rktnetes
Integrating rkt and Kubernetes

Derek Gonyeo, CoreOS

Core OS

About Me

Derek Gonyeo
rkt Scientist at CoreOS
Student at RIT
@dgonyeo

Core OS

Outline

- ► What is rkt?
- ► What is kubernetes?
- ► What is rktnetes?
- ► How does rktnetes work?
- ► Why rktnetes?

Core OS

Outline

Core OS

What is rkt?

rkt...

What is rkt?

rkt...
- ▸ is an open source project

Core OS

What is rkt?

rkt...
- ▸ is an open source project
- ▸ is a golang binary

Core OS

What is rkt?

rkt...
- is an open source project
- is a golang binary
- has a simple command line interface

Core OS

What is rkt?

rkt...

- ▸ is an open source project
- ▸ is a golang binary
- ▸ has a simple command line interface
- ▸ is packaged for CoreOS, Debian, Ubuntu, Fedora, Arch, Gentoo, and Nix

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:
- ▸ Fetch container images

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:
  - ▸ Fetch container images
  - ▸ Cryptographically verify container images

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:
- ▸ Fetch container images
- ▸ Cryptographically verify container images
- ▸ Manage a local store of container images

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:
- ► Fetch container images
- ► Cryptographically verify container images
- ► Manage a local store of container images
- ► Run container images

Core OS

What is rkt?

rkt is a container runtime.

This means that it will:

- ▸ Fetch container images
- ▸ Cryptographically verify container images
- ▸ Manage a local store of container images
- ▸ Run container images
- ▸ Provide information about running containers

Core OS

What is rkt?

Notes on rkt's architecture:

Core OS

What is rkt?

Notes on rkt's architecture:
- ▸ Has a pod-first design

Core OS

What is rkt?

Notes on rkt's architecture:
- ▸ Has a pod-first design
- ▸ Does not have a central daemon

Core OS

What is rkt?

Notes on rkt's architecture:
- ▸ Has a pod-first design
- ▸ Does not have a central daemon
- ▸ Has swappable isolation models (more on this later)

Core OS

What is rkt?

rkt is:

- ▸ Secure
- ▸ Standards Compliant
- ▸ Composable

Core OS

What is rkt?

rkt is:

- ▸ **Secure**
- ▸ Standards Compliant
- ▸ Composable

Core OS

What is rkt?

How is rkt secure?

Core OS

What is rkt?

How is rkt secure?
  ▸ Requires images to be GPG signed

Core OS

What is rkt?

How is rkt secure?
- ▸ Requires images to be GPG signed
- ▸ Uses selinux to prevent breakouts

Core OS

What is rkt?

How is rkt secure?
- ▸ Requires images to be GPG signed
- ▸ Uses selinux to prevent breakouts
- ▸ Uses seccomp to drop privileges

Core OS

What is rkt?

How is rkt secure?
- ▸ Requires images to be GPG signed
- ▸ Uses selinux to prevent breakouts
- ▸ Uses seccomp to drop privileges
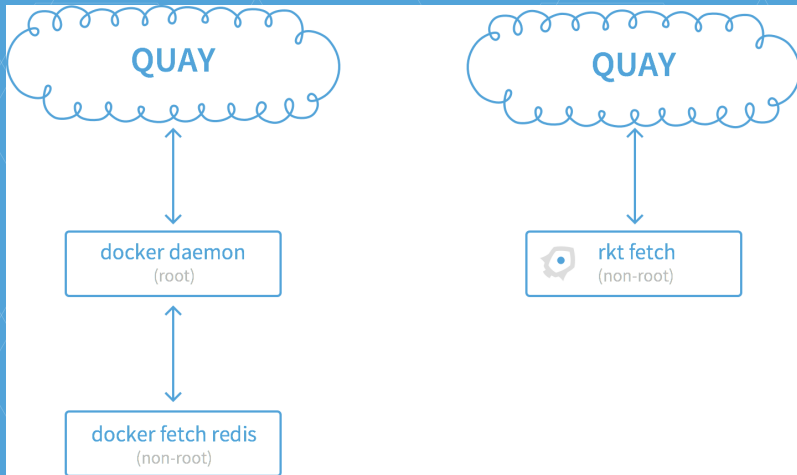- ▸ Uses the TPM to make a tamper-proof audit log

Core OS

What is rkt?

How is rkt secure?

- ▸ Requires images to be GPG signed
- ▸ Uses selinux to prevent breakouts
- ▸ Uses seccomp to drop privileges
- ▸ Uses the TPM to make a tamper-proof audit log
- ▸ No central privileged daemon

Core OS

What is rkt?

