Kubernetes-k8s VS. Docker

How kubernetes/Docker works

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1.pod and node

2.docker image

3.docker cmd

Kubernetes

K8s

1.Kubernetes is an open source system
2.K8s managing containerized applications across multiple hosts.
3.K8s provides basic mechanisms for
    1.deployment of applications
    2.maintenance of applications
    3.scaling of applications
4. K8s is hosted by Cloud Native Computing Foundation(CNCF)
5. CNCF is focused on:
    1.drive alignment among container techs
    2.container-packaged
    3.dynamically scheduled
    4.microservices-oriented

Cloud Native Computing Foundation

CNCF organization members

COREOS

box

Goldman Sachs

at&t

cisco

intel

IBM

docker
TELEPRESENCE

Google

HUAWEI

Red Hat
Enterprise Linux

Joyent

CLOUD NATIVE
COMPUTING FOUNDATION

UNIVA

switch

MESOSPHERE

CLOUD FOUNDRY

weaveworks

vmware

CYCLE
COMPUTING

ebay

Core of CNCF

1.CNCF collaborate among devs and operators for:
    1.CNCF deploying cloud native application services
    2.CNCF bring the open source code in neutral and collaborative forum
    3.CNCF aims to advance the application development at internet scale
2.CNCF create set of container techs driven by tech merit
    1. advance in containers
    2. advance in automation
    3.advance in orchestration
    4.improve the dev experience
    5.faster code reuse
    6.improve machine efficiency
    7.reduce costs
    8.increase agility/maintainability of applications
3.CNCF look at open source at the orchestration level:
    1. Container orchestration
    2.CNCF integration of hosts and services(assemble components)
    3.CNCF defining API and standards to container-packaged application infrastructure.
    4.CNCF work with Open Container initiative on its container image specification
    5.CNCF represents the next step in the evolution of open source software.
        1.provides a mechanism for complementary projects to come together as a single and harmonized solution architecture.
3.CNCF provides collaborative and organizational framework:
    1.project hosts can focus on innovation and results
    2.provide you with a framework to run distributed systems resiliently
4.CNCF span:
    1.enterprise
    2.Mobile
    3.embeded
    4.life sciences markets

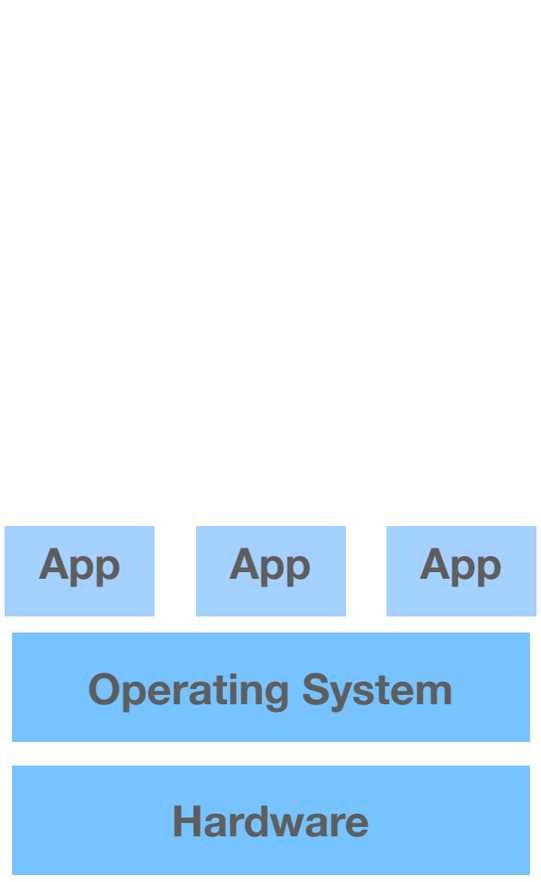
CNCF are critical for companies:

1. scale their business quickly and successfully
2. simplify and improve the overall developer experience
3. increase access to compute for big data, analytics and batch computing
4. remove the barriers to resources that analysts, engineers depend on.
5. become ubiquitous in application development, deployment and management
6. simplifies use case from web and data apps to distributed systems
7. help to define common cloud native computing APIs, tools and frameworks.
8. make applications born in the cloud and driven by open innovation
9. make it possible for thousands of stateful and stateless services to run multi-tenant on:
    1. the same clusters.
    2. simplifying operations
    3. maintaining proper access controls
    4. security isolation between workloads
    5. above are requirements for modern datacenters

