



Kubernetes 101



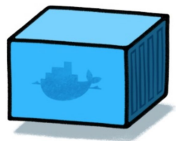
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Background



Containers

Allows to specify exactly which parts of your environment you need and want to run. Are easy to package and move, and often utilize compute resources more efficiently. Decouple an application and its dependencies from OS.



Docker

Performs OS-level virtualization also known as containerization, is primarily developed for Linux, where it uses the resource isolation features of the Linux kernel to allow independent "containers" to run within a single Linux instance, avoiding the overhead of starting virtual machines (VMs).



Where it begins...



It was developed by **Google**, and announced in mid-2014. Many of the key developers were previously working on Google's in-house orchestration.

With Kubernetes v1.0 in the summer of 2015, Google open-sourced it and partnered with the Linux Foundation in a joint effort to advance the technology.

Currently, it is hosted by Cloud Native Computing Foundation(CNCF).

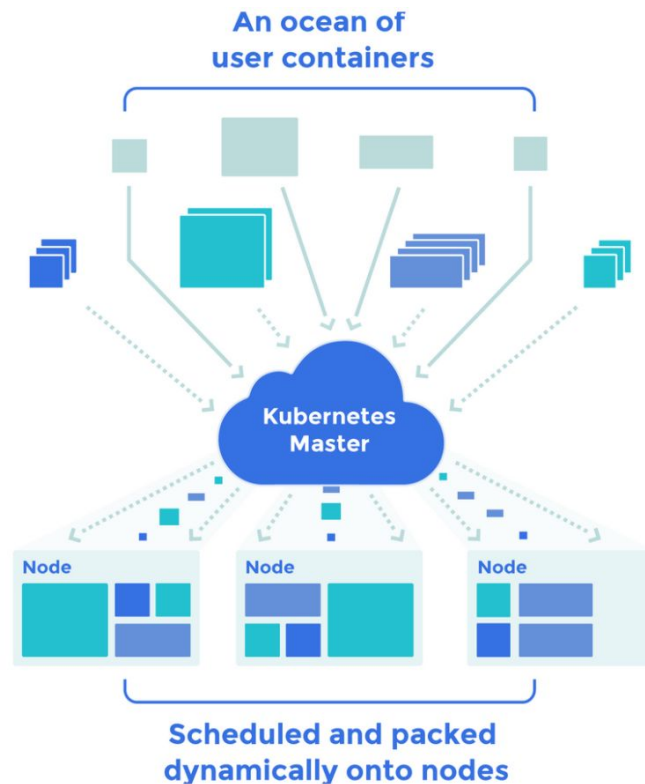
K8s handles all the crucial deployment, scaling and management steps so you don't have to. It's essentially a tool for managing your containers.

A platform to set how to serve your containers and then manage them.

