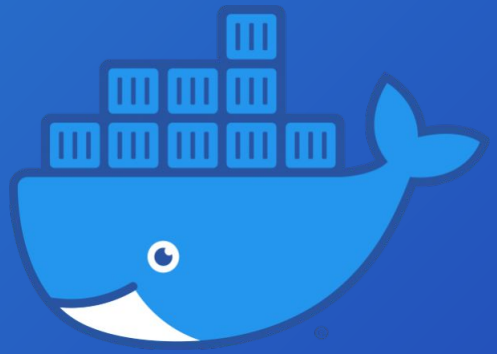


Docker:
Containerization vs Virtualization

Stefan Tobler

TABLE OF CONTENTS

01

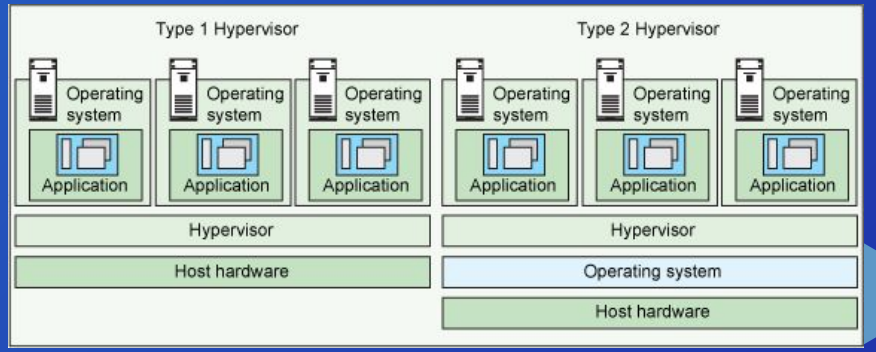
What is Docker not?

It is not a virtual machine!

Docker is not a virtual machine!

What is virtualization?

- Virtualization emulates hardware
- Two types of virtualization
  - Type 1
  - Type 2
- Resources are controlled by a hypervisor
- Complete isolation of guest systems



02

What is Docker?

Containers, application isolation, and more!

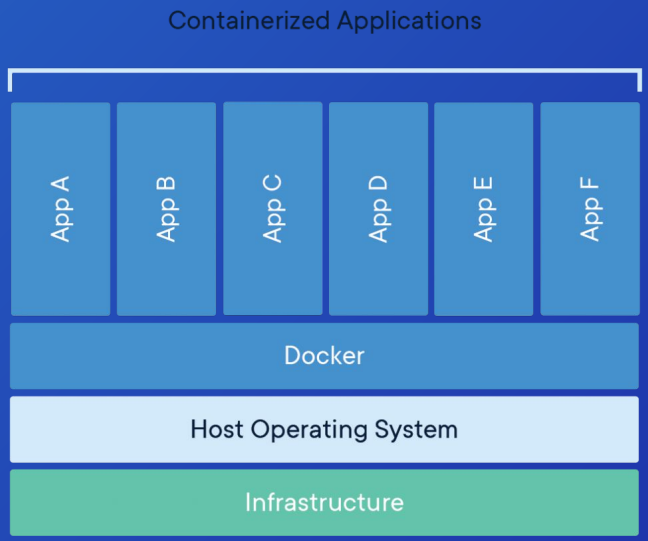
“Docker is an open platform for developing, shipping, and running applications.”

–Docker Documentation

Docker deploys containers!

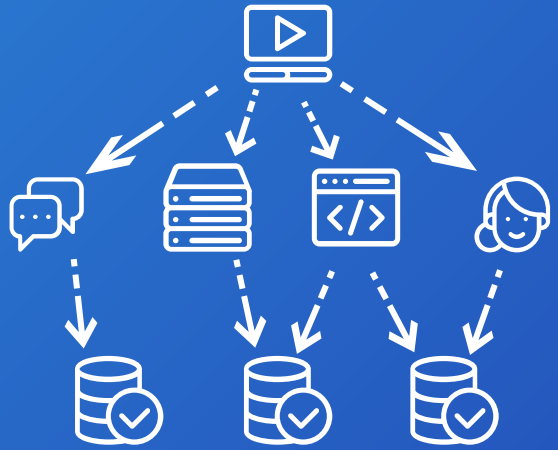
What is a container?

