usage (bytes)	Age
cluster1-dct1-default-sts-0	app.kubernetes.io/managed-by: cassandra-operator	kind-cassandra-worker3	Running	0	-	-	13 minutes
cluster1-dct1-default-sts-1	app.kubernetes.io/managed-by: cassandra-operator	kind-cassandra-worker4	Running	0	-	-	13 minutes
cluster1-dct1-default-sts-2	app.kubernetes.io/managed-by: cassandra-operator	kind-cassandra-worker2	Running	0	-	-	14 minutes

# Prometheus + Grafana



# Prometheus metrics collection



# Dse Metrics Exporter

## Reference Documentation

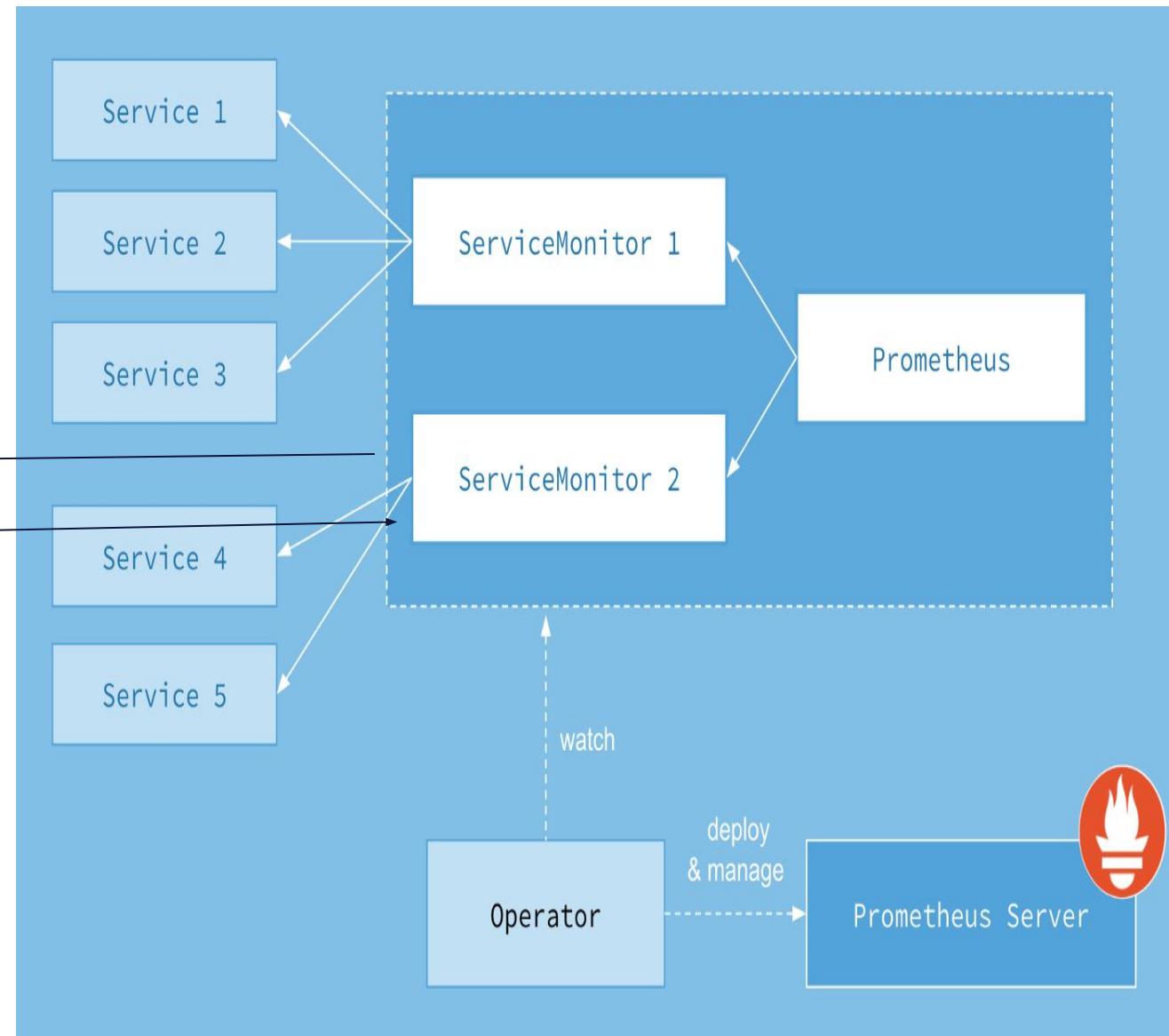
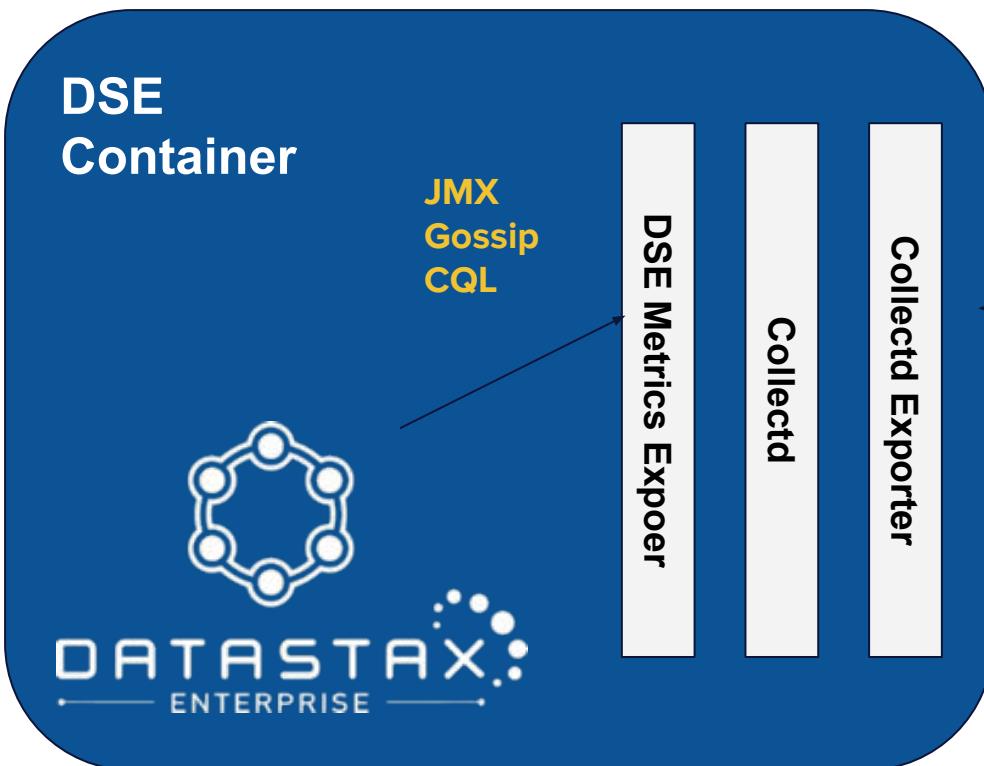
[https://docs.datastax.com/en/dse/6.7/dse-dev/datastax\\_enterprise/tools/metricsCollector/mcIntroduction.html](https://docs.datastax.com/en/dse/6.7/dse-dev/datastax_enterprise/tools/metricsCollector/mcIntroduction.html)

