DISTROLESS IMAGES

Securing Your Docker Images

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THE AGENDA

- Container History
- Containers in Real Life
- Container Gotchas
- Distroless Images

ALL ABOUT . . .

CONTAINERS

SHARING LIMITED RESOURCES

1979 / 1982- chroot

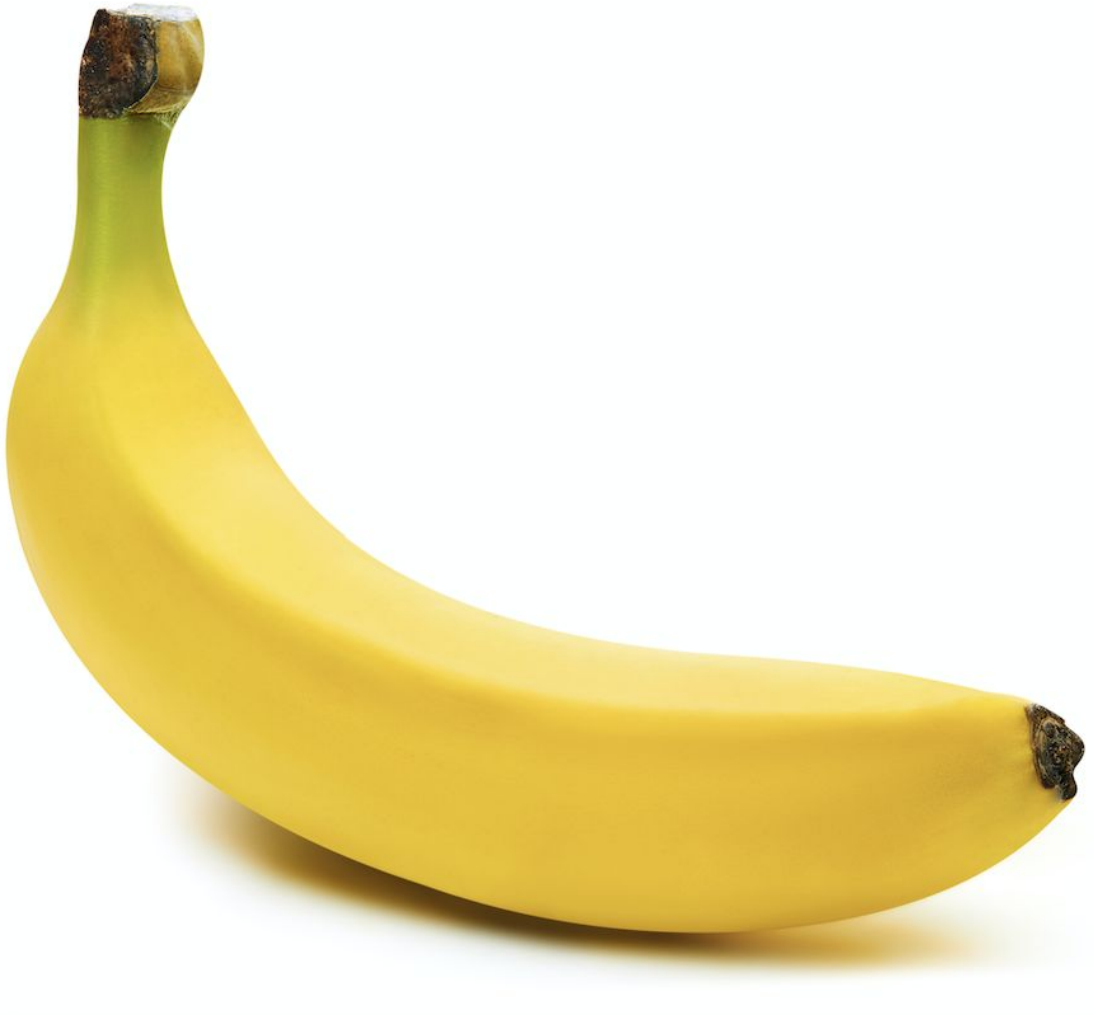
PROGRESS TOWARD VIRTUALIZATION

- 2000 - FreeBSD jail
- 2004 - Solaris Zones / snapshots
- 2006 - Google Process Containers / cgroups
- 2008 - IBM **L**inu**X** **C**ontainers (LXC)
- 2013 - Docker (open source!)
  - Google LMCTFY (open source!)
- 2014 - Docker trades LXC for libcontainer
- … *more stuff happened*
- June 2015 - Open Container Project/Initiative (OCI)
  - Runtime Specification (runtime-spec)
  - Image Specification (image-spec)
- … *even more stuff happened and is* ***still happening!***

2011
Java 7

2014
Java 8

WHAT EXACTLY IS A CONTAINER?



