Exploring Kubernetes

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Agenda

- Introduction to Kubernetes
- Kubernetes Features
- Some basic Concepts
- Understanding Kubernetes Architecture
- Understanding Key Concepts
- Kubelet
- Kubernetes cluster
- etcd
- Services
- Namespaces
- Flannel
- Replication Controller
- Volumes
- Monitoring and much more

Who am I ?

- Open Source Tech Enthusiastic .
- Open Source Contributor.
- Foodie,Traveler.
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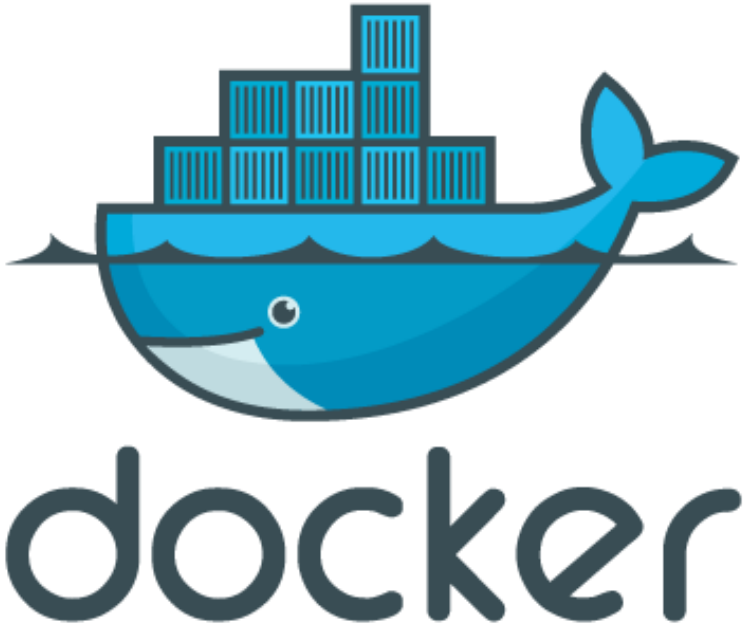
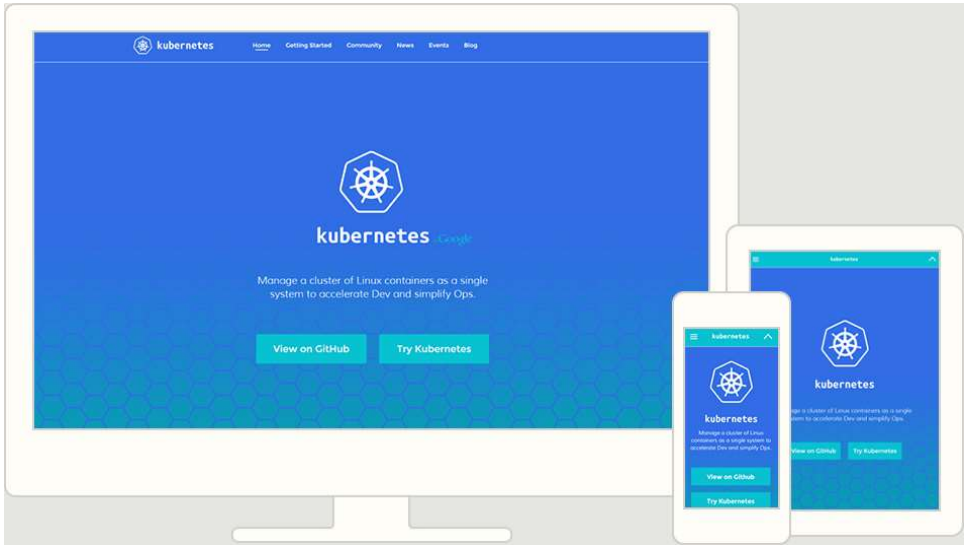
Docker

- Docker is a powerful build for your Linux containers.
- Open platform for developers and sysadmins to build, ship, and run distributed applications.
- Docker enables apps to be quickly assembled from components.
- It eliminates the friction between development, QA, and production environments.



What is it ?

- Introduced and Built By Google Cloud Platform.
- Open Source and Apache 2.0 Licensed.
- Container Orchestrator.
- Monitoring of Endpoints.
- Docker Containers across multiple hosts.
- Inspired and informed by Google’s experiences and internal systems