- DSE Metrics Collector aggregates DataStax Enterprise (DSE) metrics and integrates with existing monitoring solutions to facilitate problem resolution and remediation.
- **DSE Metrics Collector is built on [collectd](#)**, a popular, well-supported, open source metric collection agent. With [over 90 plugins](#), you can tailor the solution to collect metrics most important to your organization.
- When DSE Metrics Collector is enabled, DSE sends metrics and other structured events to DSE Metrics Collector.

[`/etc/dse/collectd.conf tmpl`](#)

```
LoadPlugin load
LoadPlugin memory
LoadPlugin swap
LoadPlugin uptime
LoadPlugin processes
LoadPlugin tcpconns
```

# All Together



# Online Workshops



## Section #4 : Grafana Prometheus

[https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/3-prometheus\\_grafana/README.MD](https://github.com/DataStax-Academy/kubernetes-workshop-online/blob/master/3-prometheus_grafana/README.MD)



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# Developer Resources

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Join [community.datastax.com](https://community.datastax.com)  
Ask/answer community user questions - share your expertise

**SUBSCRIBE !**

Follow us @DataStaxDevs  
We are on Twitter - Youtube - Twitch!

Slides and code for this course are available at  
<https://academy.datastax.com/resources/cassandra-developer-workshop>

**REVIEW**

Accelerate  
<https://www.datastax.com/accelerate/why-tomorrows-cassandra-deployments-will-be-on-kubernetes>



# Training Courses at DataStax Academy

- Free self-paced DSE 6 courses
  - [DS201: DataStax Enterprise 6 Foundations of Apache Cassandra™](#)
  - [DS210: DataStax Enterprise 6 Operations with Apache Cassandra™](#)
  - [DS220: DataStax Enterprise 6 Practical Application Data Modeling with Apache Cassandra™](#)
  - [DS330: DataStax Enterprise 6 Graph](#)
  - [DS332: DataStax Enterprise 6 Graph Analytics \(NEW\)](#)



