CRI, OCI, CRI-O

David Chang DevOps @ Mithril
Back-End Developer, Kuberentes admin, DevOps

MITHRIL

Outline

1. Container Runtime Interface (CRI)
2. Open Container Initiative (OCI)
3. CRI-O
4. Kubernetes on CRI-O

cri-o

Trend Kubernetes

- Kubernetes 1.3 introduced rktnetes
- Kubernetes 1.5 introduced CRI
- Kubernetes 1.7 removed pre-CRI Docker / rkt integration
- Currently works Kubelet to use CRI
- CRI-O: released 1.0.x to match Kubernetes 1.7

Nomination

CRI-O
- OCI-based implementation of Kubernetes Container Runtime Interface

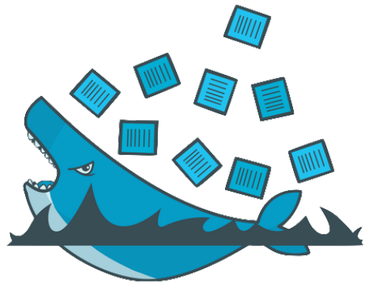
CRI
- Kubernetes Container Runtime Interface

OCI
- Open Container initiative

Projects with Container Runtime

docker, rkt, LXC/LXD, runC, containerd, OpenVZ, systemd-nspawn, machinectl, qemu-kvm, lkvm...

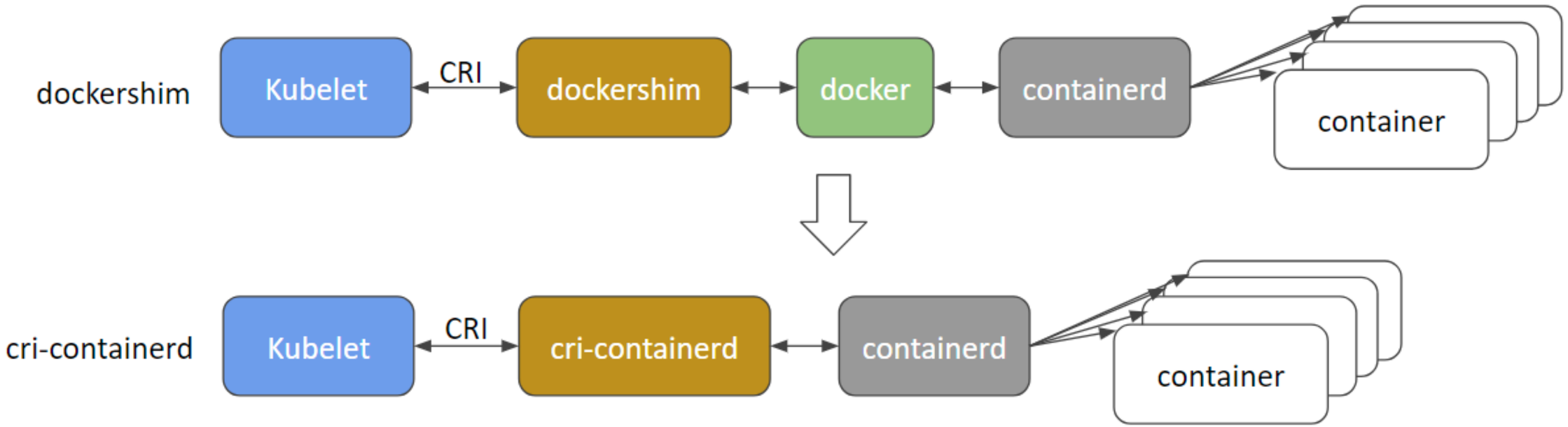
Kubernetes (before 1.6) native supports
- Docker
- rkt



Container Runtime Interface(CRI)

- Enable Kubernetes to support more runtimes
- Free kubernetes to focus on orchestration from runtime integration
- Consists
  - a protocol buffers and gRPC API
  - libraries, additional specifications and tools

Container Runtime Interface(CRI)



CRI api in kubernetes

https://github.com/kubernetes/kubernetes/blob/master/pkg/kubelet/apis/cri/runtime/v1alpha2/api.proto

CRI runtimes

- Docker CRI shim (cri-containerd)
- CoreOS rktlet
- frakti: hypervisor-based container runtimes
- Intel Clear container
- OpenStack kata runtime
- cri-o

Open Container Inititive (OCI)

- open governance structure
- container industry standards
- runtime spec defines configuration, execution environment, and lifecycle of a container
- image spec spec on archetecture and OS, filesystem layers and configuration

OCI from aspect of user

- Use all OCI-conplimant container runtime
- Use all OCI-complimant images registries
- Similar UX

https://www.opencontainers.org/blog/2018/06/20/cri-o-how-standards-power-a-container-runtime