Google Cloud Platform

Features

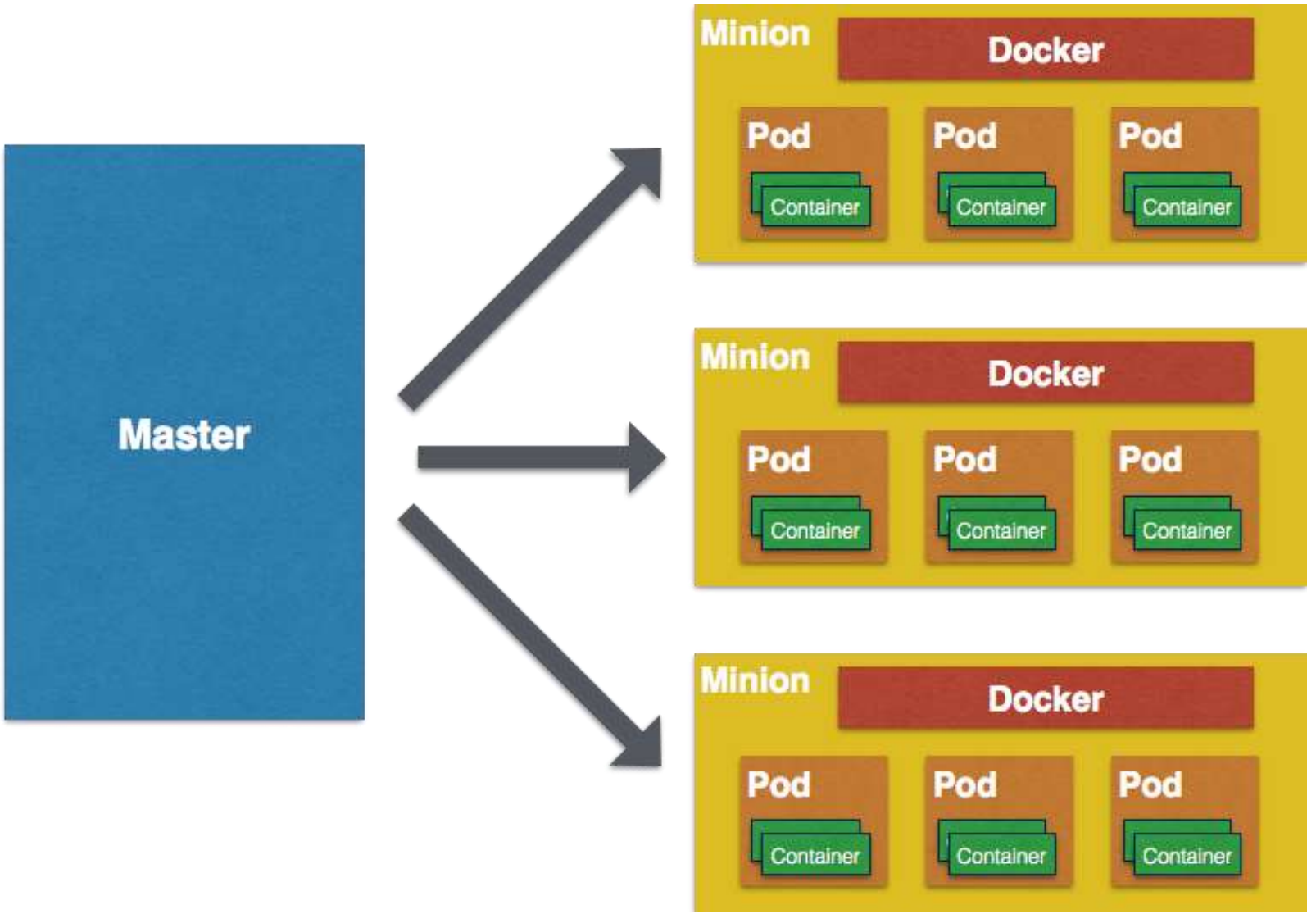
- Auto-restarting, re-scheduling, and replicating containers.
- Supports existing OSS apps.
- Manual/Auto Scaling.
- Manual/Auto Healing.

Google Cloud Platform

Basic Terminologies

- **Pods** are the smallest deployable units that can be created, scheduled, and managed. Its a logical collection of containers that belong to an application.
- **Master** is the central control point that provides a unified view of the cluster. There is a single master node that control multiple minions.
- **Minion** is a worker node that run tasks as delegated by the master. Minions can run one or more pods. It provides an application-specific "virtual host" in a containerized environment.
- **Selector**: A query against labels, producing a set result
- **Controller**: A reconciliation loop that drives current state towards desired state.
- **Service**: A set of pods that work together.

Architecture



Kubelet

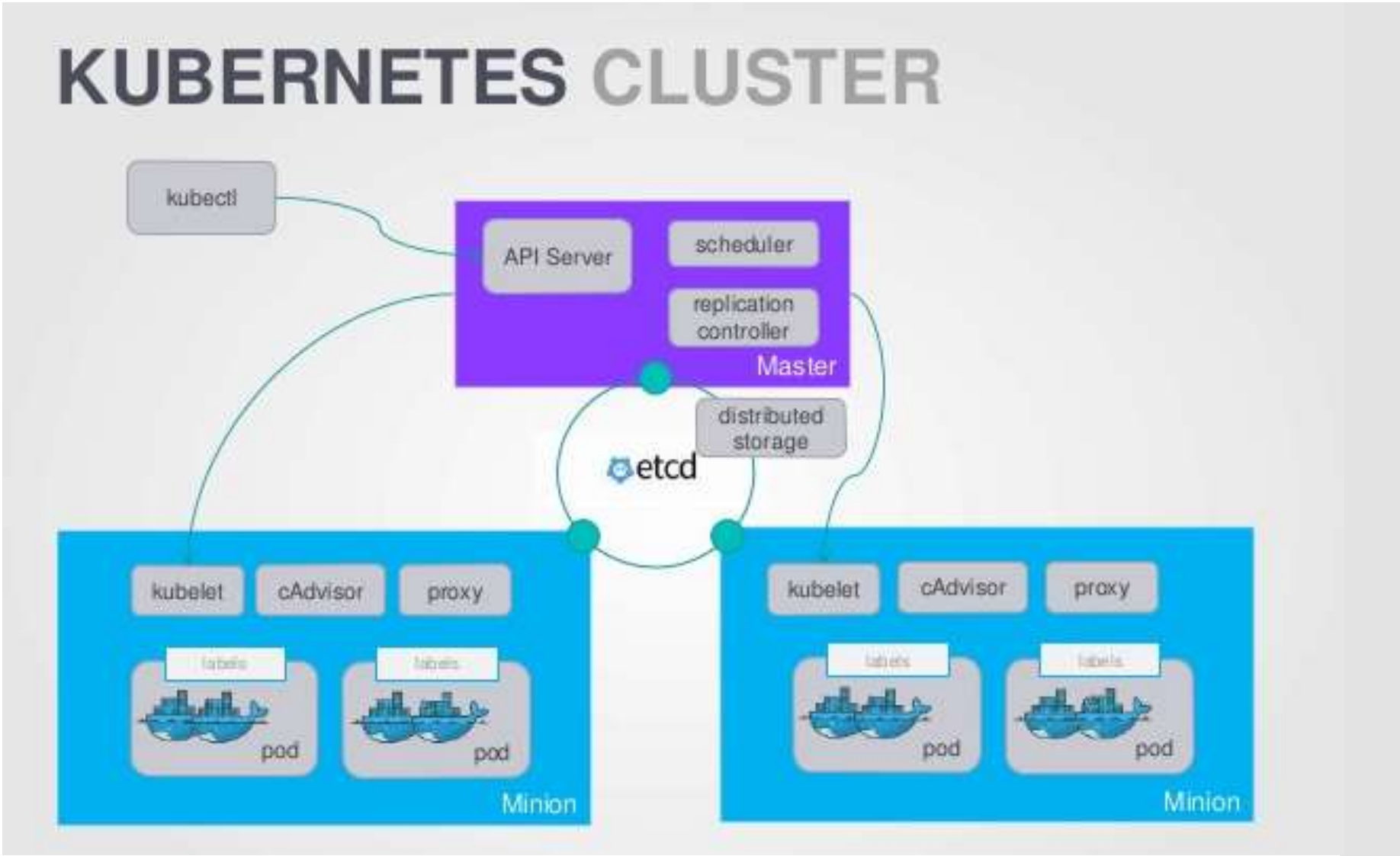
- The primary "node agent" that runs on each node. The kubelet works in terms of a PodSpec.
- PodSpec is a YAML or JSON object that describes a pod
- Kubelet takes a set of PodSpecs that are provided through various mechanisms and ensures that the containers described in those PodSpecs are running and healthy.
- Other than from an PodSpec from the apiserver, there are three ways that a container manifest can be provided to the Kubelet.