# Cassandra The Definitive Guide

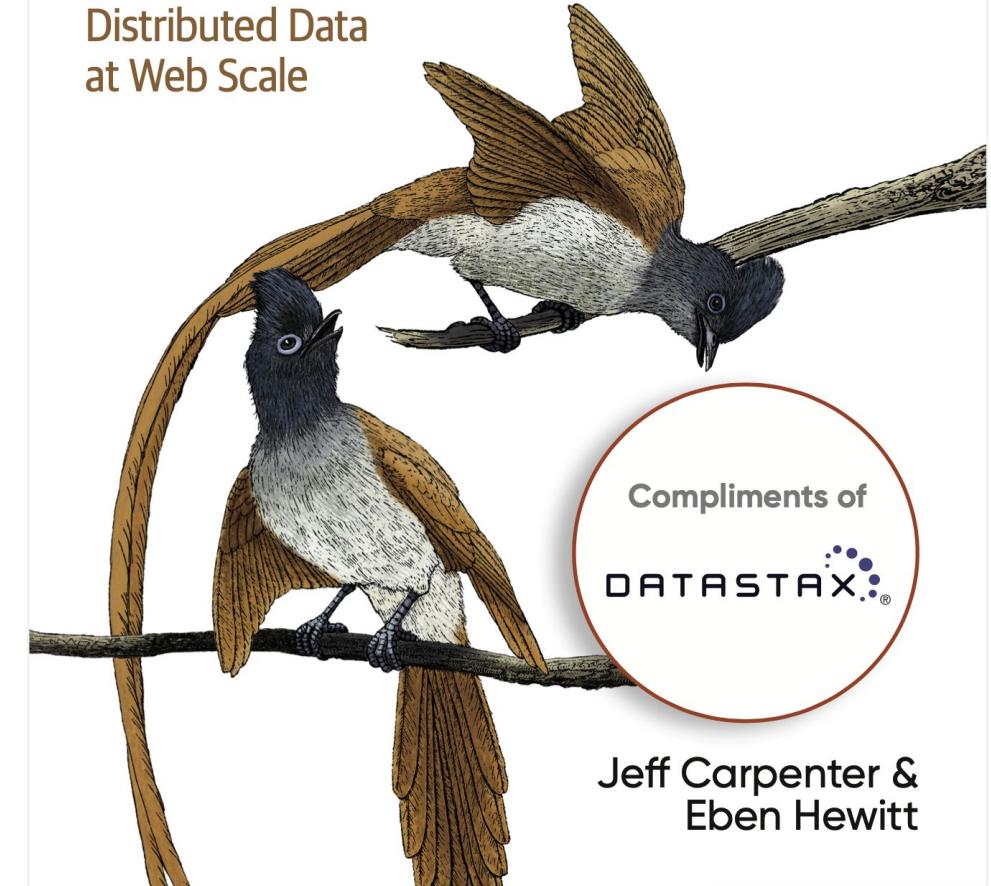
<https://www.datastax.com/resources/ebook/oreilly-cassandra-definitive-guide>

O'REILLY®

Third  
Edition

# Cassandra The Definitive Guide

Distributed Data  
at Web Scale



Jeff Carpenter &  
Eben Hewitt

# Upcoming events

Date	Time	Content	Type
5/18	12pm IST	Cassandra Developer Workshop	WORKSHOP = HANDS-ON
5/19	12EDT	Accelerate Kubernetes Panel	Questions to Panel
5/20	12pm PT	Astra BetterBoz	WORKSHOP = HANDS-ON
5/26	12BST	Cassandra Developer Workshop	WORKSHOP = HANDS-ON
5/27	12pm EDT	OSS Fallout	WORKSHOP = HANDS-ON
6/3	12pm EDT	NoSQLBench : Benchmark Your Data Models	WORKSHOP = HANDS-ON



@DataStaxDevs #DataStaxDeveloperDay

<https://community.datastax.com>



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# What's NEXT ?

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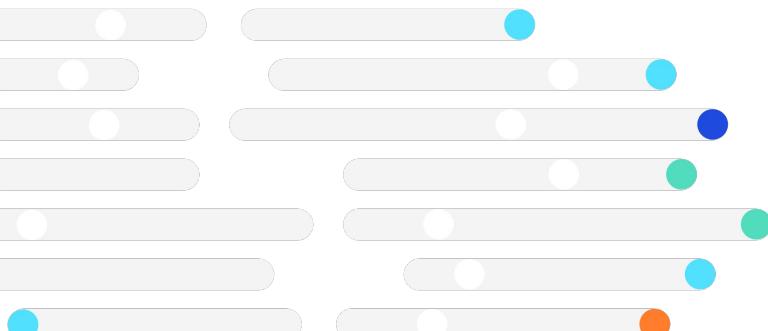
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# 47 90 51



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**Thank you**

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