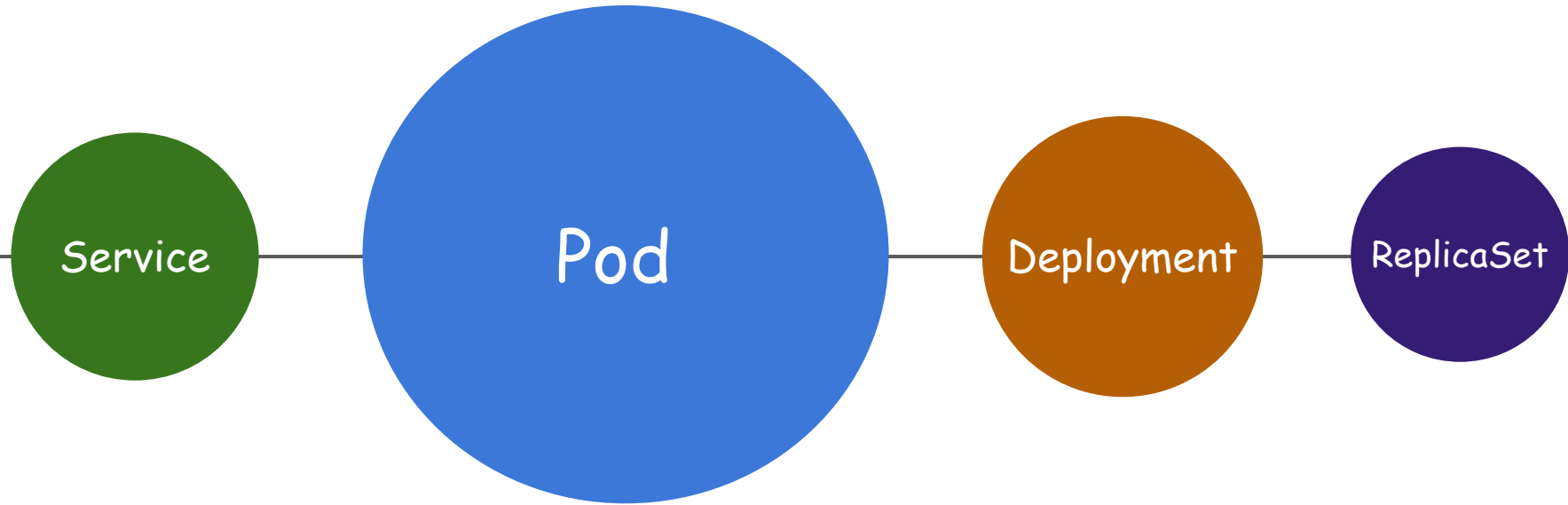


Platform features

- ❑ Container grouping using pod
- ❑ Self-healing
- ❑ Auto-scalability
- ❑ DNS management
- ❑ Load balancing
- ❑ Rolling update or rollback
- ❑ Resource monitoring and logging



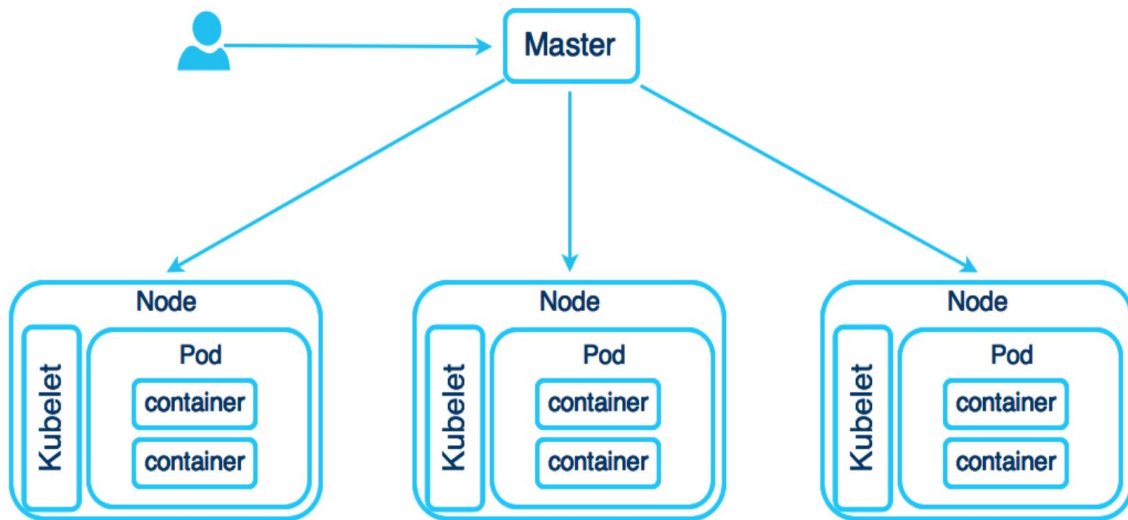
Kubernetes Objects



The Deployment instructs K8s how to create and update instances of your application. Once created, the K8s master schedules the application instances into individual Nodes in the cluster.



Pod



A group of one or more containers (such as Docker containers), with shared storage/network, and a specification for how to run the containers. Even if the pod has several containers, they will all be reachable in the network through a single IP address.