- Loosely isolated environment
- Run on top of the Docker daemon
- Share the kernel with the host OS
- Installs all dependencies and bins to run within the container



Are containers just OS virtualization?

Why use Docker?



- Fast and lightweight
- Microservices
- No conflicting dependencies
- Handle crashes efficiently
- Isolate applications

03

How is Docker Implemented?

namespaces and cgroups

NAME SPACES

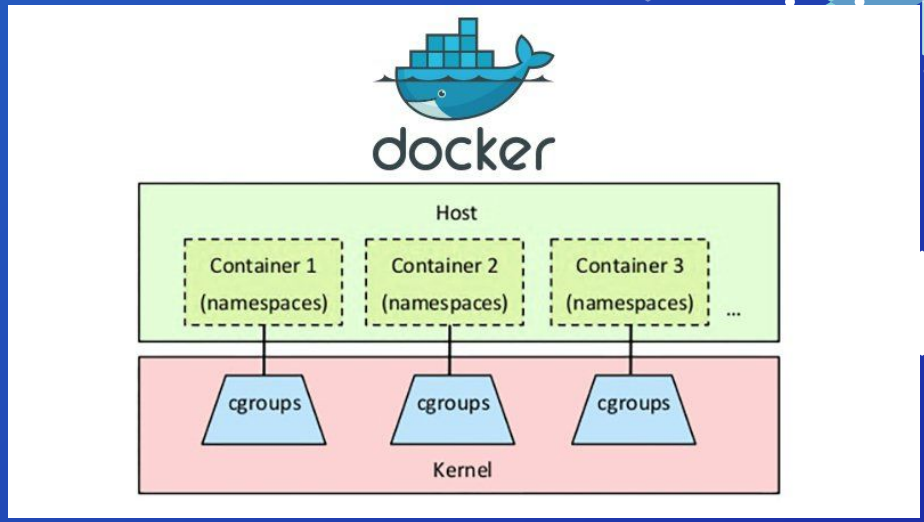
What are namespaces?

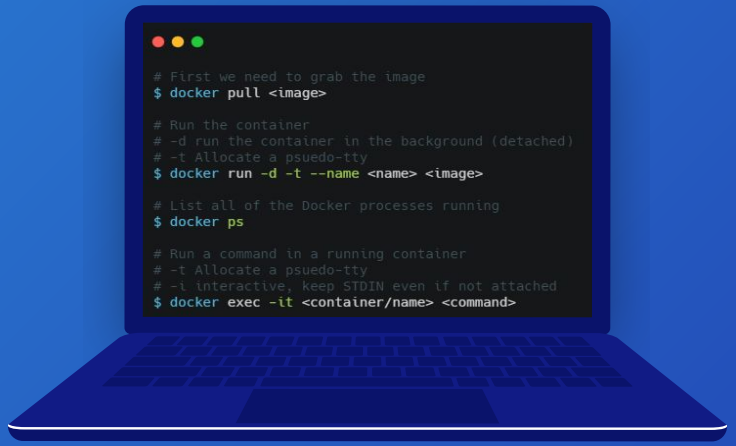
- Made to implement containers
- Creates isolation through abstraction
- Examples of namespaces used by Docker
  - pid - process isolation
  - net - manage network interfaces
  - ipc - manage access to ipc resources
  - mnt - manage filesystem mounts

