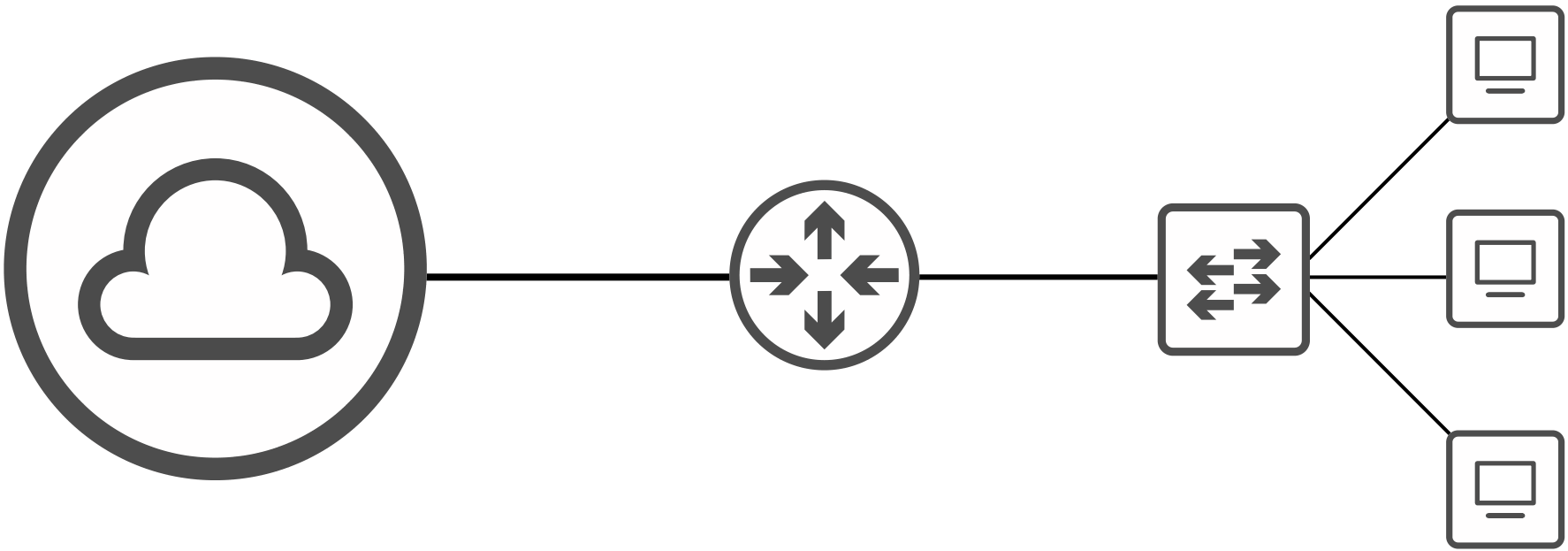
JEREMY'S IT LAB

CCNA

Virtualization: Containers



Things we'll cover

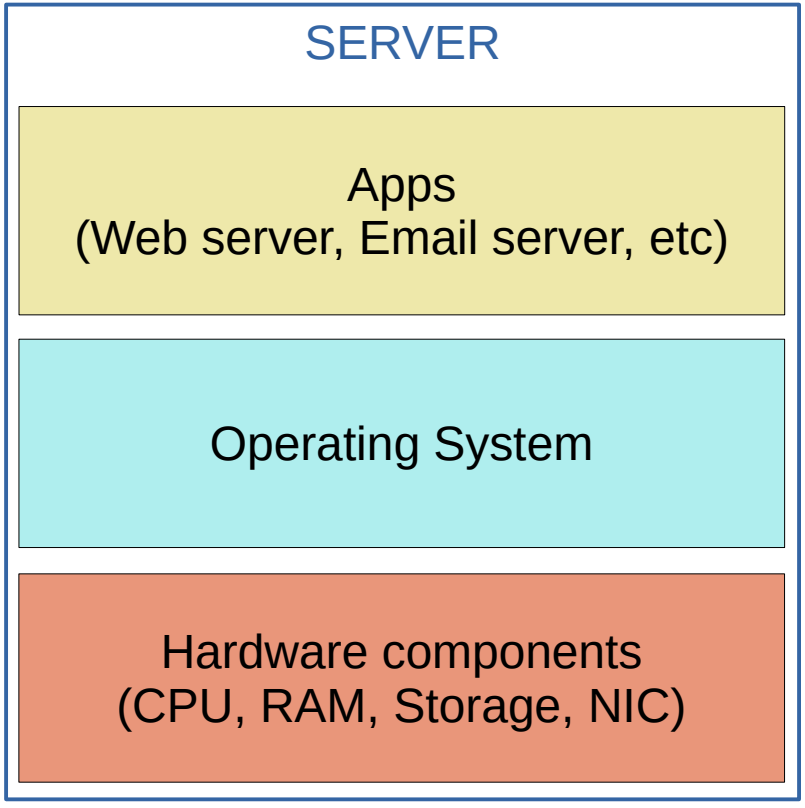
- Review of Virtual Machines
  → Type 1/Type 2 Hypervisors