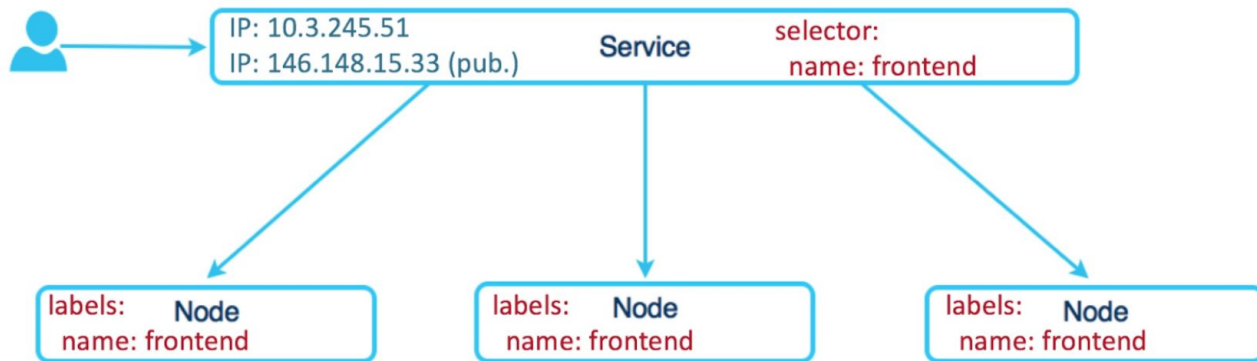


Service

ports:

-port: 80

targetPort: 8181



An abstraction which defines a logical set of Pods and a policy by which to access them. Pods have a life cycle. They get created and die. We need a way to make them accessible on a regular basis, even if they are re-created. By giving Pods a certain label we use a Service to route traffic to all Pods with that particular label. Voila! Reliable access to Pods even if they are re-created.



Deployment



Manifest File(s)

- Optional only in *trivial* cases.
 - (trivial = CLI only possible)
- YAML (or JSON) format.

Labels

- Key/Value "tags" – placed on any deployable object.
- Selectable – by actions and other declarations.
 - Configuration Flexibility

Descriptor Types (partial list)

- Replication Controller
- Deployment
- Service
- Pod
- Job

PodSpec clause – within most descriptors

- Labeled
 - allows versioning
 - other constraint application
- Container(s)
 - very Dockerfile / docker-compose like.
 - Image location, (including image version)
 - Volume requirements
 - Ports exposed

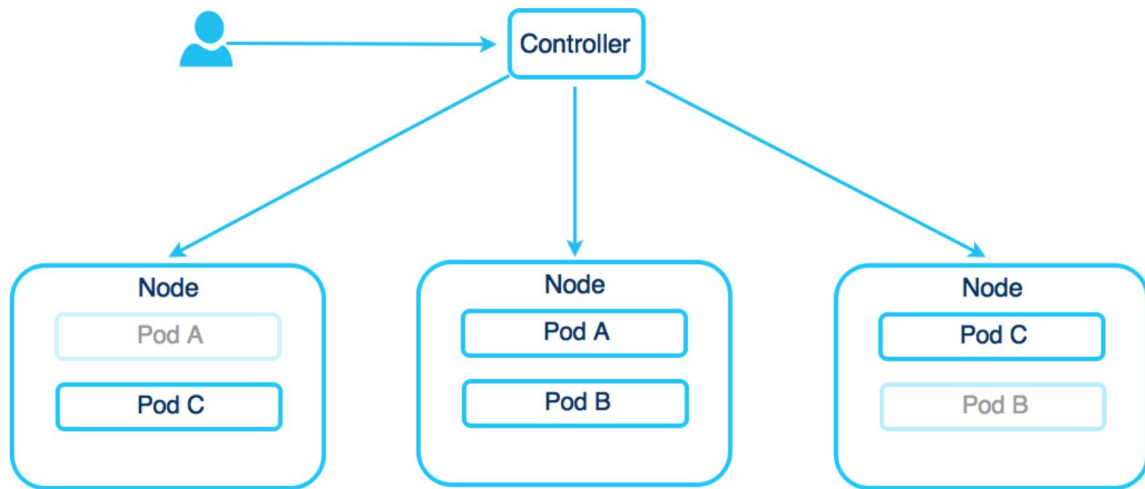
Replication Controller descriptor

- "template/spec" clause declares PodSpec configuration.
- "replica" clause declares sizing of the service.
- Rolling-updates & canary deploys are a supported

Describes the desired state and makes sure to change the actual state to the desired state if needed. A deployment manages Pods and ReplicaSets so you don't have to. Just like magic!



ReplicaSet



Manages the lifecycle of a Pod. While you are free to deploy a single Pod, you need the RS to ensure that a certain amount of Pods are running. If a Pod dies, the RS creates a new one, if you scale up/down Pods, the RS creates/destroys your Pods.



Now, let's practice in a Cluster!