CGROUPS

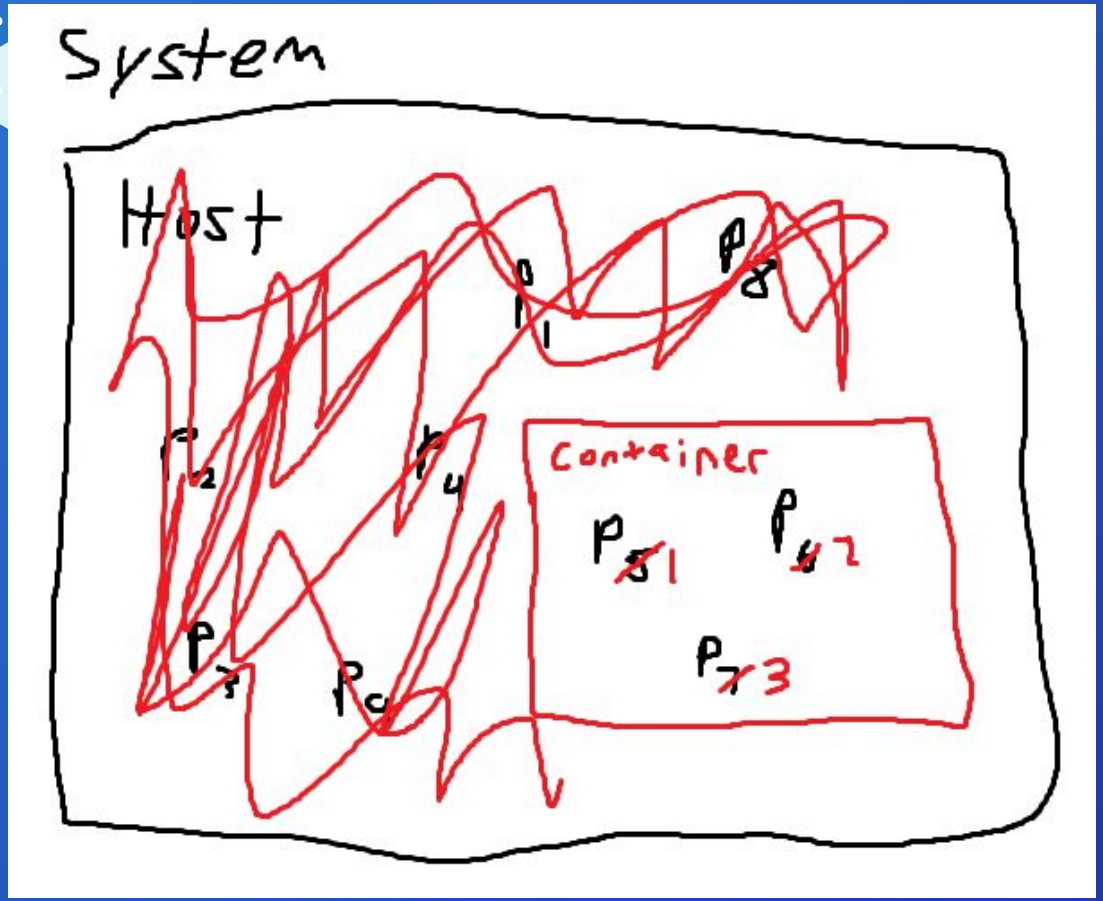
What are cgroups?

- Limit applications to specific resources
- Allows Linux to share hardware across the machine
- Enforce limits and constraints on resources





