Docker in the real world

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Agenda

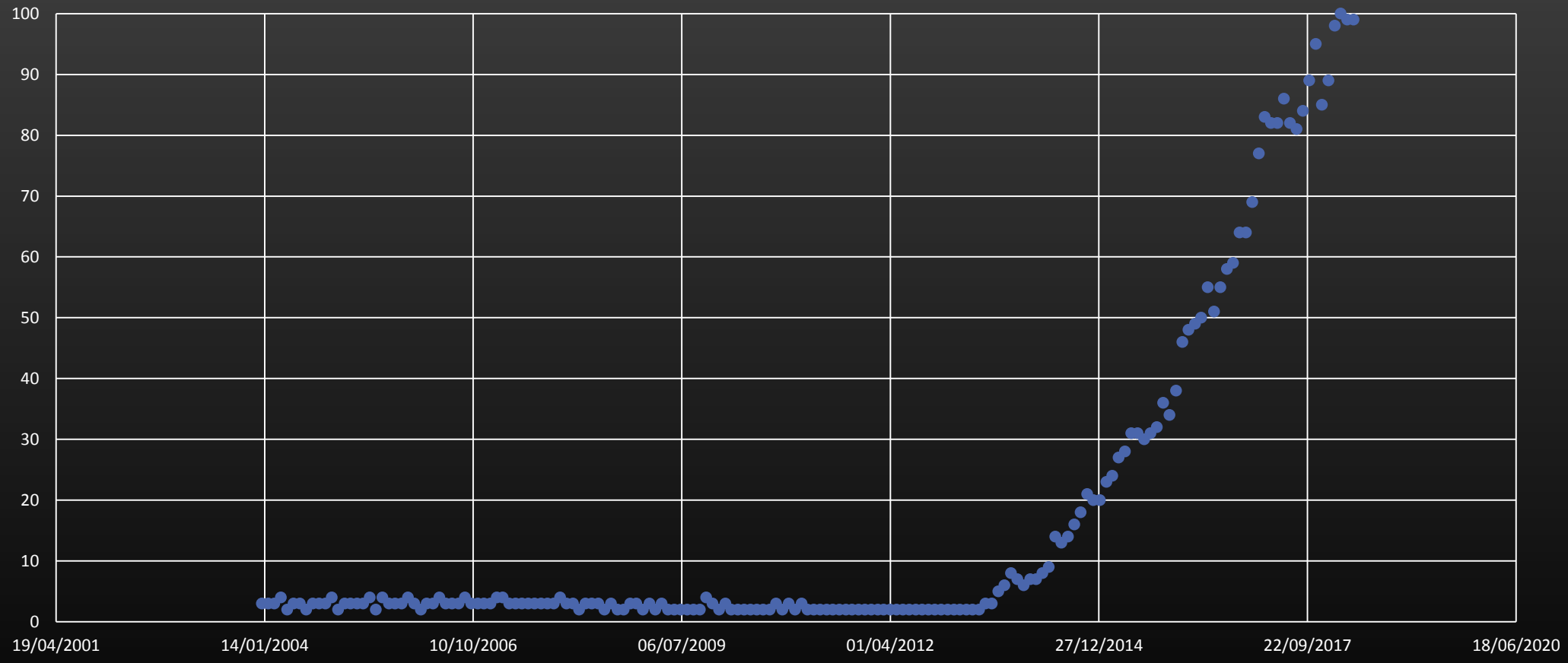
- Who am I?
- A (very) brief history of containers
- Getting started
- Writing your own Dockerfile
- Multi stage builds