CONTAINER COMPONENTS

TARBALL OF A FILESYSTEM

LINUX FEATURES

- namespaces
- cgroups
- Union File systems

```
docker-desktop:~# lsns
        NS TYPE   NPROCS   PID USER COMMAND
4026532297 mnt         13 13436 999  postgres
4026532298 uts         13 13436 999  postgres
4026532299 ipc         13 13436 999  postgres
4026532300 pid         13 13436 999  postgres
4026532302 net         13 13436 999  postgres
```

```
~ ▷ docker stats
CONTAINER           CPU %   MEM USAGE / LIMIT
d99745e33562        0.01%   480KiB / 1GiB
9094a1844f8e        4.16%   1.338GiB / 1.944GiB
fcf20c230c2c        0.19%   19.41MiB / 1.944GiB
```

Mix these together to create and run a container! Voila!

https://docs.docker.com/get-started/overview/

FILESYSTEM DETAILS

```
~ ▷ docker info
...
Operating System: Docker Desktop
OSType: linux
Architecture: x86_64
CPUs: 8
Total Memory: 1.944GiB
Name: docker-desktop
ID: 2POK:GJEZ:EHWW:WDRH:PYOW:PQ6C:LYAB:XLOH:DYSW:4SSN:A3JR:NXUF
Docker Root Dir: /var/lib/docker
Debug Mode: true
 File Descriptors: 67
 Goroutines: 76
...
```

NOTE: On OSX, containers will actually be running in a tiny Linux VM (use screen)

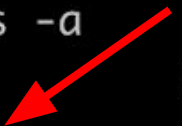
`screen ~/Library/Containers/com.docker.docker/Data/vms/0/tty`

FILESYSTEM DETAILS

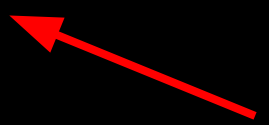
```
~ ▷ docker images
REPOSITORY                                  TAG                 IMAGE ID
mjmckay-app-docker.jfrog.io/my-image        latest              62165ddeceb6
docker.bintray.io/jfrog/artifactory-jcr     7.5.7               8b3066e25260
~ ▷ docker inspect 8b3066e25260
[
    {
        "Id": "sha256:8b3066e252609e484b032c583dada4ebd6f59b6b5de0a2f597f91b5ed4bcf117",
...
        "GraphDriver": {
            "Data": {
                "LowerDir": "/var/lib/docker/overlay2/b01599ceeaa2761004b4f6a0a0d3d5c368dc40c8f20808434de4ed312029b1ff/diff:/var/lib/docker/overlay2/47dbb7eff56c58762e84b943a98bd1b558b5800b000b98bc6a07bfae53c1d79e/diff:/var/lib/docker/overlay2/2f5763dd07792eb22869fd9118a80d2170eafe6936d78bc73dbc3dc600e
...
                "MergedDir": "/var/lib/docker/overlay2/a0bbe2014fe5a7befe1eaaca401a3d2ac54340e7513e719cffc4383722af9406/merged",
                "UpperDir": "/var/lib/docker/overlay2/a0bbe2014fe5a7befe1eaaca401a3d2ac54340e7513e719cffc4383722af9406/diff",
                "WorkDir": "/var/lib/docker/overlay2/a0bbe2014fe5a7befe1eaaca401a3d2ac54340e7513e719cffc4383722af9406/work"
```

FILESYSTEM DETAILS

```
~ ▷ docker ps -a
CONTAINER ID        IMAGE                                                COMMAND
d99745e33562        mjmckay-app-docker.jfrog.io/my-image:latest          "/bin/sh -c 'tail -f…"
9094a1844f8e        docker.bintray.io/jfrog/artifactory-jcr:7.5.7        "/entrypoint-artifac…"
fcf20c230c2c        docker.bintray.io/postgres:9.6.11                    "docker-entrypoint.s…"
```



```
docker-desktop:~# ls /var/lib/docker/
builder     containers  overlay2    swarm       volumes
buildkit    image       plugins     tmp
containerd  network     runtimes    trust
docker-desktop:~# ls /var/lib/docker/containers/
9094a1844f8e398845a6ae8f44c1cd9b8ffa21101133a6042ec741faf1ff9b0d
d99745e335621a1ed138fa1812d7fc83d9c5e337a159f92efd70ed7ed46df4b0
fcf20c230c2cc706a82bc16a6b9e39ee8a8d82b6508bd03cfd80d1ea2715106c
```



```
~ ▷ docker rm my_image_name
~ ▷ docker system prune
~ ▷ docker run -d --memory=1g mjmckay-app-docker.jfrog.io/my-image:latest --rm
```

CONTAINER GOTCHAS

CONTAINER GOTCHAS
- RUNNING AS ROOT

CONTAINER GOTCHAS
- NO CONSTRAINTS

CONTAINER GOTCHAS
- NEVER UPDATING

CONTAINER GOTCHAS
- JAVA/JVM GOTCHAS

CONTAINER GOTCHAS
- IMAGE BLOAT

DISTROLESS
WHAT'S IN YOUR CONTAINER?

DISTROLESS IMAGES
- AND MULTISTAGE BUILDS

- Waste Not Want Not (smaller images)
- No Shell
- No Exec

```
1   FROM openjdk:11-jdk-slim AS build-env
2   ADD . /app/examples
3   WORKDIR /app
4   RUN javac examples/*.java
5   RUN jar cfe main.jar examples.HelloJava examples/*.class
6
7   FROM gcr.io/distroless/java:11
8   COPY --from=build-env /app /app
9   WORKDIR /app
10  CMD ["main.jar"]
```

https://github.com/GoogleContainerTools/distroless (examples)

MANAGING YOUR IMAGES - REMOTE BY DEFAULT

https://dzone.com/refcardz/getting-started-with-container-registries

START FREE: https://bit.ly/MelissaWKSHP

Q & A

THANK YOU!

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