A look at Docker

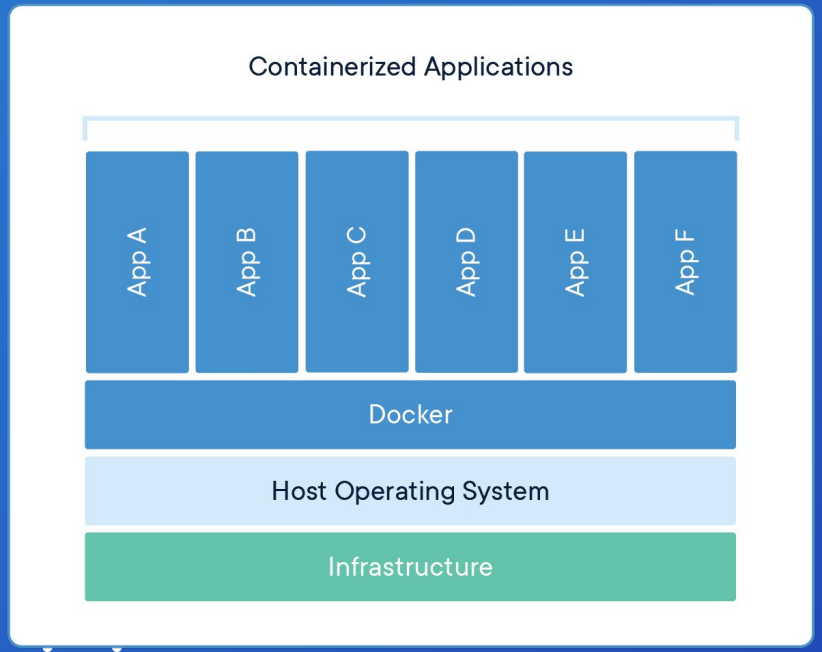

System
Host
Container

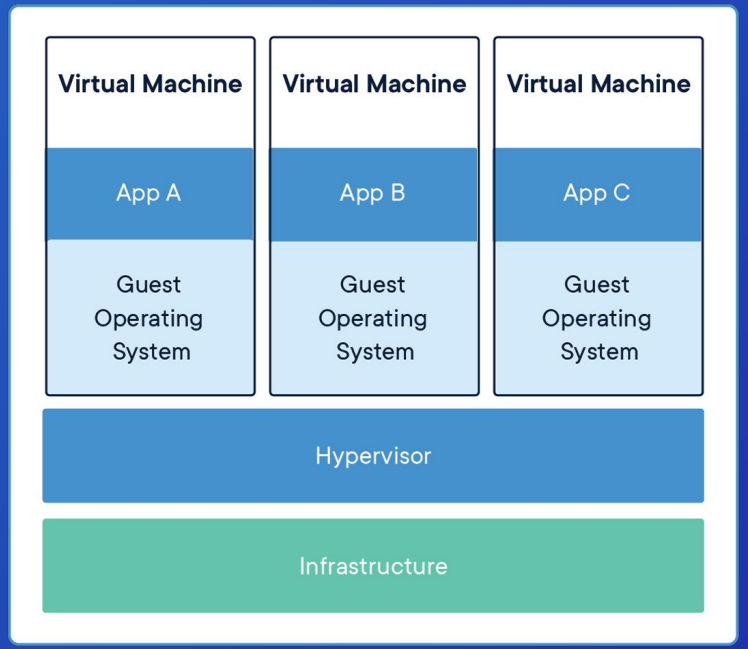
04

Containerization vs Virtualization

The ultimate showdown

What do they look like again?





Containerization

Fast
Kernel is already running, only the application starts.

Lightweight
Images are usually only MB of space.

Portability
Any OS running the same kernel can run the container.

Security
Vulnerable to kernel exploits.

Persistent Data Storage
Data storage can be complex because data needs to be moved out of the container.

OS Requirements
Lack of a dedicated OS, they must share resources.

Virtualization

Security
Each VM is separate and isolated from one another.

Robust Environment
Application has the whole OS at its disposal.

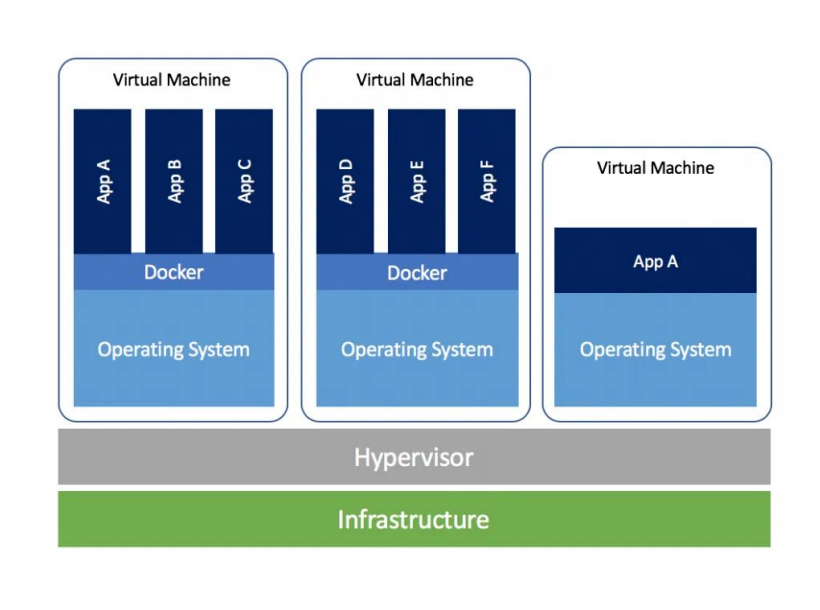
OS Diversity
Able to run OSs with different kernels at the same time.

Slow
Starting up an entire OS, including the full boot process.

Resource Hungry
VM will consume resources even when no applications are running.

Portability
VMs can require a lot of hardware power to run. GBs of OS image.

Concluding Remarks



- Actually implemented like this

- Used in cloud infrastructure
- Security through isolation
- Essential in web services today
- Built together

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Pollock, Antonia. *Virtualization vs. Containerization*. 16 Sept. 2020, www.liquidweb.com/kb/virtualization-vs-containerization/.