We are going to run a Minikube single-node cluster, deploy a Go image stored in Hub Docker, then we will interact with some kubectl commands in K8s cluster. Also, we are going to use single node cluster scenario for free in Katacoda online kubernetes playground.

Source: <https://github.com/twogg-git/k8s-intro>



Katacoda Single-Node Cluster



The Katacoda logo, featuring a stylized orange cat head with a white 'K' on its forehead.

More Information about Katacoda

Search

Launch Single Node Kubernetes Cluster

< Step 1 of 4 >

Step 1 - Start Minikube

Minikube has been installed and configured in the environment. Check that it is properly installed, by running the *minikube version* command:

```
minikube version ↵
```

Start the cluster, by running the *minikube start* command:

```
minikube start ↵
```

Great! You now have a running Kubernetes cluster in your online terminal. Minikube started a virtual machine for you, and a Kubernetes cluster is now running in that VM.

CONTINUE

Terminal

Dashboard +

Your Interactive Bash Terminal.

```
$  
$ minikube version  
minikube version: v0.25.0  
$ minikube start  
There is a newer version of minikube available (v0.25.2). Download it here:  
https://github.com/kubernetes/minikube/releases/tag/v0.25.2  
  
To disable this notification, run the following:  
minikube config set WantUpdateNotification false  
Starting local Kubernetes v1.9.0 cluster...  
Starting VM...  
Getting VM IP address...  
Moving files into cluster...  
Setting up certs...  
Connecting to cluster...  
Setting up kubeconfig...  
Starting cluster components...  
Kubectl is now configured to use the cluster.  
Loading cached images from config file.  
$
```

<https://www.katacoda.com/courses/kubernetes/launch-single-node-cluster>



Basic Commands



Minikube is a tool that makes it easy to run K8s locally, runs a single-node K8s cluster inside a VM.

```
$ minikube start
```

```
$ minikube dashboard
```

Kubectl is a command line interface for running commands against Kubernetes clusters.

```
$ kubectl cluster-info
```

```
$ kubectl get nodes
```

```
$ kubectl get all
```



Deployment



```
$ kubectl run twogg --image=twogghub/k8s-intro:1.4-k8s
```

```
$ kubectl get deployment twogg --output wide
```

```
$ kubectl expose deployment twogg --port=8080  
--external-ip=$(minikube ip) --type=LoadBalancer
```

- ❑ In Katacoda click + button then “Select port to view on Host1”, in new tab enter port **8080**

```
$ kubectl describe service twogg
```

```
$ kubectl get pods,services,deployments --output wide
```



Update and Scale



```
$ kubectl set image deployment twogg twogg=twogghub/k8s-intro:1.5-k8s
```

```
$ kubectl scale --replicas=3 deployment twogg
```

- ❏ Run --watch flag on a new terminal. In Katacoda click + button then “Open new terminal”.

```
$ kubectl get pods --output wide --watch
```

```
kubectl get pods --output wide
```

```
$ kubectl delete pod <pod-id>
```



Pod Interaction



```
$ kubectl run ghost --image=ghost:0.9
```

```
$ kubectl expose deployment ghost --port=2368 --replicas=3  
--external-ip=$(minikube ip) --type=LoadBalancer
```

```
$ kubectl label pods <pod-id> owner=pioneras
```

```
$ kubectl logs <pod-id>
```

```
$ kubectl get pod <pod-id> --output=json
```

```
$ kubectl exec -ti <pod-id> /bin/bash
```



Clean up...



```
$ kubectl delete pod <pod-id>
```

Every pod is generated based on its deployment file, every time you delete a pod, it comes up again because you defined the value 'replicas: X' in the deployment file. To delete a Pod/s permanently, You will have to first delete the deployment of that pod and then delete the pod.

```
$ kubectl delete deployment twogg
```

```
$ kubectl delete services,pods,deployments --all
```



Links & References



- Intro to Kubectl commands
<https://github.com/twogg-git/k8s-intro>
- Official Kubernetes Documentation
<https://kubernetes.io/docs/home/>
- Kubernetes by Example
<http://kubernetesbyexample.com/>
- Katacoda training courses
<https://www.katacoda.com/learn>
- Kubectl commands documentacion
<https://kubernetes.io/docs/reference/generated/kubectl/kubectl-commands>

