Kubernetes and OpenShift

The direction of travel for containerised apps

Tim Dudgeon, Alan Christie
Informatics Matters Ltd.

Look Mum, no Docker!

- Docker has changed our world, but ...
- … Alternatives are appearing
  - Because of Docker's perceived control of the ecosystem
  - To address design issues such as the big fat daemon running as root
- In particular take a look at:

Singularity

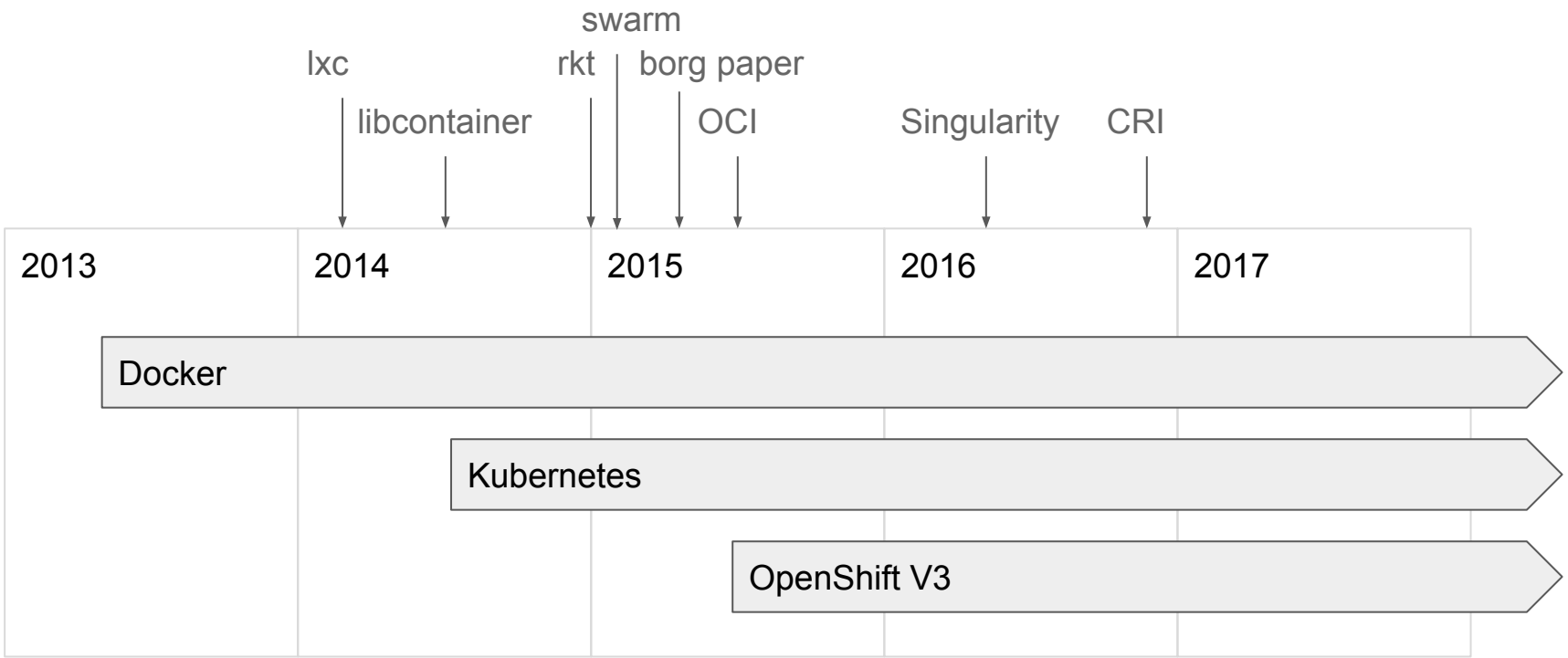
- https://singularity.lbl.gov/
- Daemon-less approach to running containers
- Favoured by HPC admins
- Significant traction in scientific computing

Kubernetes & Openshift

- https://kubernetes.io/
- https://www.openshift.com/
- Community effort led by Google and Red Hat, CoreOS and others

History of Containers

2002 - Namespaces
2008 - CGroups



What is Docker

- Docker Inc. did not invent containers
- They just made them easy to use by providing:
  - `docker build` - for building container images
  - Docker Hub for storing and sharing images
  - `docker run` and `docker-compose` for running containers
- Created a fast moving ecosystem
  - but breaking backward compatibility at times
- Open Source, but Docker Inc. controlled the process
- Some “design flaws”
  - That big fat daemon running as root

What is Kubernetes?