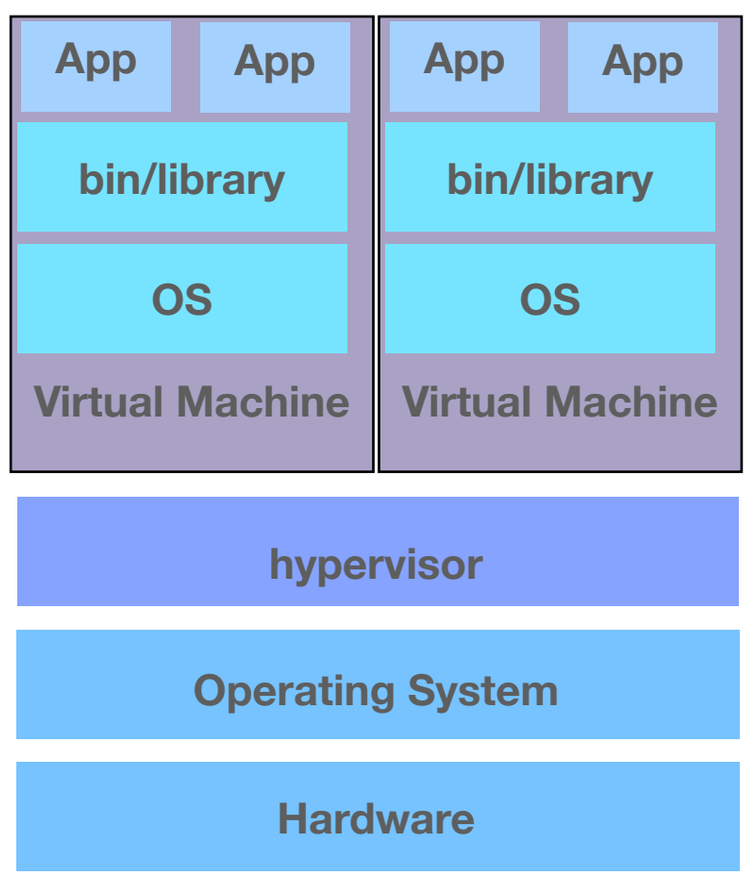
Kubernetes Features

1.Automated rollouts and rollbacks
2.Storage orchestration
    1.automatically mount the storage system of your choice
3.Batch execution
    1.K8s can manage your batch and CI workloads
4.IPv4/IPv6 dual-stack
    1.allocation of IP addresses to pods
5.self-healing
    1. restarts containers that fail
    2.reschedule containers when nodes dies
    3.kill containers that don’t respond to your user-defined health check.
6. Automatic bin packing
    1.Automatically places containers
    2.mix critical and best-effort workloads
7.Horizontal scaling
    1.scale your application up and down with a simple cmd, with a UI, or automatically based on CPU usage

