Kubernetes Docker Deprecation Architectural Analysis

containerd

cri-o

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Computer Clusters

Kubernetes Cluster

- ✓ Kubernetes is an open source Container orchestration platform for managing clusters of containerized applications and services. Developed by Google engineers Joe Beda, Brendan Burns, and Craig McLuckie in 2014 and open sourced shortly. Today managed by the Cloud Native Computing Foundation (CNCF), an arm of the Linux Foundation.
- ✓ Kubernetes now has more than 2,300 contributors, and has been widely adopted by companies large and small, including half of the Fortune 100.

Some Key Terms – Cheat Sheet

Kubecon

Cluster
Is a set of computers individually referred to as nodes used to run containerized applications managed by Kubernetes.

Node
Is either a virtual or physical machine. A cluster consists of one or more shared control planes (master node) and a number of worker nodes.

Cloud Container
Is an image that contains software and its dependencies.

Pod
Is the Smallest building block in the k8 cluster also it is a single container or a set of containers running on your Kubernetes cluster.

Deployment
Is an object that manages replicated applications represented by pods. Pods are deployed onto the nodes of a cluster.

Replicaset
Ensures that a specified number of pod replicas are running at one time.

Service
Describes how to access applications represented by a set of pods with in the cluster. Services typically describe ports and load balancers, and can be used to control internal and external access to a cluster.

Kubernetes Architecture

Cluster Configuration – t2.medium , 4gb , 2 CPU

Common to all nodes

- ❑ sudo apt -y install vim git curl wget kubelet kubeadm kubectl
- ❑ cat <<EOF | sudo tee /etc/sysctl.d/99-kubernetes-cri.conf
  net.bridge.bridge-nf-call-iptables = 1
  net.ipv4.ip_forward = 1
  net.bridge.bridge-nf-call-ip6tables = 1
  EOF
- ❑ sudo apt-get install -y containerd

- ❑ sudo kubeadm init --pod-network-cidr=10.244.0.0/16
- ❑ mkdir -p $HOME/.kube
- ❑ sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
- ❑ sudo chown $(id -u):$(id -g) $HOME/.kube/config
- ❑ sudo kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/master/Documentation/kube-flannel.yml

Master- NODE 1: 192.168.49.5
Control Plane

sudo kubeadm join 172.31.23.26:6443 --token h91ctg.34qsjrc9vb8hq1z0 \
--discovery-token-ca-cert-hash sha256:0be50bcd5eb36b4b75252fce491357afb870707f41598d003f1db0c52475c54a

WK - NODE 1: 192.168.49.2

Sudo ubeadm join 172.31.23.26:6443 --token h91ctg.34qsjrc9vb8hq1z0 \
--discovery-token-ca-cert-hash sha256:0be50bcd5eb36b4b75252fce491357afb870707f41598d003f1db0c52475c54a

WK - NODE 2 : 192.168.49.3

```
ubuntu@ip-172-31-23-26:~$ kubectl get nodes
NAME     STATUS       ROLES    AGE   VERSION
master   Ready        master   35m   v1.15.7
node1    Ready        none>    15m   v1.15.7
node2    NotReady     <none>   9s    v1.15.7
```

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The Evolution of Container Runtime

A running version of a image is a container. A container run time is a software which manage the container and maintains it runtime status by collaborating with the low-level components of the container engine.

In 2016 Docker decided to separate the a runtime component from the rest and containerd emerged.

Docker Engine

runc is an abstraction, in order to support a wider range of isolation technologies and a cli tool for spawning and running containers as per OCI specification

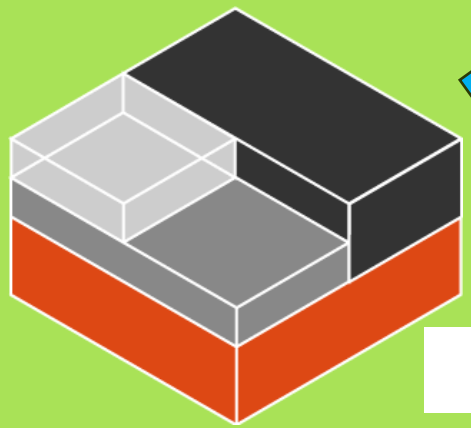
containerd

opencontainers/
runc

On 2014, with the release of version 0.9 Docker dropped LXC as the default execution environment and replaced with its own libcontainer library

was used before docker 0.9

Opencontainers/ runc



libcontainer

Other Container Runtimes

LXC – Linux Containers

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What about Kubernetes and Container runtime

Deprecating Approach – With docker

New Approach – Without docker

Current Approach

A container runtime is software that can execute the containers that make up a Kubernetes pod

kubelet

CRI

dockershim

docker

containerd

Containers

kubelet

CRI

CRI - containerd

containerd

Containers

kubelet

CRI

CRI - Plugin

containerd

Containers

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Docker runtime support is removed in a future release (*Update*: removal of dockershim is scheduled for Kubernetes v1.24)

The Impact

- ✓ The dockershim component of k8 cluster facilitate docker as k8's runtime. Kubernetes built-in dockershim component is deprecated in release v1.20.
- ✓ If you are using Docker for building your application containers, you can still run these containers on any container runtime. This use of Docker does not count as a dependency on Docker as a container runtime.
- ✓ When alternative container runtime is used, executing Docker commands may either not work or yield unexpected output. This is how you can find whether you have a dependency on Docker
- ✓ You cannot get container information using 'docker ps' or 'docker inspect' commands.
- ✓ Since it is not possible to list the containers, you cannot stop containers , get logs or executing something inside containers with 'docker exec'
- ✓ You have to use the Kubernetes API to stop a container
- ✓ Still you can pull the images and build the using 'docker build'

Industry use cases

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Kubernetes Architecture

Components Workflow

KUBECTL

~/.kube and
~/.minikube

Kube -API - Server

etcd

Cloud Controller Manager

Kube Controller Manager

Validated and authorized request by API- Server

Kube Schedular

Master- NODE 1: 192.168.49.5
Control Plane

Kubelet

pod

Container runtime

containerd

Kube-proxy

WK - NODE 1: 192.168.49.2

My App

SVC

Kubelet

pod

SVC

Kube-proxy

Namespace

Container runtime

pod

WK - NODE 2 : 192.168.49.3

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Thank You.

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