File: Path passed as a flag on the command line. This file is rechecked every 20 seconds (configurable with a flag).

HTTP endpoint: HTTP endpoint passed as a parameter on the command line. This endpoint is checked every 20 seconds

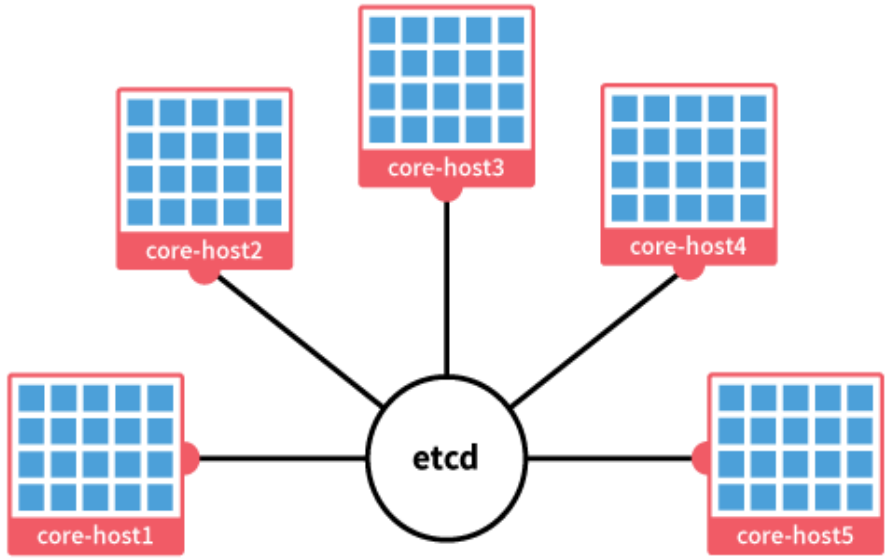
HTTP server: The kubelet can also listen for HTTP and respond to a simple API (underspec'd currently) to submit a new manifest.

Kubernetes Cluster



etcd

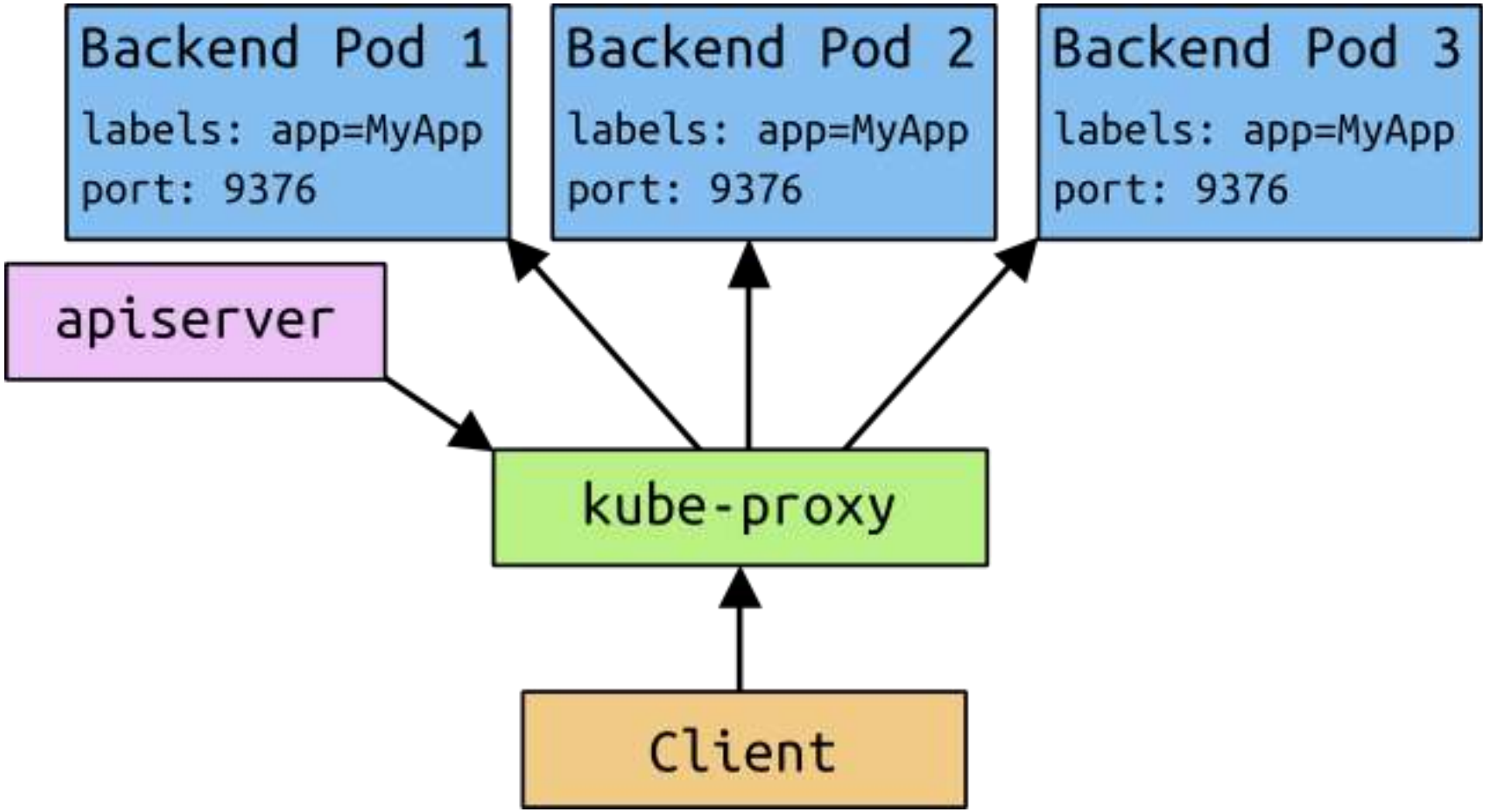
- Etcd is a distributed consistent key-value store for shared configuration and service discovery.
- It is by default built in for kubernetes.
- All cluster data is stored here.