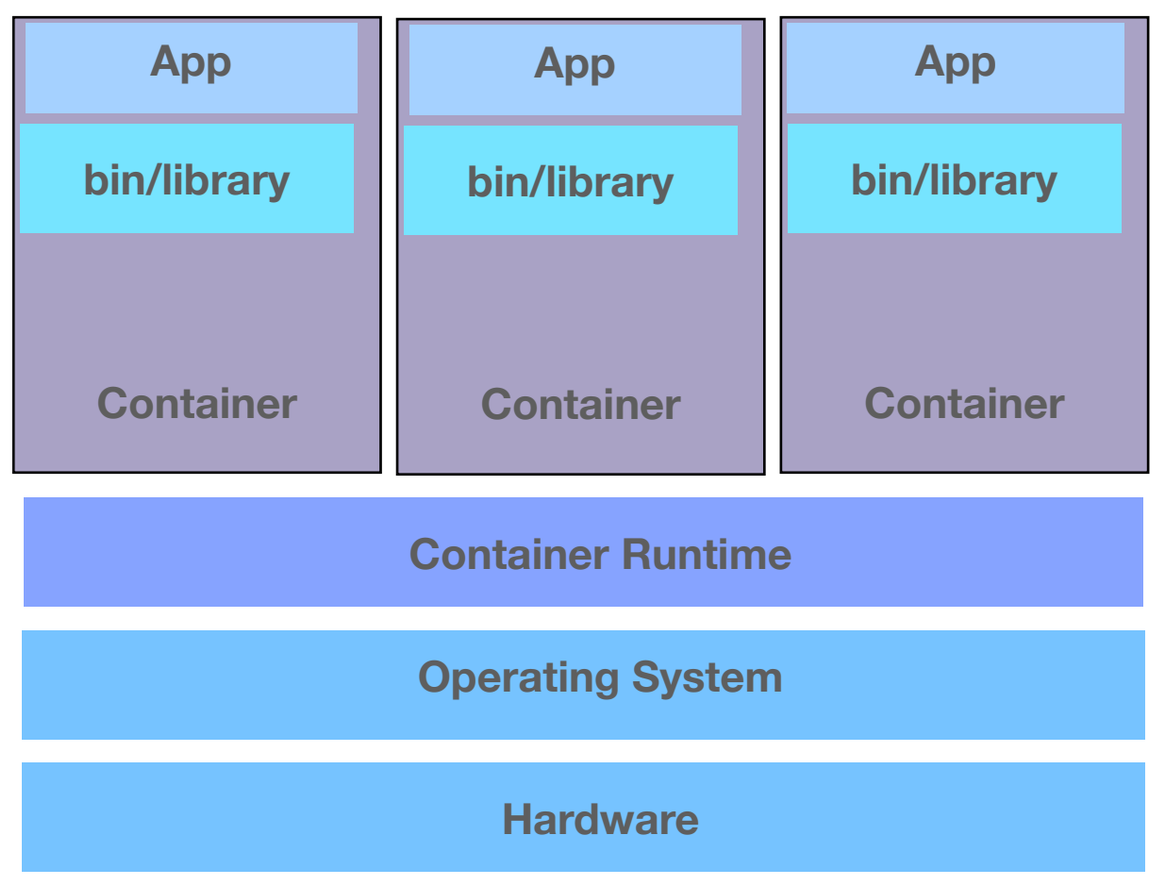
Deployment



Traditional Deployment

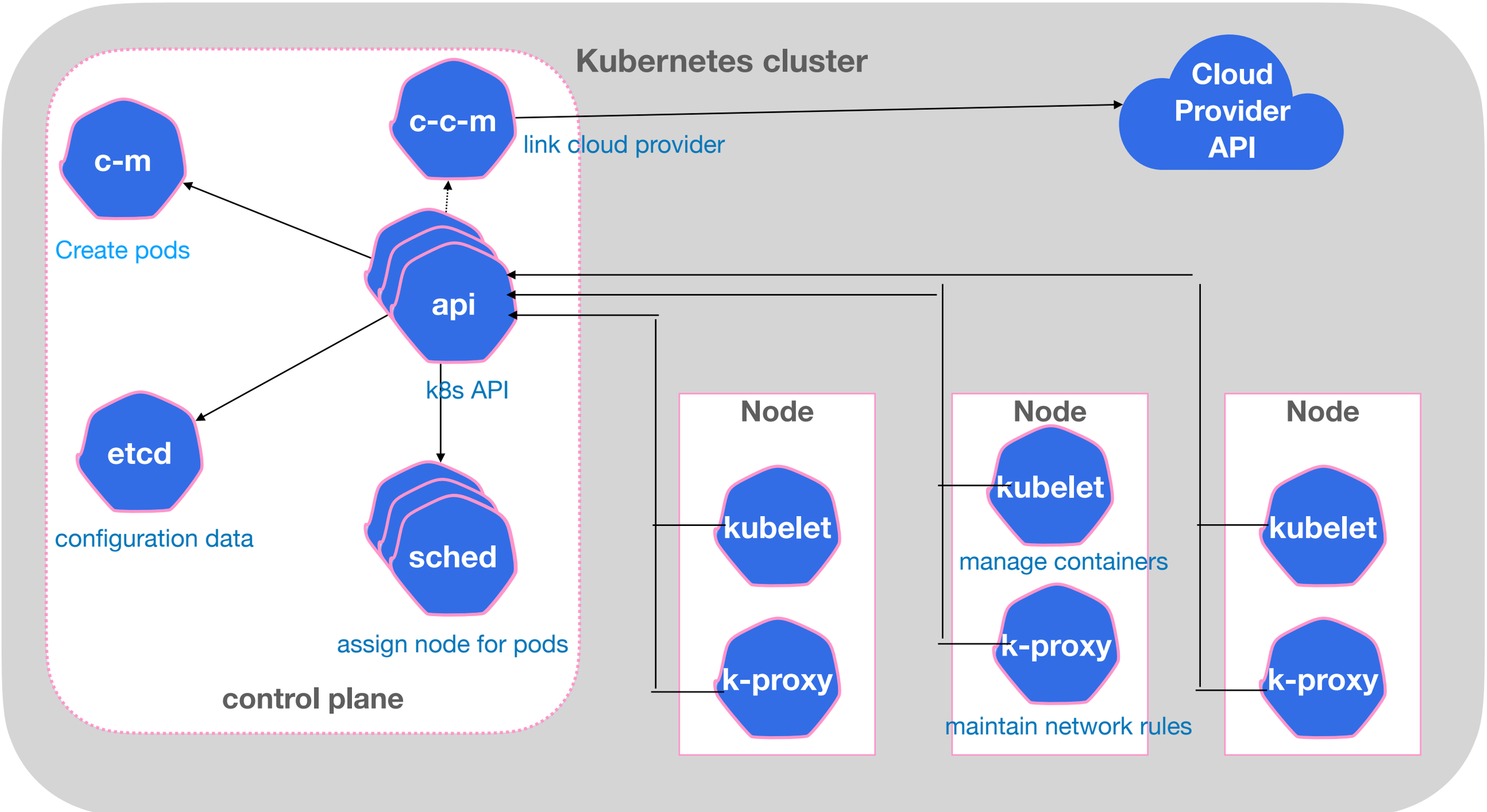


Virtualized Deployment



Container Deployment

Kubernetes Cluster



concept in kubernetes cluster control plane

1.c-m
    1.controller manager
    2.group of controller(exposed as single binary and run in a single process):
        1.node controller: notice/responding when nodes go down
        2.job controller:
            1.watch for job tasks
            2.create pods to run those tasks
            3.enpointslice controller: provide link between services and pods
            4.serviceAccount controller: create default serviceAccounts for new namespaces.
2.c-c-m
    1.cloud controller manager
    2. ccm used to link cluster into your cloud provider’s API
    3.only run controllers that are specific to your cloud provider
3.api
    1.exposes the kubernetes API.
4.etcd
    1.eternal distributed consistent database
    2. etcd used to store the kubernetes configuration data
        1.pods, services, nodes, and deployment
        2.k8s use etcd data to track the state of cluster and ensure that all ocmponent are running as expected
5.sched
    1.scheduler
    2.assigned node for newly created pods
    3.scheduler strategy:
        1.individual and collective resource requirements
        2.hardware/software/policy constraints
        3.affinity and anti-affinity specifications
        4.data locality
        5.inter-workload interface
        6.deadline

concept in kubernetes cluster Node Components

Node components run on every node

1. Node components run on every node
2. Node components maintaining running pods
3. Node components providing the kubernetes runtime environment
4. Kubelet:
    1. a agent running on each node
    2. kubelet make sure containers are running in a pod