- Loads of demos

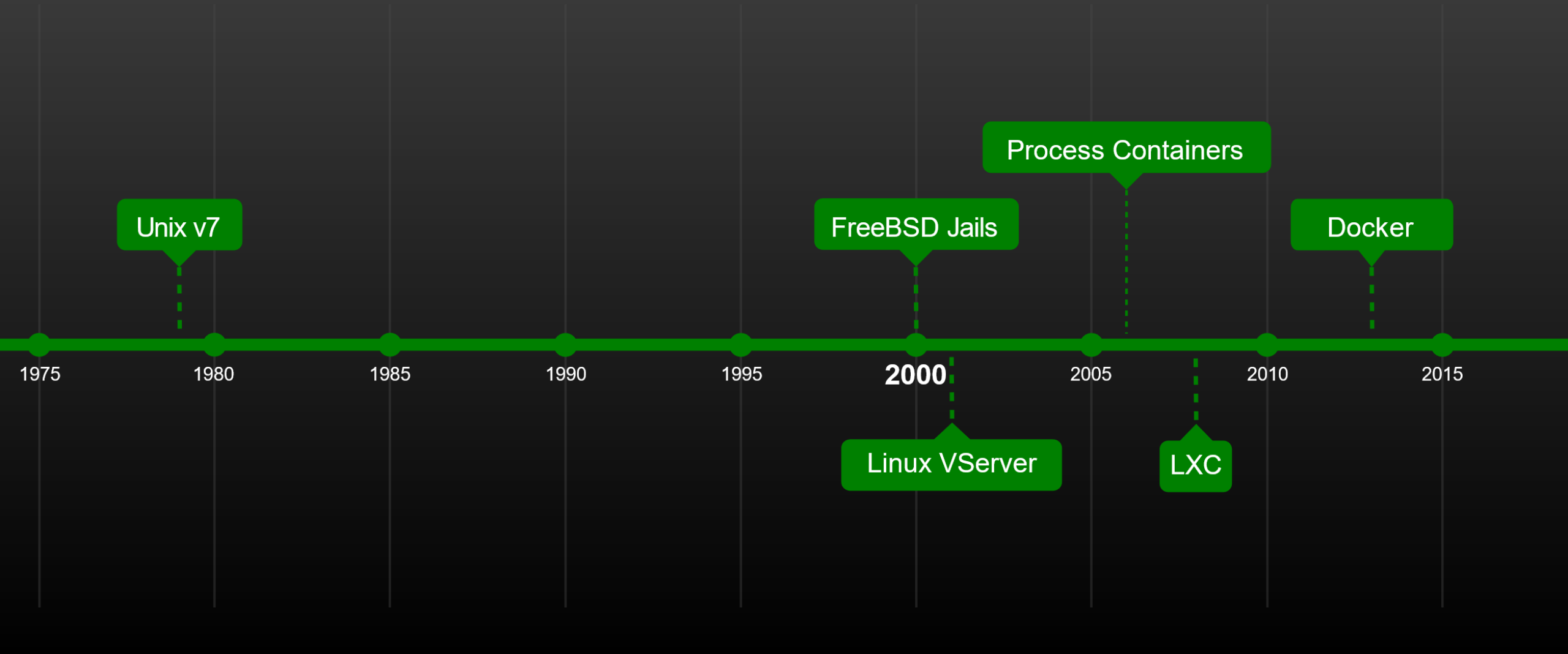
What are Docker containers?

- Containers are runtime environments. You usually run one main process in one Docker container.
- Docker containers are started by running a **Docker image**. A Docker image is a pre-built environment for a certain technology or service.

Google Trend for ‘docker’