Services

- It is abstraction which defines a logical set of Pods and a policy by which to access them - sometimes called a micro-service.
- Each service is given its own IP address and port which remains constant for the lifetime of the service. So to access the service from inside your application or container you just bind to the IP address and port number for the service.
- A service, through its label selector, can resolve to o or more pods. Over the life of a service, the set of pods which comprise that service can grow, shrink, or turn over completely.

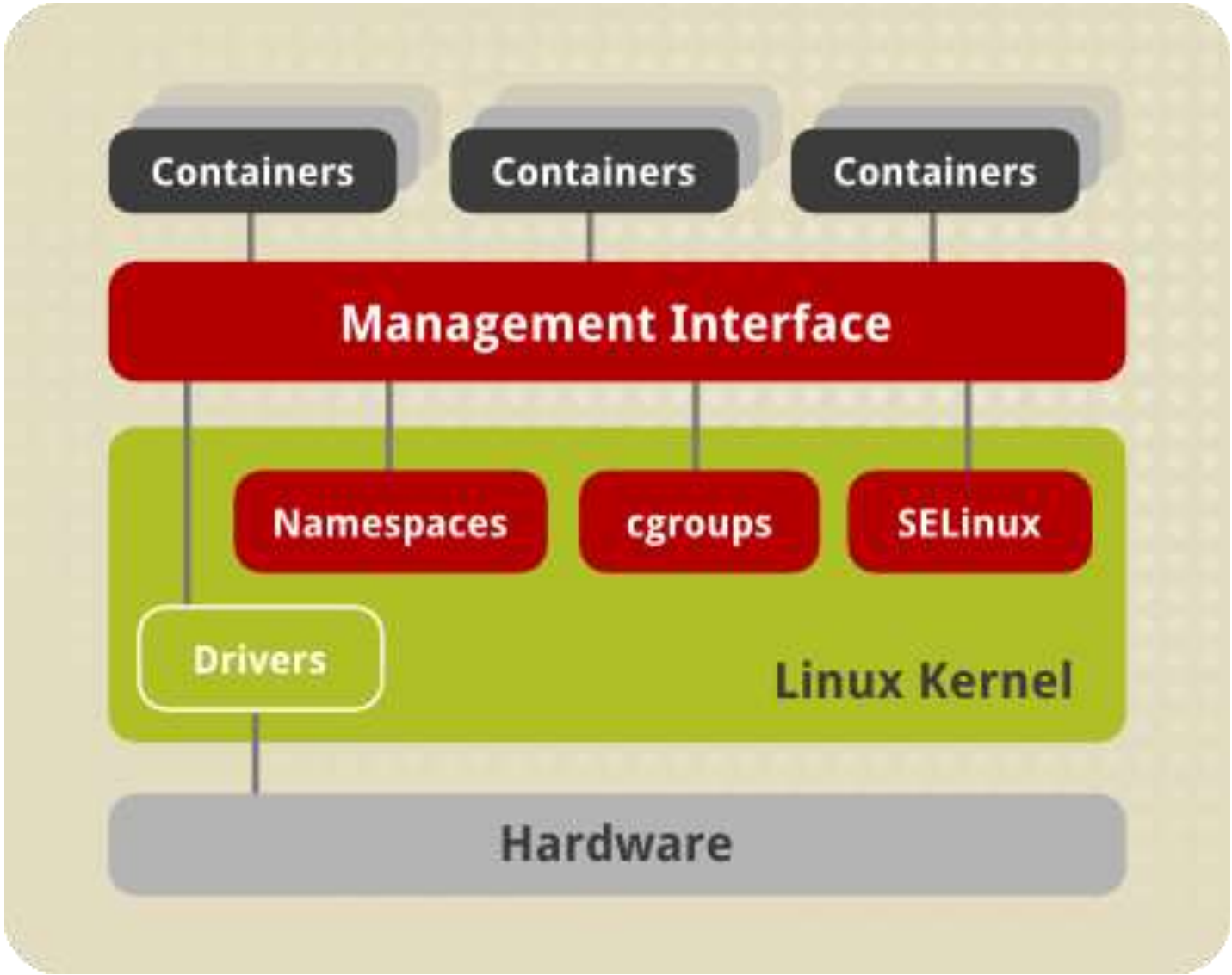
Services



NameSpaces

- It enable you to manage different environments within the same cluster.
- It is abstraction which defines a logical set of Pods and a policy by which to access them - sometimes called a micro-service.
- You can also run different types of server, batch, or other jobs in the same cluster without worrying about them affecting each other.