What is rkt?

rkt is:

- ▸ **Secure**
- ▸ Standards Compliant
- ▸ Composable

Core OS

What is rkt?

rkt is:
- ▸ Secure
- ▸ **Standards Compliant**
- ▸ Composable

Core OS

What is rkt?

How is rkt standards compliant?

Core OS

What is rkt?

How is rkt standards compliant?
- ► Implementation of the AppC spec

Core OS

What is rkt?

How is rkt standards compliant?
- ▸ Implementation of the AppC spec
- ▸ Supports images from the docker spec

Core OS

What is rkt?

How is rkt standards compliant?
- ▸ Implementation of the AppC spec
- ▸ Supports images from the docker spec
- ▸ Supports images from the OCI spec

Core OS

What is rkt?

How is rkt standards compliant?

- ▸ Implementation of the AppC spec
- ▸ Supports images from the docker spec
- ▸ Supports images from the OCI spec
- ▸ Native OCI support coming

Core OS

What is rkt?

How is rkt standards compliant?
- ▸ Implementation of the AppC spec
- ▸ Supports images from the docker spec
- ▸ Supports images from the OCI spec
- ▸ Native OCI support coming
- ▸ Uses CNI for network configuration

Core OS

What is rkt?

rkt is:
- ▸ Secure
- ▸ **Standards Compliant**
- ▸ Composable

Core OS

What is rkt?

rkt is:

- ▸ Secure
- ▸ Standards Compliant
- ▸ **Composable**

Core OS

What is rkt?

How is rkt composable?

Core OS

What is rkt?

How is rkt composable?

- ▸ Simple process model

Core OS

What is rkt?

How is rkt composable?
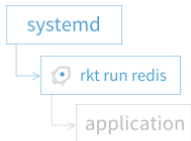- ▸ Simple process model
- ▸ Swappable stage1s

Core OS

What is rkt?

How is rkt composable?
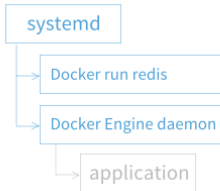- ▸ Simple process model
- ▸ Swappable stage1s
- ▸ Systemd integration

Core OS

What is rkt?
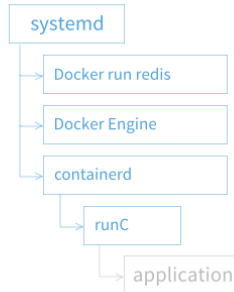

Container Engine Process Models

rkt 1.0+

- systemd
  - rkt run redis
    - application

Docker < 1.11.0

- systemd
  - Docker run redis
  - Docker Engine daemon
    - application

Docker 1.11.0+

- systemd
  - Docker run redis
  - Docker Engine
  - containerd
    - runC
      - application

CoreOS

What is rkt?

rkt has stages

Core OS

What is rkt?

stage0:

What is rkt?

stage0:
- ▸ Handles user interaction

Core OS

What is rkt?

stage0:
- ▸ Handles user interaction
- ▸ Fetches and verifies images

Core OS

What is rkt?

stage0:

- ▸ Handles user interaction
- ▸ Fetches and verifies images
- ▸ Manages the image store

Core OS

What is rkt?

stage0:
- ▸ Handles user interaction
- ▸ Fetches and verifies images
- ▸ Manages the image store
- ▸ Handles dependencies

Core OS

What is rkt?

stage0:

- ▸ Handles user interaction
- ▸ Fetches and verifies images
- ▸ Manages the image store
- ▸ Handles dependencies
- ▸ Renders images

Core OS

What is rkt?

stage0:

- ▸ Handles user interaction
- ▸ Fetches and verifies images
- ▸ Manages the image store
- ▸ Handles dependencies
- ▸ Renders images
- ▸ Execs stage1

Core OS

What is rkt?

stage1:

What is rkt?

stage1:
  ▸ Sets up isolation for pod

Core OS

What is rkt?

stage1:

- ▸ Sets up isolation for pod
- ▸ Sets up relevant networking

Core OS

What is rkt?

stage1:

- ► Sets up isolation for pod
- ► Sets up relevant networking
- ► Sets up mounts

Core OS

What is rkt?

stage1:

- ▸ Sets up isolation for pod
- ▸ Sets up relevant networking
- ▸ Sets up mounts
- ▸ Execs stage2

Core OS

What is rkt?

The stage2 is user provided - your app!

Core OS

What is rkt?

Available stage1s:

What is rkt?

Available stage1s:
- ► coreos

Core OS

What is rkt?