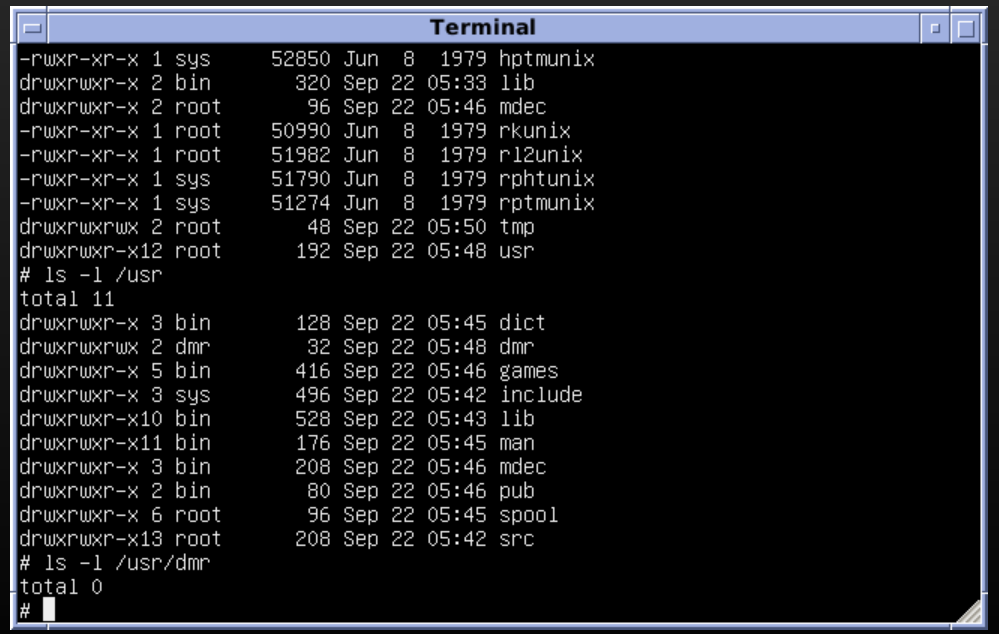


How did we get here?



1979 – Version 7 Unix

- chroot system call was introduced
  - changes the root directory of a process and its children to a new location in the filesystem
- BSD gained chroot in 1982



2000 – FreeBSD Jails

- Administrators can partition a system into several ‘jails’
  - independent, smaller systems
  - IP address for each system and configuration

2001 – Linux vServer

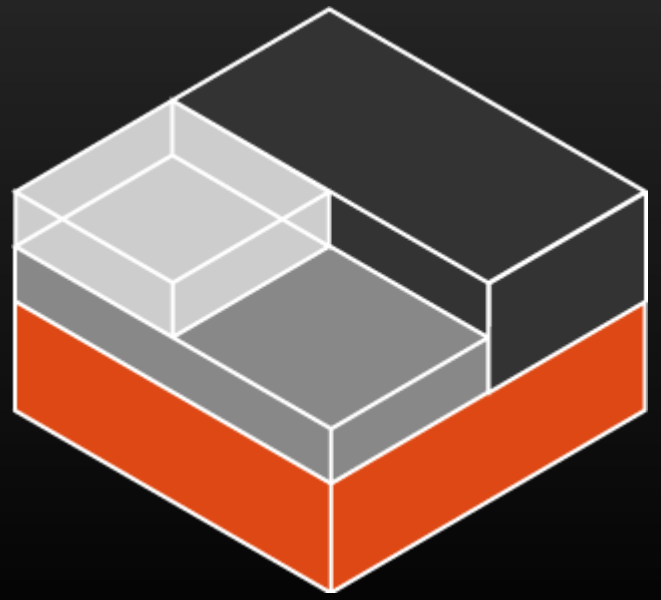
- Similar to FreeBSD jails
- Implemented by kernel patch

2006 – Process Containers

- Launched by Google in 2006
  - Renamed to ‘Control Groups’ in 2007
- Limits, accounting and isolation of process collections
  - CPU
  - Memory
  - Network & Disk access
- Linux kernel 2.6.24

