Kubernetes

Virtualisation

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- joins multiple machines into a cluster;
- lets us interact with the cluster as a single entity;
- allows us to run containers and set up volumes for them on the cluster;
- uses a container runtime (typically, but not necessarily, Docker);
- **adds a significant amount of extra machinery.**

Kubernetes clusters

- Clusters are made up of a control plane and worker nodes.
- Bother require a collection of software components.
- The components are distinct for each.

Worker node components

- kubelet
- kube-proxy
- a container runtime, e.g., Docker

In general we don’t interact with worker nodes.

Control plane components

- kube-api-server
- etcd
- kube-scheduler
- controller managers

Add ons

- DNS
- Web dashboard
- Resource monitoring
- Logging service

None of these is strictly required, although we generally always need DNS.

Admin interface

kubectl is the standard CLI tool used to administer a Kubernetes cluster. It interacts with the kube-api-server on the master. Typically we would install it on a workstation.

Installing Kubernetes

Since Kubernetes is actually a collection of software spread across several machines, there is no one standard installation method or package.

We will use a special version of Kubernetes designed to run on a single machine, called `microk8s`.

Pods

- The basic unit of deployment is the *pod*.
- A pod is a collection of containers and volumes.
- All of the items in a pod will be deployed onto the same node.
- Other deployment elements are built up from pods.

Pod manifests

- There is more than one way to create a pod. Typically we create them from manifest files.
- These are JSON or YAML files (typically we use YAML).
- We use these files with kubectl (e.g. `kubectl apply -f mypod.yml`).

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: kuard
spec:
  volumes:
  - name: "kuard-data"
      hostPath:
        path: "/var/lib/kuard"
  containers:
    - image: gcr.io/kuar-demo/kuard-amd64:1
      name: kuard
      volumeMounts:
        - mountPath: "/data"
          name: "kuard-data"
      ports:
        - containerPort: 8080
          name: http
          protocol: TCP
```

From: Kelsey Hightower, Brendan Burns, and Joe Beda. ”Kubernetes: Up and Running.”

Other deployment elements

- ReplicaSets
- DaemonSets
- Deployments
- Jobs
- Services
- Secrets
- ConfigMaps