Available stage1s:

- ▸ coreos
- ▸ host

Core OS

What is rkt?

Available stage1s:
- ► coreos
- ► host
- ► fly

Core OS

What is rkt?

Available stage1s:

- ▸ coreos
- ▸ host
- ▸ fly
- ▸ kvm

Core OS

What is rkt?

systemd isn't required to use rkt!

What is rkt?

systemd isn't required to use rkt!

But if you are using systemd:
- ▸ Trivial to have rkt in systemd units

Core OS

What is rkt?

systemd isn't required to use rkt!

But if you are using systemd:
- ▸ Trivial to have rkt in systemd units
- ▸ journald integration

Core OS

What is rkt?

systemd isn't required to use rkt!

But if you are using systemd:
- ▸ Trivial to have rkt in systemd units
- ▸ journald integration
- ▸ machined integration

Core OS

Outline

Core OS

Outline

Core OS

What is kubernetes?

Kubernetes is:
- ► container orchestration
- ► cluster-level
- ► fault tolerant

Core OS

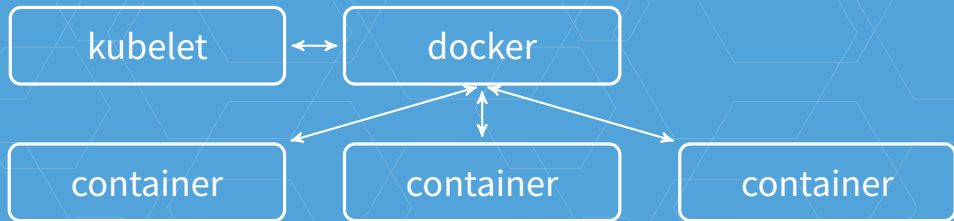# What is kubernetes?

etcd

Core OS

What is kubernetes?

etcd

API Server

Core OS
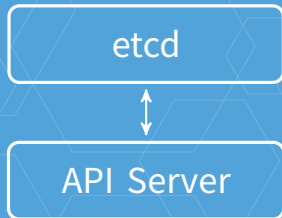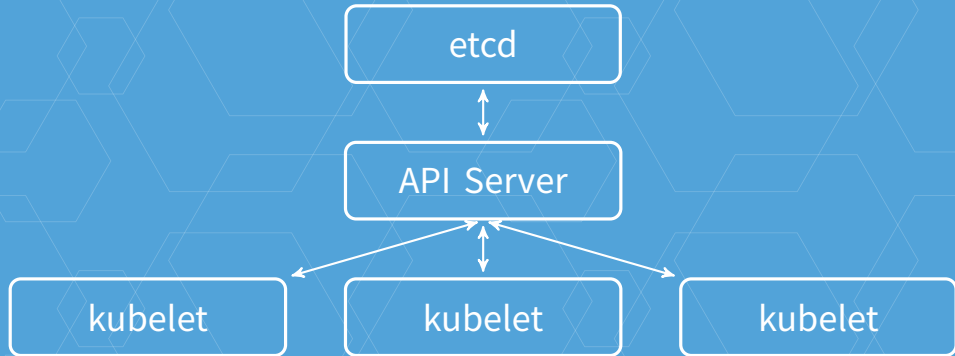
What is kubernetes?

What is kubernetes?

kubelet

Core OS

What is kubernetes?

What is kubernetes?

Outline

Core OS

Outline

Core OS

What is rktnetes?

Use rkt as the container runtime!

Core OS

What is rktnetes?

Current status:

Core OS

What is rktnetes?

Current status:
- ▸ Support included in Kubernetes 1.3

Core OS

What is rktnetes?

Current status:
- ▸ Support included in Kubernetes 1.3
- ▸ >90% of common end-to-end tests pass with rkt

Core OS

What is rktnetes?

Current status:

- ▸ Support included in Kubernetes 1.3
- ▸ >90% of common end-to-end tests pass with rkt
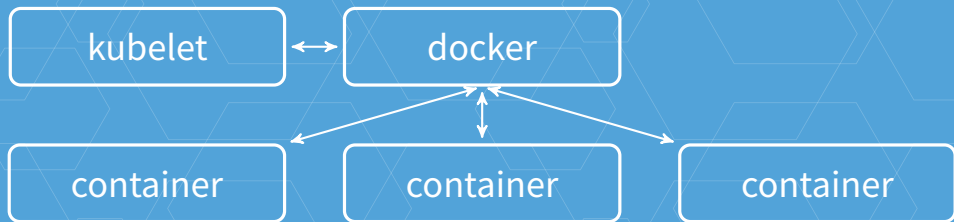- ▸ Still working on refining the integration