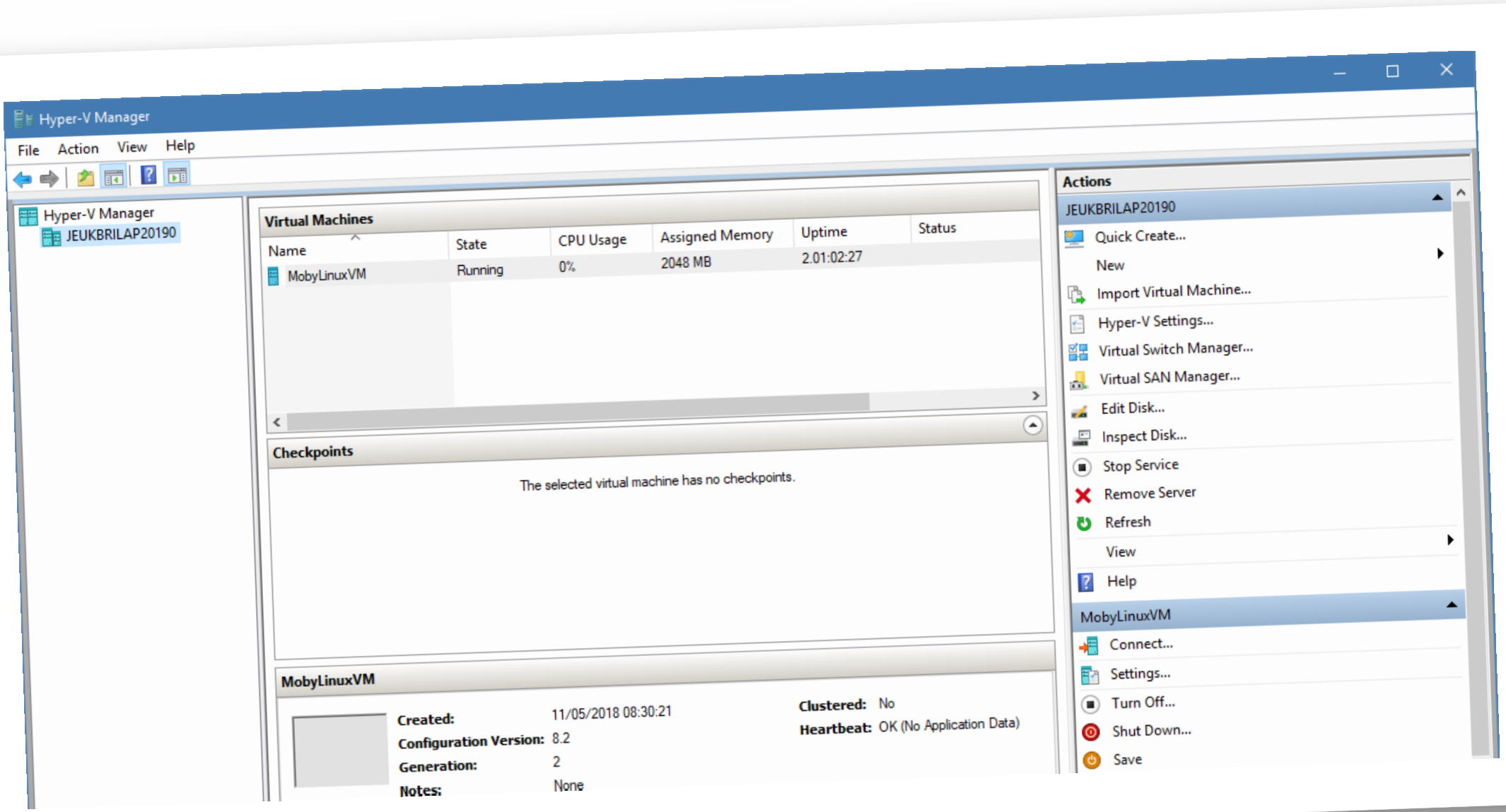
2008 - LXC

- LinuX Containers
- Built using cgroups
- Runs on single Linux kernel
  - Requires no patches