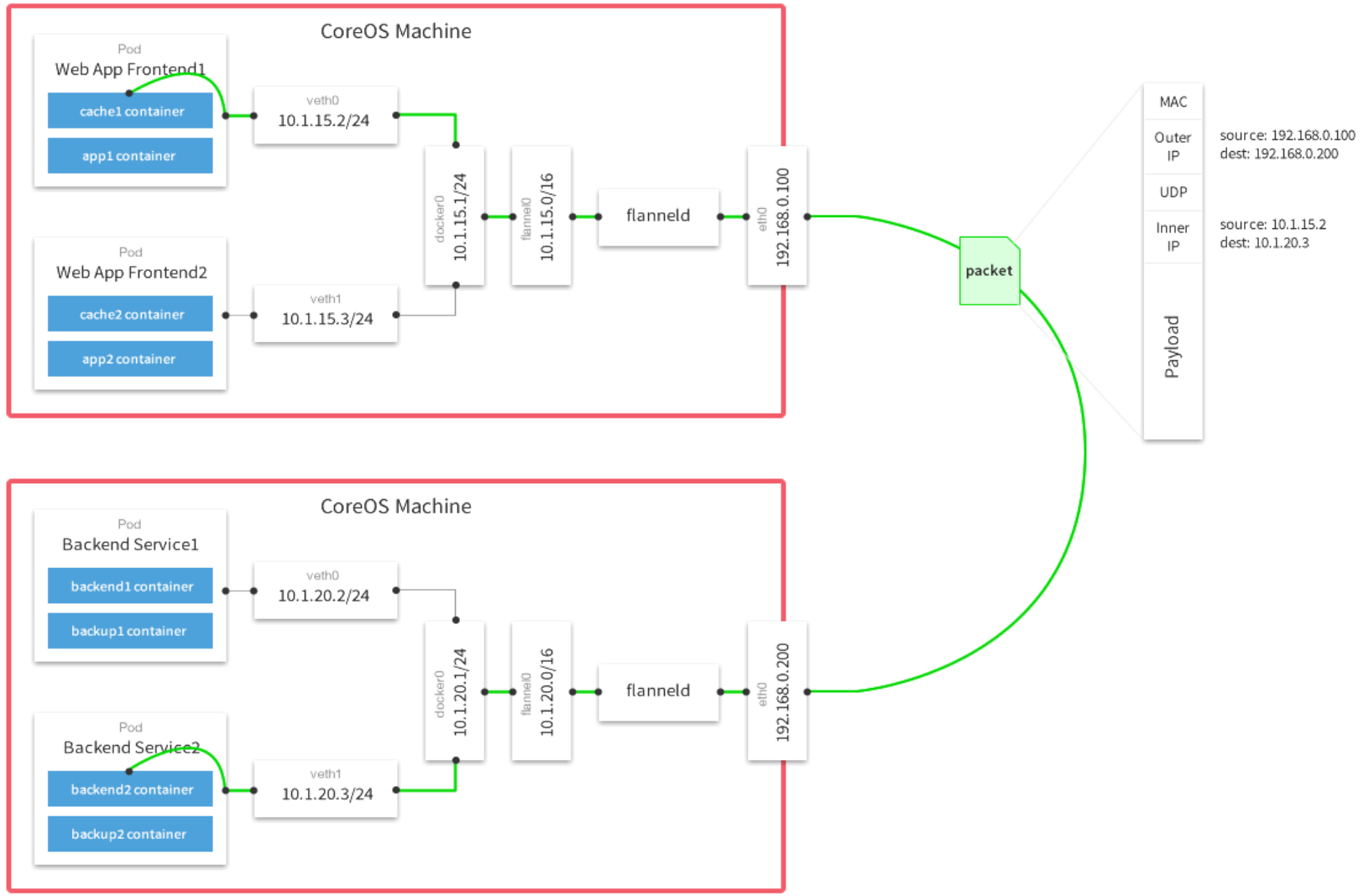
NameSpaces



Flannel

- Formerly known as Rudder.
- Etcd backed network fabric for containers.
- It uses etcd to store the network configuration, allocated subnets, and auxiliary data (such as host's IP).
- The simplest backend is udp and uses a TUN device to encapsulate every IP fragment in a UDP packet.