CRI-O

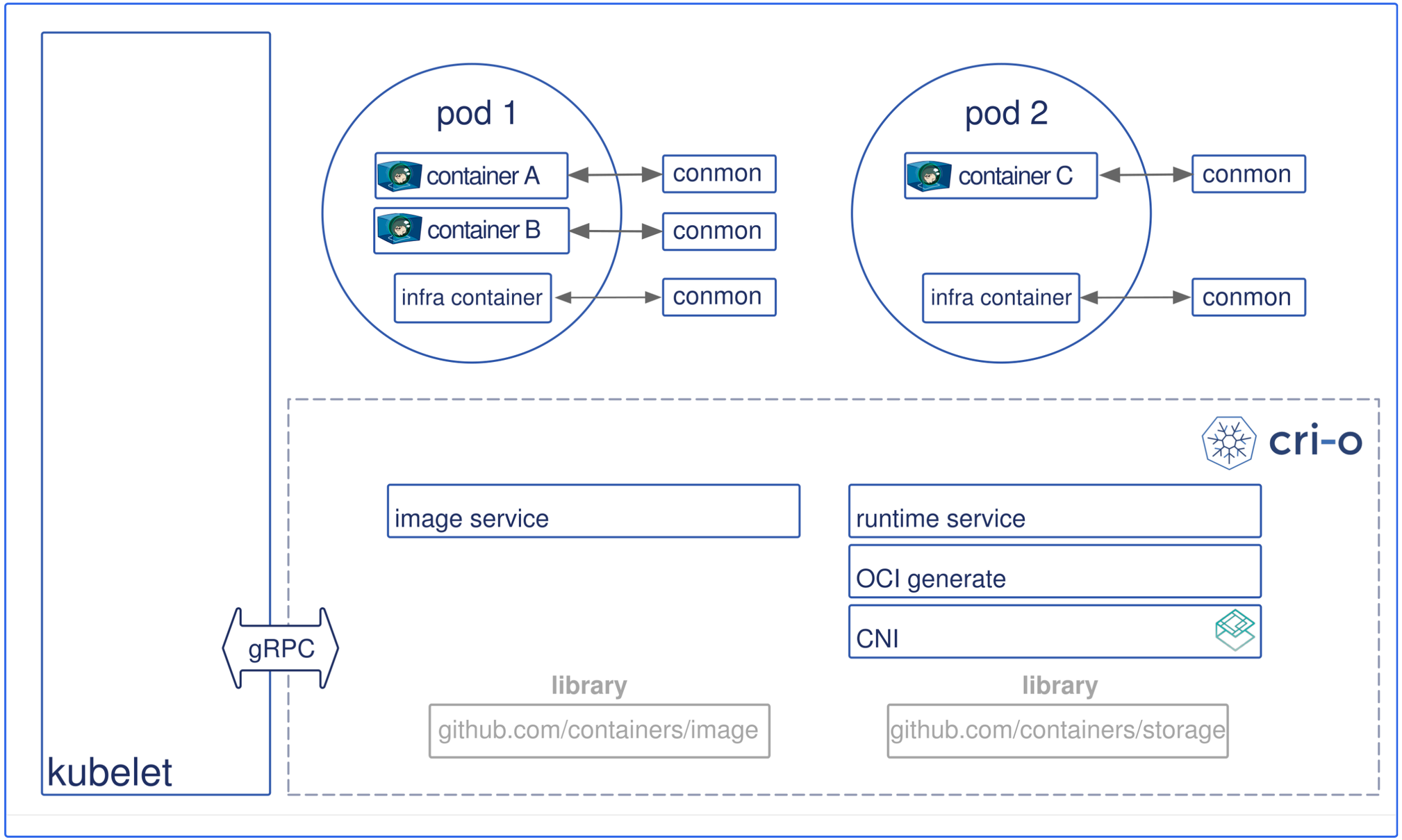
- OCI-based implementation of Kubernetes Container Runtime Interface
- Kubernetes incubator project also part of the CNCF
- Dedicated for Kubernetes
- Enable CRI-O plugin to other runtimes
- Available on RHEL, Fedora, Centos, Ubuntu...

http://cri-o.io/

CRI-O vs Docker (containerd)

kubelet -> cri-containerd (shim) -> containerd -> runC -> container
kubelet -> cri-o -> runC -> container

- Lightweight
- Stability
  - built for Kubernetes
  - No cli, image utilities, ...
  - No swarm, mesosphere integration, ...


pod 1
container A
container B
infra container
conmon
conmon
conmon
pod 2
container C
infra container
conmon
conmon
cri-o
image service
runtime service
OCI generate
CNI
gRPC
library
github.com/containers/image
library
github.com/containers/storage
kubelet

Let's use CRI-O

- Install cri-o and dependencies, runC and CNI
- Install Podman
  - Podman to cri-o as Docker-cli to Docker daemon

```
sudo podman run --name my-golang golang:alpine bash
```

Minikube

```
minikube start \
  --network-plugin=cni \
  --container-runtime=cri-o

minikube start \
  --network-plugin=cni \
  --extra-config=kubelet.container-runtime=remote \
  --extra-config=kubelet.container-runtime-endpoint=/var/run/crio/crio.sock \
  --extra-config=kubelet.image-service-endpoint=/var/run/crio/crio.sock
```

Run Kubernetes on CRI-O

Kubespray

```
kubeadm_enabled: true
...
container_manager: crio
```

Full cluster

```
kubelet --container-runtime-endpoint=unix:///var/run/crio/crio.sock
...
```

References

https://kubernetes.io/blog/2016/12/container-runtime-interface-cri-in-kubernetes/
https://kubernetes.io/blog/2017/11/containerd-container-runtime-options-kubernetes/
Rttps://kubernetes.io/blog/2017/11/containerd-container-runtime-options-kubernetes/
https://xuxinkun.github.io/2017/12/12/docker-oci-runc-and-kubernetes/
https://www.kubernetes.org.cn/1079.html