Core OS

Outline

Core OS

Outline

- ▶ What is rkt?
- ▶ What is kubernetes?
- ▶ What is rktnetes?
- ▶ **How does rktnetes work?**
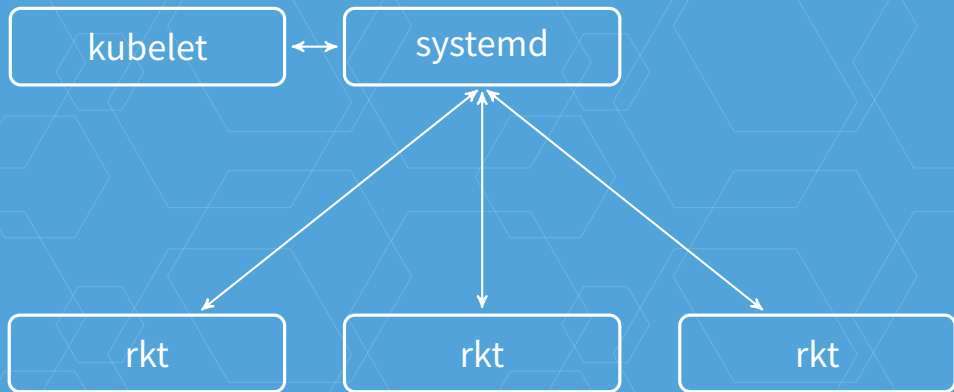- ▶ Why rktnetes?

Core OS

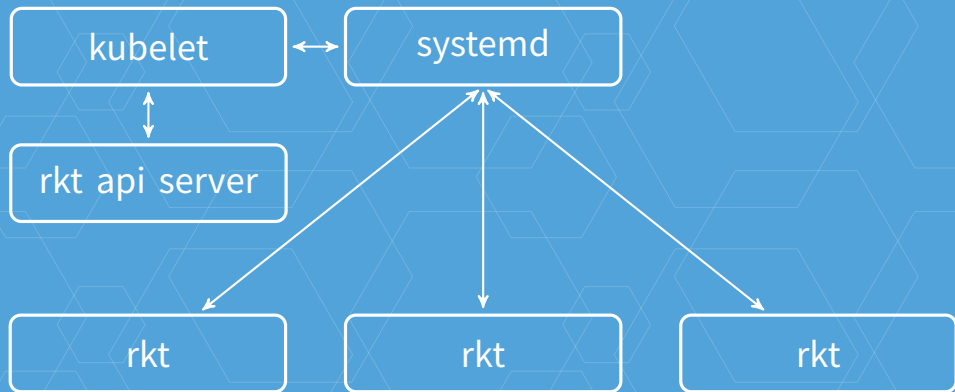# How does rktnetes work?

How does rktnetes work?

kubelet

Core OS

How does rktnetes work?

How does rktnetes work?

How does rktnetes work?

kubelet ↔ systemd

rkt api server

rkt   rkt   rkt

Core OS

How does rktnetes work?

rktnetes prerequisites:

Core OS

How does rktnetes work?

rktnetes prerequisites:
  ▸ The host must use systemd

Core OS

How does rktnetes work?

rktnetes prerequisites:
- ▸ The host must use systemd
- ▸ rkt v1.9.1 or greater must be installed

Core OS

How does rktnetes work?

rktnetes prerequisites:
- ▸ The host must use systemd
- ▸ rkt v1.9.1 or greater must be installed
- ▸ The rkt api service must be running

Core OS

How does rktnetes work?

How do I use rktnetes?

Core OS

How does rktnetes work?

How do I use rktnetes?
- ▸ Add `--container-runtime=rkt` to the kubelet

Core OS

Outline

- ▶ What is rkt?
- ▶ What is kubernetes?
- ▶ What is rktnetes?
- ▶ **How does rktnetes work?**
- ▶ Why rktnetes?

Core OS

Outline

- ▸ What is rkt?
- ▸ What is kubernetes?
- ▸ What is rktnetes?
- ▸ How does rktnetes work?
- ▸ **Why rktnetes?**

Core OS

Why rktnetes?

Why did we build this?
- ▸ Path to a generic container runtime interface
- ▸ rkt has a different feature set than docker

Core OS

Questions?

Core OS

By the way:

By the way:

Kubernetes Community Bash

Tonight at 7 pm

Real Sports Bar & Grill

https://kubernetesecosystembash.eventbrite.com/

Core OS