    3. kubelet manage containers created by kubernetes
5. Kube-proxy
    1. network proxy runs on each node
    2. maintain network rules on nodes
        1. the inside/outside cluster communications rules to your pods
        2.

Cmd line tool kubectl

1.kubectl config file: $HOME/.kube directory
    1.setting KUBECONFIG environment variable
    2.setting —kubeconfig flag
2.kubectl get pod pod1
3.kubectl describe nodes <node-name>
    1.display the details of the node with name
4.kubectl delete pods
5.kubectl exec <pod-name> —date
6.kubectl cordon <node-name>
    1.marking a node as unsschedulable

Deployment components

when you deploy kubernetes, you get a cluster

1.Node
    1.kubernetes cluster consists of a set of worker machines, called nodes.
        1.a node is a worker machine
            1.a node is either a virtual or physical machine
        2.a node can have multiple pods
    2.nodes run containerized applications
2.pod
    1.pod is the components of the application workload
    2.a group of one or more containers
    3.a pod models an applications specific logical host
        1.contains one or more application containers which are relatively tightly coupled.
    4.pod have a lifecycle
    5.pod is a set of containers with shared namespaces and shared filesystem volumes
    6.when a worker nodes dies, the pods running on the Node are also lost
    7.Each pod in a cluster has a unique IP address
        1.although each pod has a unique IP address, those IPs are not exposed outside the cluster without a service.
        2.we couldn’t refer to pods by IP
        3.we are able to refer to Pods by their logical name rather than their specifics IP number
3. control plane
    1.manages the worker nodes and the pods in the cluster

Node | Pod | Container