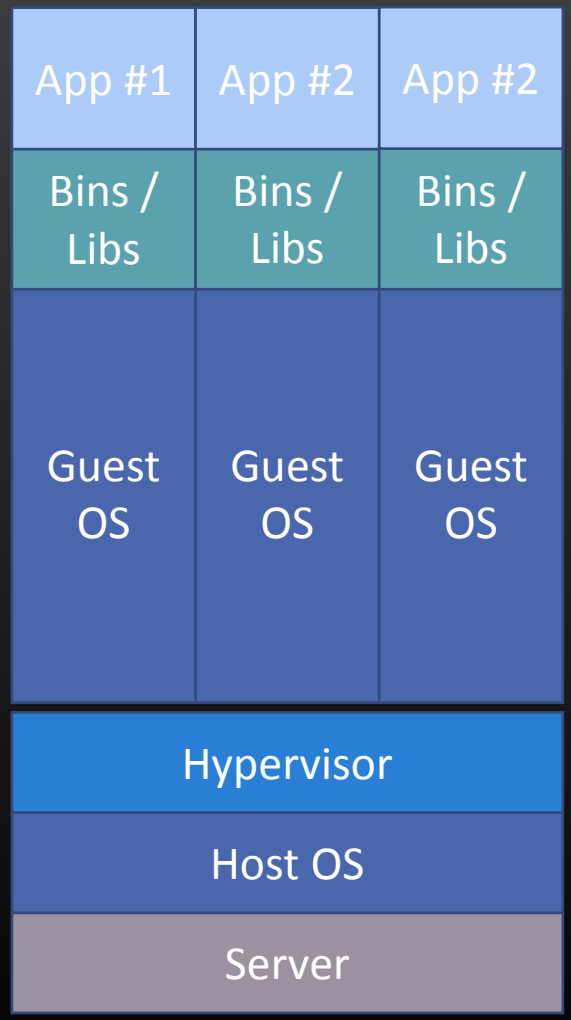


2013 - Docker

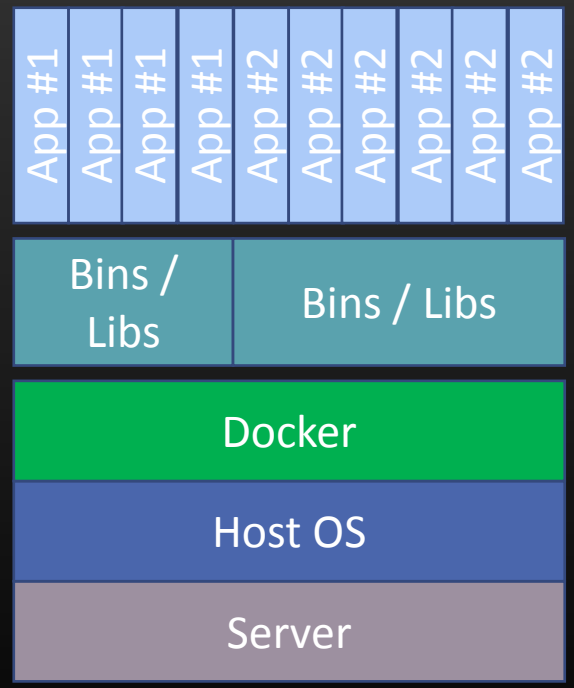
- Originally built using LXC
- Since version 0.9.0 uses it’s own libcontainer library


Hyper-V Manager
File
Action
View
Help
Hyper-V Manager
JEUKBRILAP20190
Virtual Machines
Name
State
CPU Usage
Assigned Memory
Uptime
Status
MobyLinuxVM
Running
0%
2048 MB
2.01:02:27
Checkpoints
The selected virtual machine has no checkpoints.
MobyLinuxVM
Created:
11/05/2018 08:30:21
Configuration Version:
8.2
Generation:
2
Notes:
None
Clustered:
No
Heartbeat:
OK (No Application Data)
Actions
JEUKBRILAP20190
Quick Create...
New
Import Virtual Machine...
Hyper-V Settings...
Virtual Switch Manager...
Virtual SAN Manager...
Edit Disk...
Inspect Disk...
Stop Service
Remove Server
Refresh
View
Help
MobyLinuxVM
Connect...
Settings...
Turn Off...
Shut Down...
Save

