CONTAINER RUNTIMES

DRAW SOME LINES

Devconf.IN 2019 Bangalore, IN

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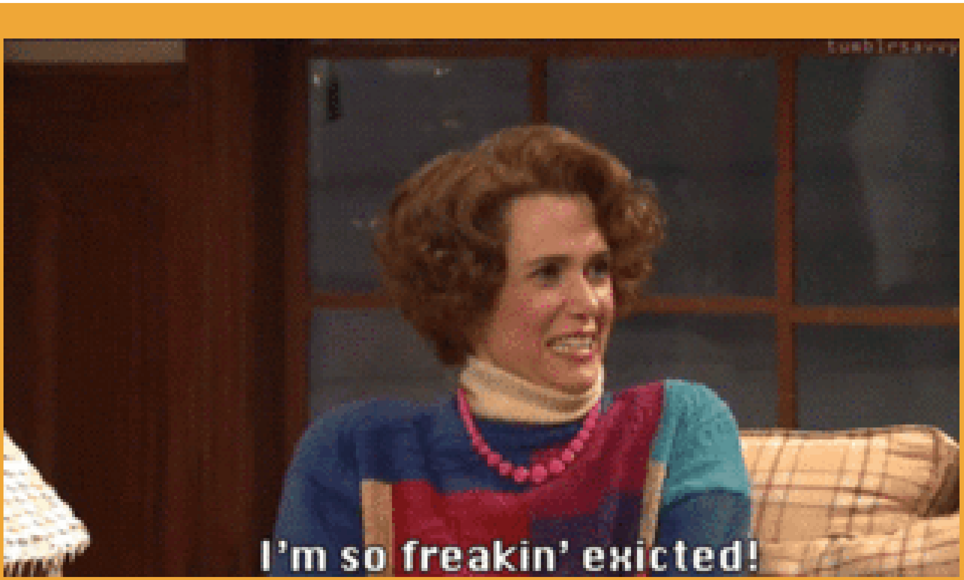
```
$> finger $(whoami)
Login: vbatts                           Name: Vincent Batts
Directory: /home/vbatts                 Shell: /bin/bash
Such mail.
Plan:
OHMAN
$> id -Gn
devel opencontainers docker appc redhat golang slackware
```



CONTAINERS

(Cite: the internet)

CONTAINERS

(Cite: The Internet)

CONTAINER RUNTIMES

A HISTORY

chroot + unshare (mnt ns) + cgroups

LXC

- first release Aug 2008
- alive and well today
- https://linuxcontainers.org/

systemd-nspawn

- first commit in 2011
- alive and well today
- originally just a simple test and debug utility

CONTAINER RUNTIMES

A HISTORY

Docker

- all the things
- 2013 python script became golang
- (not a single good link to the source)

lmctfy

- 2013
- academic offering
- dead, but still a good example of form over function

rkt

- Dec 2014
- spec-first design (appC spec)

CONTAINER RUNTIMES

A HISTORY

libct

- from odis/openVZ folks
- C library of container helpers (not docker or lxc related)

libcontainer (now runc)

- 2014
- to have something golang native, rather than shell-out to lxc
- (eventually meant more shelling-out)
- the original OCI runtime

lxd

- 2014
- container manager built on lxc
- (came after Docker made asks of lxc, then abandoned it for libcontainer)

CONTAINER RUNTIMES

A HISTORY

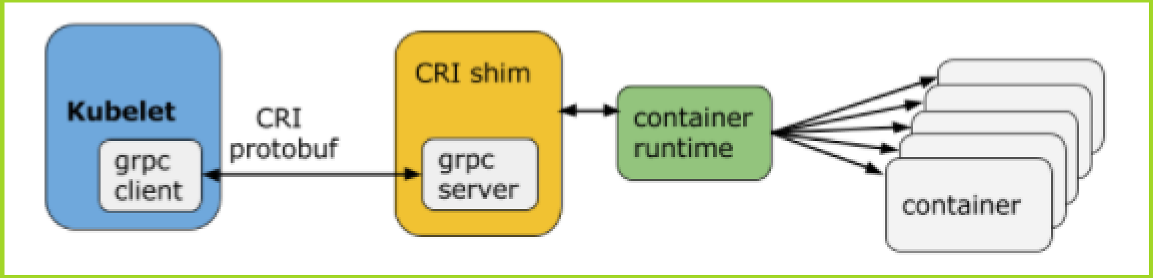
OCI Specification

- 2015
- (image and runtime) v1.0.0 in 2017
- distribution-spec began 2018 (formerly docker registry API)

CONTAINER RUNTIME INTERFACE

Kubernetes

- 2014
- was (is?) entirely too docker-centric
- with rkt it was clear there were big changes needed
- Enter CRI (2016)
  - gRPC interface for ImageService and RuntimeService



(source)

migration via dockershim

- completely switched to docker via CRI in v1.8

CONTAINER RUNTIME INTERFACE

cri-o (originally oci-d)

- kubernetes only use-case
- OCI images and runtime
- primarily called runc, but is flexible to call other runtimes

containerd

- primarily docker use-case, but includes a CRI shim
- OCI and Docker images

alibaba/pouch

- swiss arm knife of sorts
- uses kvm pieces
- supports 2.6.32+ kernel
- imports from runc, docker, p2p backend, and expose a CRI socket

CONTAINER RUNTIME INTERFACE

cri-tools

- `crictl`
- the cli for working or debugging directly with CRI layer

OCI RUNTIMES

openconatainers/runc

- 2014
- to have something golang native, rather than shell-out to lxc
- (eventually meant more shelling-out)
- the original OCI runtime

oracle/railcar

- 2017
- an OCI runtime
- written in rust

kata-containers (formerly clear containers and hyperV)

- mixed years
- an OCI runtime
- thinVM (qemu with custom machine type)

OCI RUNTIMES

nabla-containers (IBM research)

- has an OCI runtime
- unikernel approach
- requires tailored container images with their executor

nvidia fork of runc

- inherently an OCI runtime
- exposes GPU specific configuration

google/gvisor (`runsc`)

- has an OCI runtime
- syscall emulation layer
- uses a bit of kvm
- feels a bit like thrown over the wall

windows/hcsshim (`runhcs`)

- has an OCI runtime
- windows native container API

OCI RUNTIMES

- giuseppe/crun
  - thin OCI runtime written in C
- projectatomic/bwrap-oci
  - OCI runtime wrapper around bubblewrap
- vbatts/nspawn-oci
  - OCI runtime wrapper around systemd-nspawn
- wking/ccon
  - OCI pet project of community member

systemd-nspawn native support (pr9762)

- preferable than wrapper
- still has a couple of pieces missing like hooks and compatible cli

NON-DOCKER OPTIONS

umoci

- utility for working with OCI container images
- unpack, modify, repack

skopeo

- initially just remote inspect images
- now copies (local <=> remote) and translates formats

buildah

- drop-in for `docker build`, as well as shell subcommands
- direct invocation
- now supports non-root builds

podman

- easy alias for `docker`
- direct invocation
- now supports non-root

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THANKS!