- A distributed operating system for containers
  - Linux is the OS for your server
  - K8S is the OS for your cluster
- Handles orchestration, scaling, failures, persistence, secrets ....
  - Designed work working at scale - 1000’s of nodes
- Came from Google’s experiences with the Borg
  - but with significant input from Red Hat, CoreOS, Intel, IBM and others
- Initial versions were based around Docker, but there are now other options
- Runs on cloud platforms or bare metal
- Docker created Swarm to handle many of these aspects, but K8S is more capable and seems to have more momentum
  - Docker have now incorporated K8S as an alternative to Swarm

What is OpenShift

- Red Hat's distribution of K8S: K8S++, or K8S for grown ups
  (Openshift V1 and V2 were based on something completely different)
- Adds some key ingredients
  - CI/CD capabilities
    - Image Streams
    - Dockerfile, S2I, Jenkins, Custom
    - Rolling deployments
  - Enhanced Security
    - Vetting and rebuilding images
    - By default containers run as arbitrarily assigned user ID
    - Used by banks, governments ...
  - Support - subscription similar to your RHEL subscriptions
    - OpenShift Enterprise is the supported version (=== RHEL)
    - OpenShift Origin is the upstream product (=== Fedora)

If you think of K8S as the Linux kernel then think of OpenShift as a Linux distribution

Look Mum, no Docker!

It’s now possible to run (Docker) containers without any Docker tooling

Docker Inc	**K8S**
docker daemon (runc)	CRI-O (optional in K8S 1.9, default in 1.10)
docker run	podman
docker build	buildah
docker pull/push	skopeo

See Dan Walsh’s talk: https://www.youtube.com/watch?v=BeRr3aZbzqo&t=2136s

https://github.com/projectatomic/buildah

Buildah - building containers

Dockerfile

```
FROM centos:7

RUN yum install -y epel-release &&\
  yum update -y &&\
  yum -y install nginx --setopt install_weak_deps=false

EXPOSE 80

CMD ["nginx", "-g", "daemon off;"]
```

Yum is needed to install nginx, but once installed has nothing to do with running nginx.

To run yum you need python. Running nginx has no need for python.

```
$ sudo buildah bud .
...
$ sudo buildah images
IMAGE ID             IMAGE NAME            CREATED AT              SIZE
49f2f85566e6         <none>                Mar 27, 2018 13:18      407 MB
```

201 packages

nginx-buildah.sh

```
#!/bin/bash

set -x

newcontainer=$(buildah from scratch)
scratchmnt=$(buildah mount $newcontainer)

yum install bash coreutils nginx --installroot $scratchmnt --releasever 7\
  --setopt install_weak_deps=false --setopt=tsflags=nodocs\
  --setopt=override_install_langs=en_US.utf8 -y

yum clean all -y --installroot $scratchmnt --releasever 7

buildah config --label name=nginx-buildah --port 80\
  --cmd 'nginx -g "daemon off;"' $newcontainer

buildah unmount $newcontainer
buildah commit $newcontainer nginx-buildah
```

plain old shell script,
no big fat daemon

build a minimal container

install the packages

set some config info

commit the image

```
$ sudo ./buildah-nginx.sh
...
$ sudo buildah images
IMAGE ID             IMAGE NAME                                      CREATED AT             SIZE
2b8d59b55802         docker.io/library/nginx-buildah:latest          Mar 27, 2018 08:10     313.6 MB
```

166 packages

Conclusion

The container ecosystem continues to evolve rapidly.

Whilst “Docker containers” will remain the norm they may not have much or anything to do with Docker.

Your options are rapidly increasing.

Keep your eyes open!

Thank you!

tdudgeon@informaticsmatters.com
achristie@informaticsmatters.com
www.informaticsmatters.com