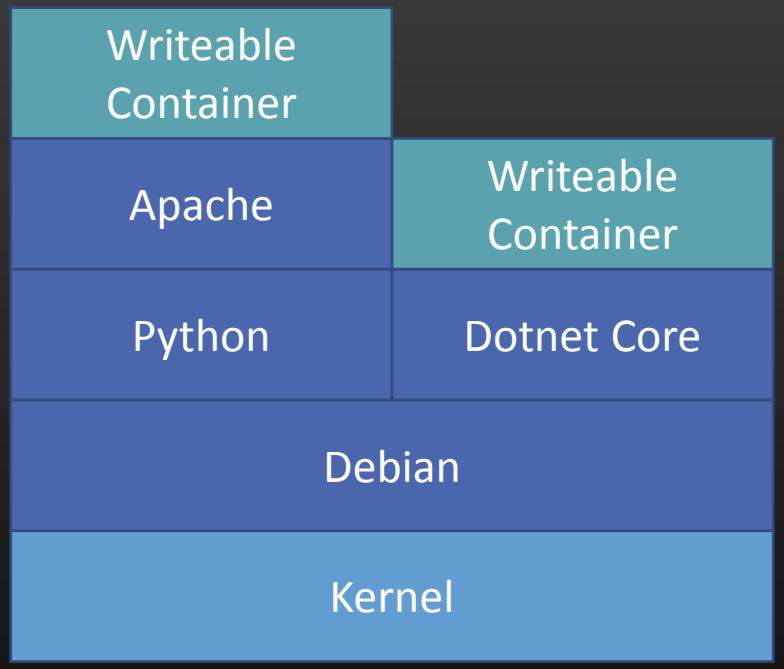
Traditional VMs



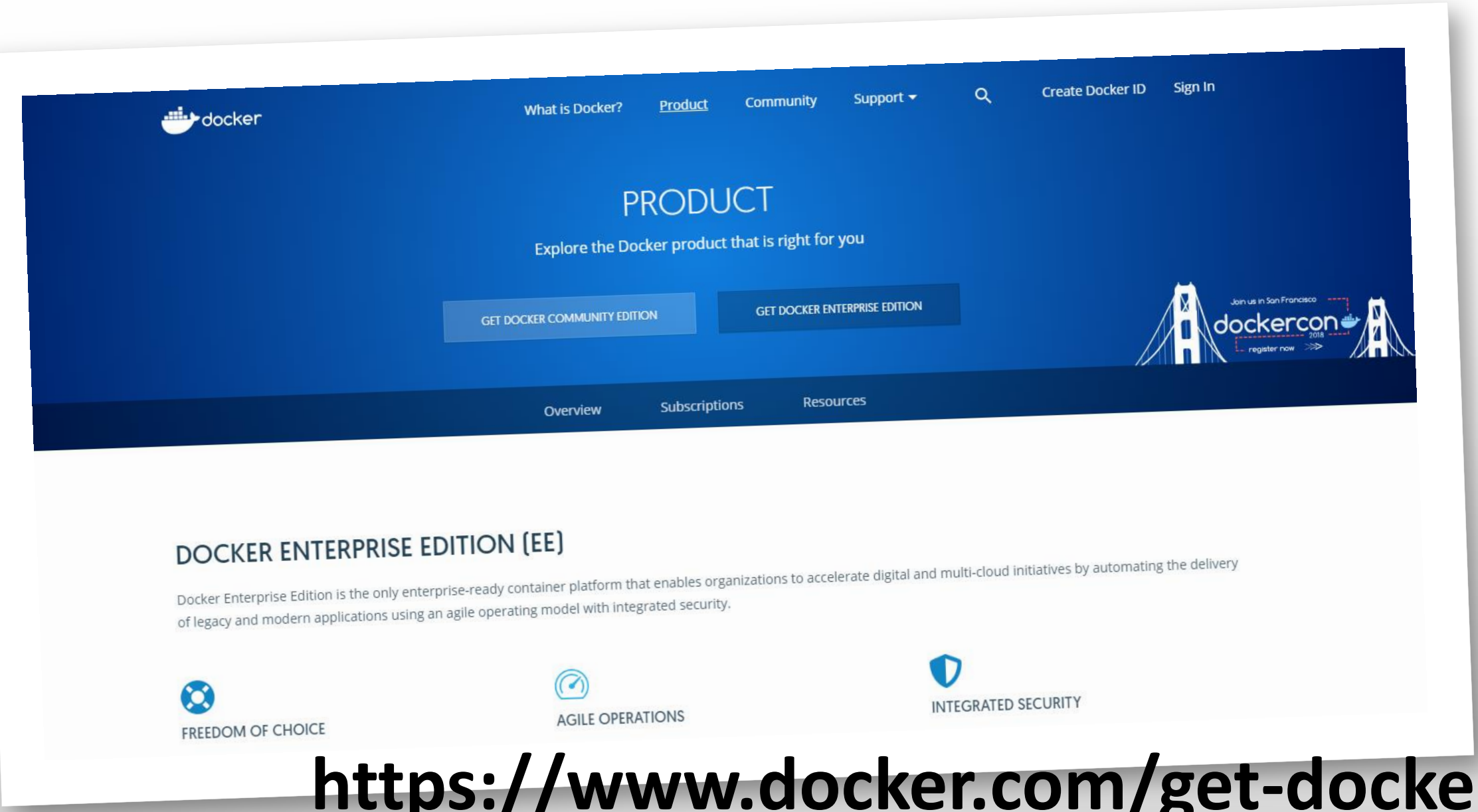
Containerised Application Model



Union Filesystem



First Steps



https://www.docker.com/get-docker

```
$ docker run hello-world
```

Basic docker cheatsheet

- docker run
  - Runs a command in a new container.
- docker start
  - Starts one or more stopped containers
- docker stop
  - Stops one or more running containers
- docker build
  - Builds an image from a Docker file
- docker exec
  - Runs a command in a run-time container
- docker search
  - Searches the Docker Hub for images

Official repositories

- Provide essential base OS repositories (for example, ubuntu, centos)
- Provide drop-in solutions for popular programming language runtimes, data stores, and other services
- Exemplify Dockerfile best practices and provide clear documentation to serve as a reference for other Dockerfile authors.
- Ensure that security updates are applied in a timely manner.