Flannel - How it works

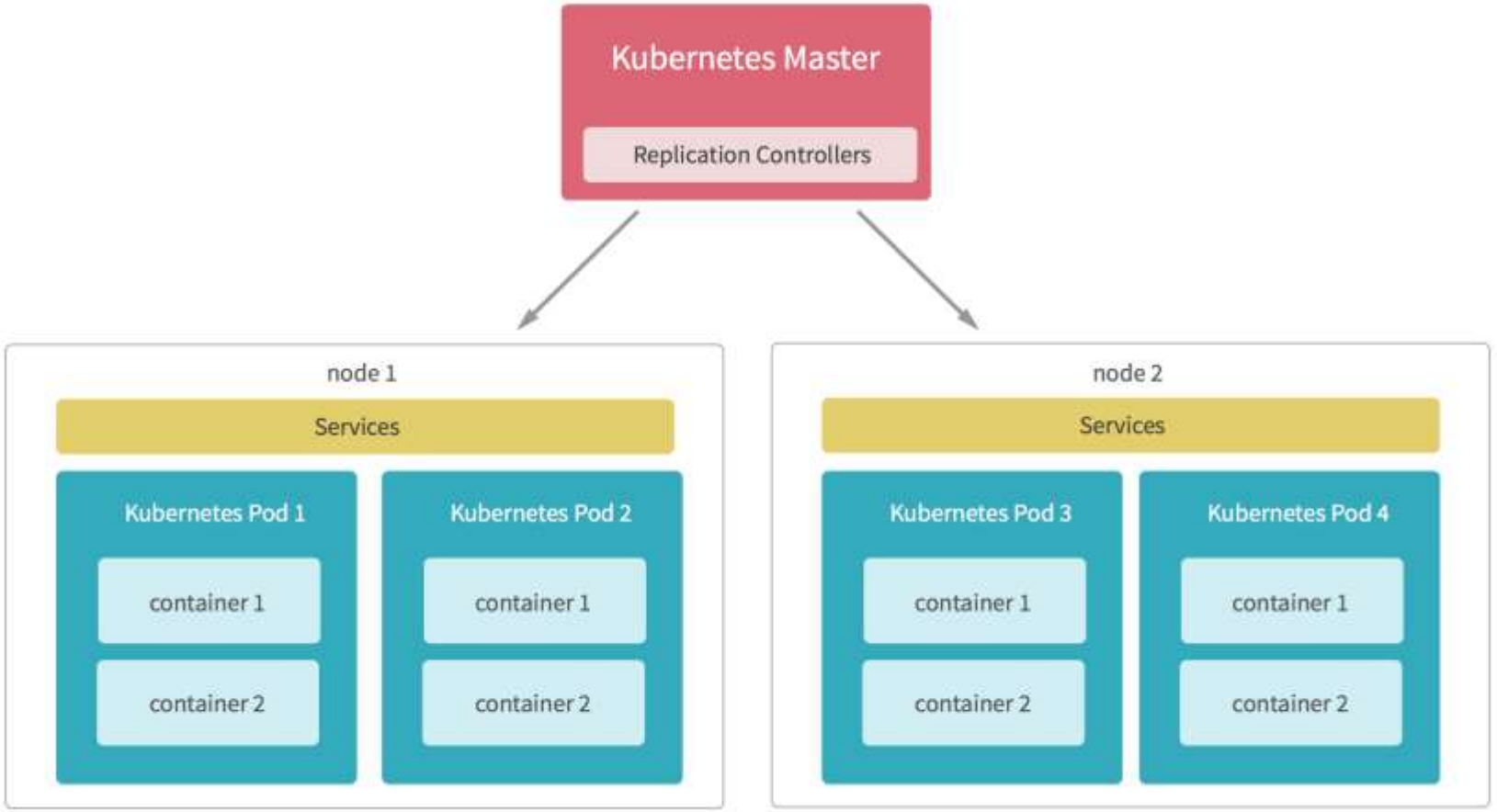


Google Cloud Platform

Replication Counter

- Ensures that a specified number of pod "replicas" are running at any one time.
- If there are too many, the replication controller kills some pods. If there are too few, it starts more.
- Pod Template - Creates new pods from a template.
- Labels - To remove a pod from a replication controller's target set, change the pod's label.
- Deleting a replication controller does not affect the pods it created.