Writing your first Dockerfile

Basic Dockerfile commands

- FROM
  - The base image to use in the build. This is mandatory and must be the first command in the file.
- COPY / ADD
  - Copies a file from the host system onto the container
- CMD / ENTRYPOINT
  - The command that runs when the container starts
- ENV
  - Sets an environment variable in the new container
- EXPOSE
  - Opens a port for linked containers
- RUN
  - Executes a command and save the result as a new layer
- USER
  - Sets the default user within the container
- VOLUME
  - Creates a shared volume that can be shared among containers or by the host machine
- WORKDIR
  - Set the default working directory for the container

```
FROM node:8-slim

WORKDIR /server

COPY . /server
RUN npm install

EXPOSE 3000
CMD [ "npm", "start" ]
```

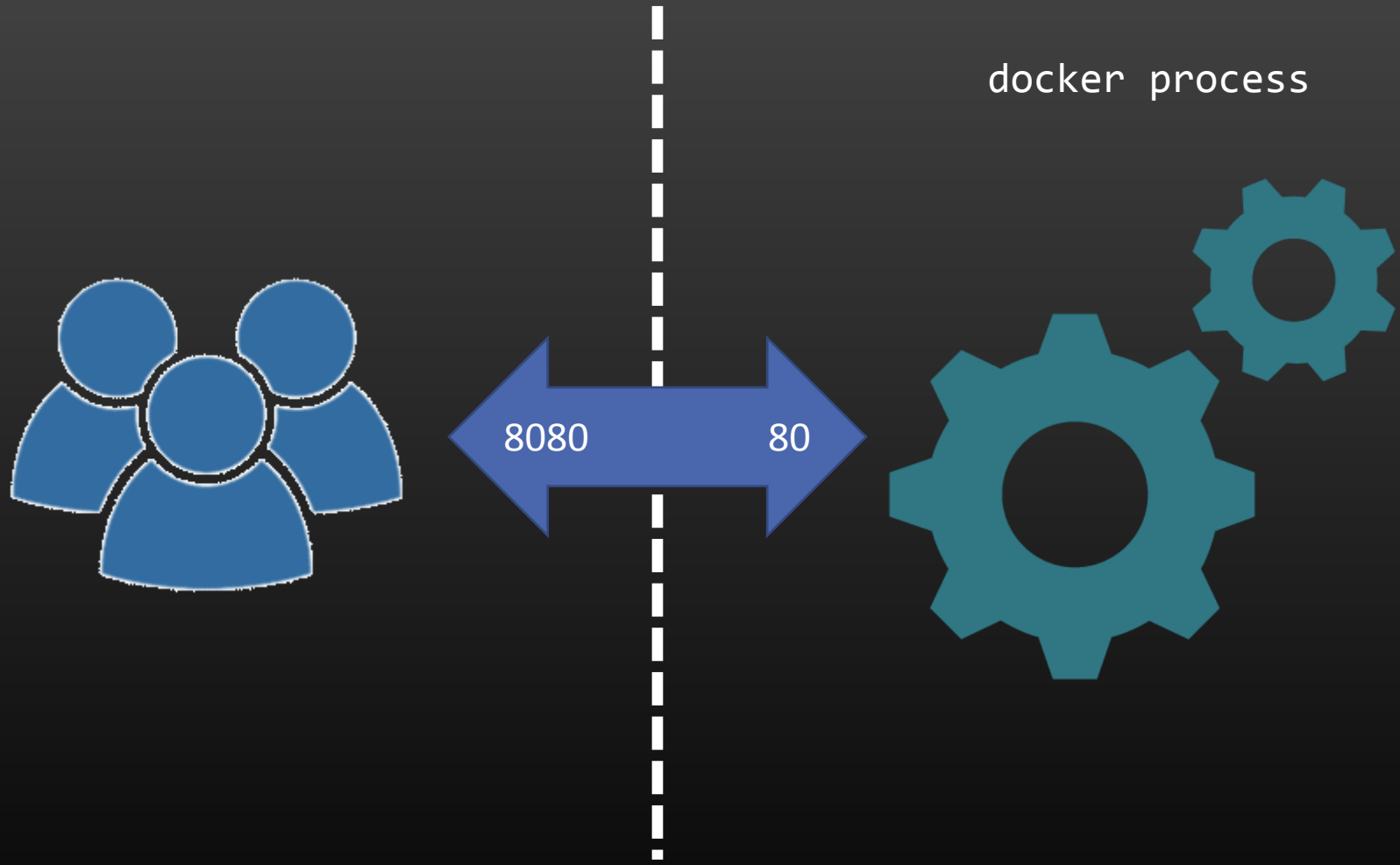
Shell Form vs. Exec Form

- CMD executable param1 param2
  - Executable is launched using /bin/sh -c

- CMD ["executable","param1","param2"]
  - Executable is launched without the use of shell

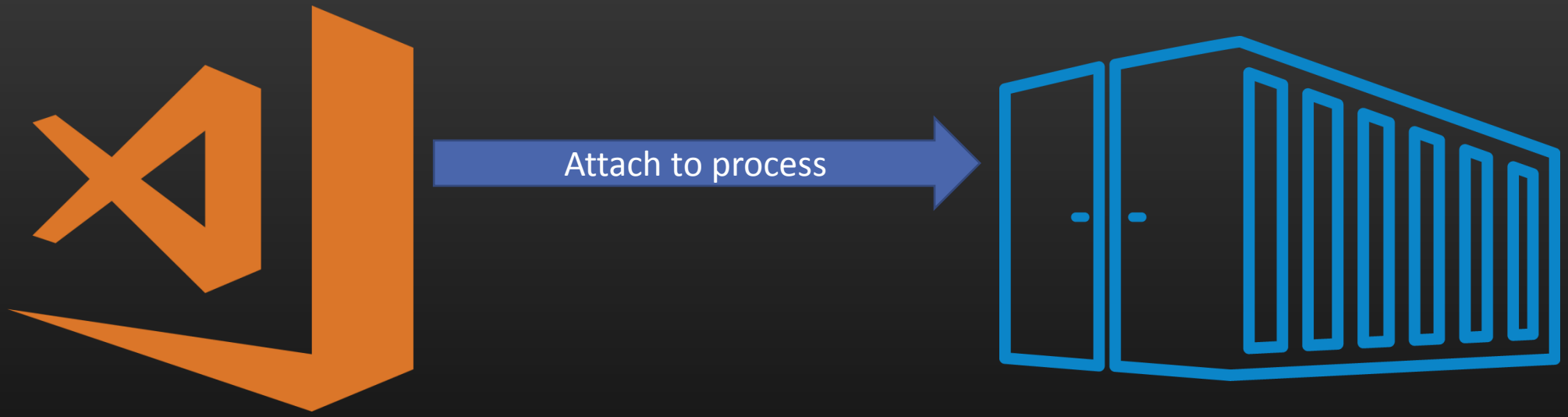
Exec form is preferred in most cases

Exposing yourself to the world




```
docker run --publish 8080:80 ...
```

Debugging a NodeJS application in VSCode


Attach to process

docker-compose

- Tool for defining and running multi-container docker applications
- YAML file to configure your application's services
- Create and start all the services from your configuration with a single command

Multi-Stage Build Files

```
FROM golang:1.7.3
WORKDIR /go/src/github.com/alexellis/href-counter/
RUN go get -d -v golang.org/x/net/html
COPY app.go .
RUN CGO_ENABLED=0 GOOS=linux go build -a -installsuffix cgo -o app .

FROM alpine:latest
RUN apk --no-cache add ca-certificates
WORKDIR /root/
COPY --from=0 /go/src/github.com/alexellis/href-counter/app .
CMD ["./app"]
```

Multiple containers

Going the whole hog…

- Create an ASP.NET Core MVC app
- Create a multi-stage Docker build
  - microsoft/aspnetcore-build for build process
  - microsoft/aspnetcore for the executable image
- Push image to Amazon AWS repository
- Run the container in the cloud

Questions?