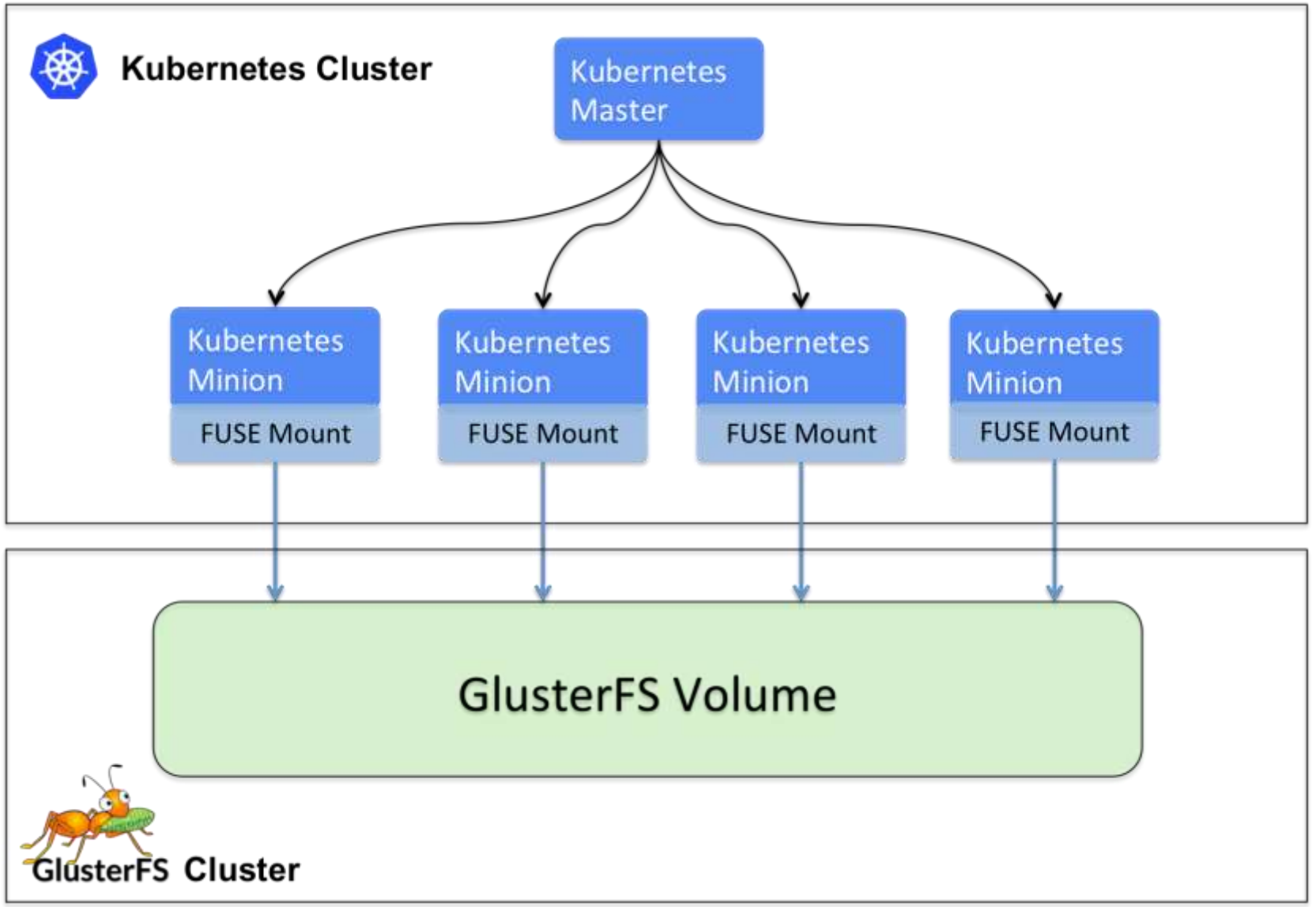
Replication Counter Architecture



Volumes

- Volume is just a directory, possibly with some data in it, which is accessible to the containers in a pod.
- Volumes can not mount onto other volumes or have hard links to other volumes.
- Each container in the Pod must independently specify where to mount each volume.
- Kubernetes supports several types of Volumes:
- EmptyDir,hostPath,gcePersistentDisk,awsElasticBlockStore,nfs,iscsi,glusterfs,rbd,gitRepo,secret,persistentVolumeClaimetc.

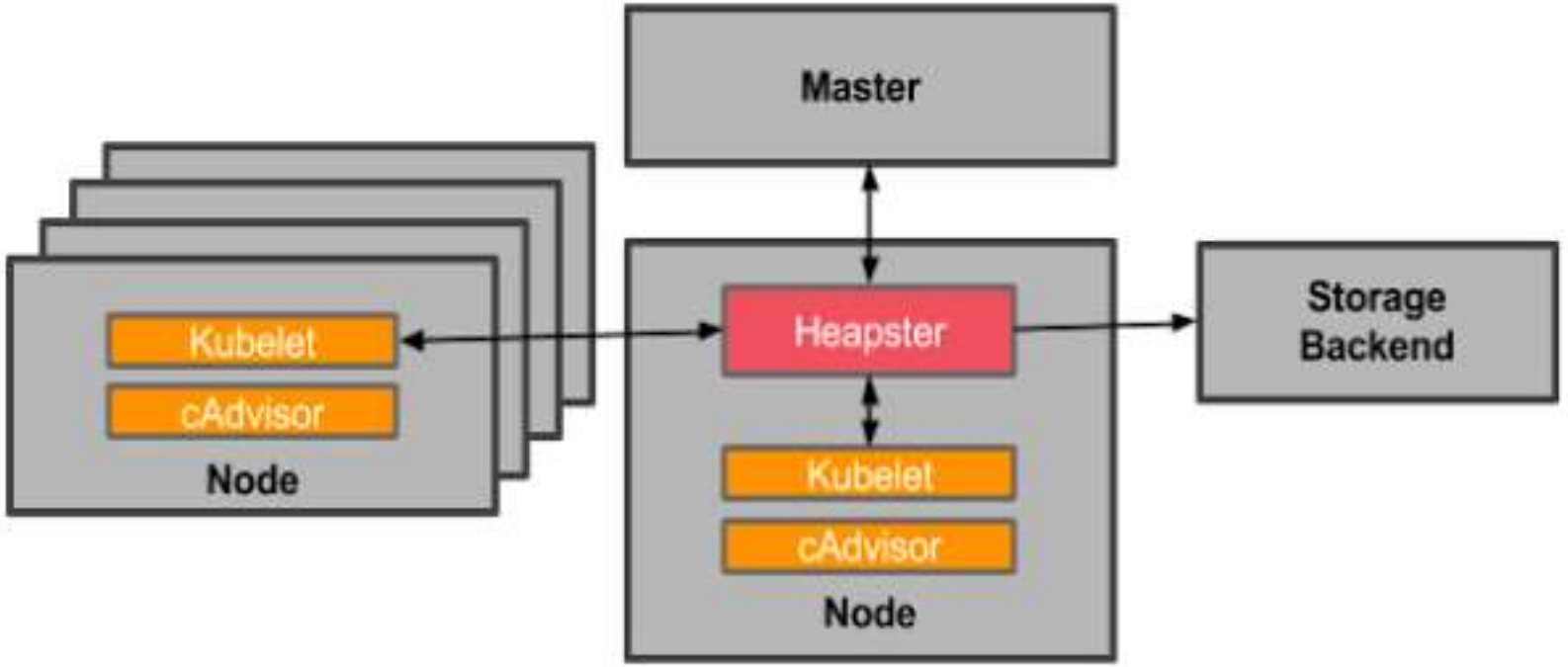
Example: Glusterfs Volume On Kubernetes



Monitoring on CAdvisor

- Optional add-on to Kubernetes clusters.
- cAdvisor is an open source container resource usage and performance analysis agent.
- Heapster is a cluster-wide aggregator of monitoring and event data.
- Kubelet itself fetches the data from cAdvisor.
- Kubelet manages the pods and containers running on a machine.

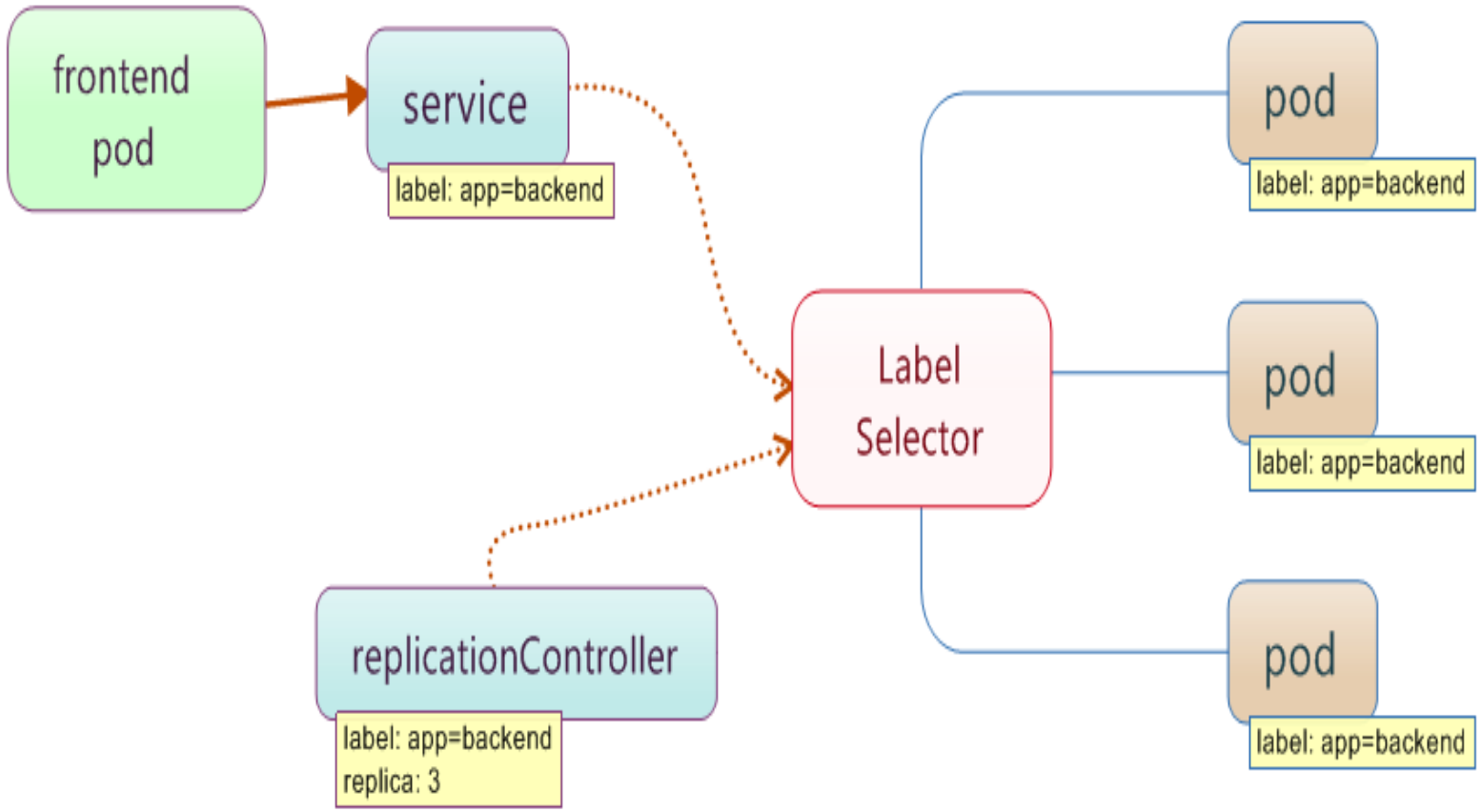
Monitoring Architecture



Labels and Selectors

- *Labels* are the key/value pairs that are attached to objects, such as pods. Labels are intended to be used to specify identifying attributes of objects that are meaningful and relevant to users.
- *A label selector*, the client/user can identify a set of objects. The label selector is the core grouping primitive in Kubernetes.

Labels and Selectors



Securing Kubernetes

- Optional add-on Kubernetes.
- A secret contains a set of named byte arrays.
- Pods consume secrets in volumes.

Setup

- First ensure these packages are installed:

```
$apt-get update
$ apt-get install ssh
$ apt-get install docker.io
$ apt-get install curl
```

- wget https://github.com/GoogleCloudPlatform/kubernetes/releases/download/v1.0.1/kubernetes.tar.gz
- tar -xvf kubernetes.tar.gz

Setup

- Build Binaries of Kubernetes,in our case we are building binaries for Ubuntu,so:

```
Cd kubernetes/cluster/ubuntu
./build.sh
```

- This shell script will download and build the latest version of K8s, etcd and flannel binaries.
- You can configure the cluster info at:

```
vi kubernetes/cluster/ubuntu/config-default.sh
export nodes="root@127.0.0.1"
export roles="ai"
export NUM_MINIONS=${NUM_MINIONS:-1}
```

- To start up the cluster:

```
cd kubernetes/cluster
$ KUBERNETES_PROVIDER=ubuntu ./kube-up.sh
```

- That's it enjoy kubernetes!!

Kubectl commands

- kubectl works to control the Kubernetes cluster manager.
- kubectl api-versions - Print available API versions.
- kubectl cluster-info - Display cluster info
- kubectl config - config modifies kubeconfig files
- kubectl create - Create a resource by filename or stdin
- kubectl delete - Delete a resource by filename, stdin, resource and name, or by resources and label selector.
- kubectl describe - Show details of a specific resource or group of resources
- kubectl exec - Execute a command in a container.
- kubectl expose - Take a replicated application and expose it as Kubernetes Service
- kubectl get - Display one or many resources
- kubectl label - Update the labels on a resource
- kubectl logs - Print the logs for a container in a pod.
- kubectl namespace - SUPERCEDED: Set and view the current Kubernetes namespace

Kubectl commands

- kubectl patch - Update field(s) of a resource by stdin.
- kubectl port-forward - Forward one or more local ports to a pod.
- kubectl proxy - Run a proxy to the Kubernetes API server
- kubectl replace - Replace a resource by filename or stdin.
- kubectl rolling-update - Perform a rolling update of the given Replication Controller.
- kubectl run - Run a particular image on the cluster.
- kubectl scale - Set a new size for a Replication Controller.
- kubectl stop - Gracefully shut down a resource by name or filename.
- kubectl version - Print the client and server version information.

Please Contribute !

googlecloudplatform/kubernetes

Works on

...and many,
many more

Questions ?

Google Cloud Platform

thanks for listening!

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