- Containers (ie. Docker)

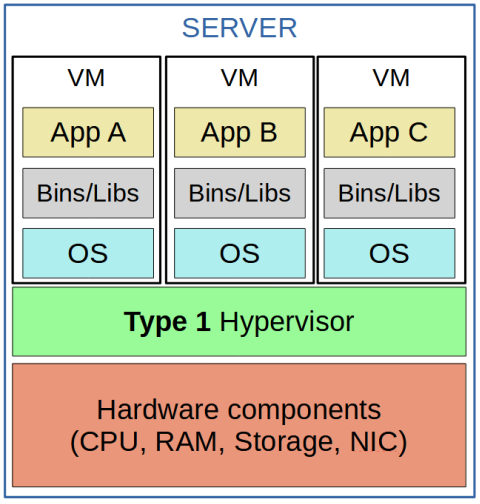
- Virtual Machines vs. Containers

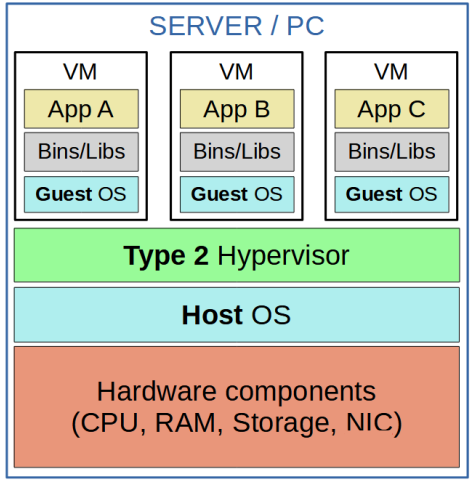
Virtual Machines

Apps running on a server without virtualization:



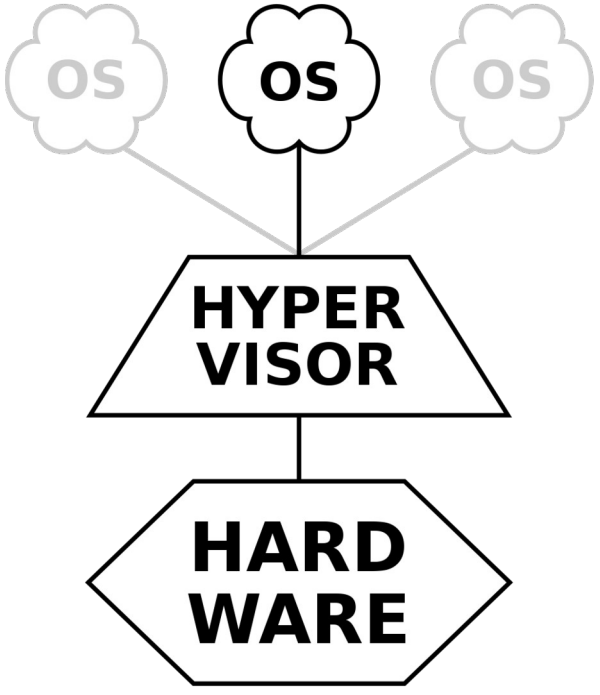
Virtual Machines





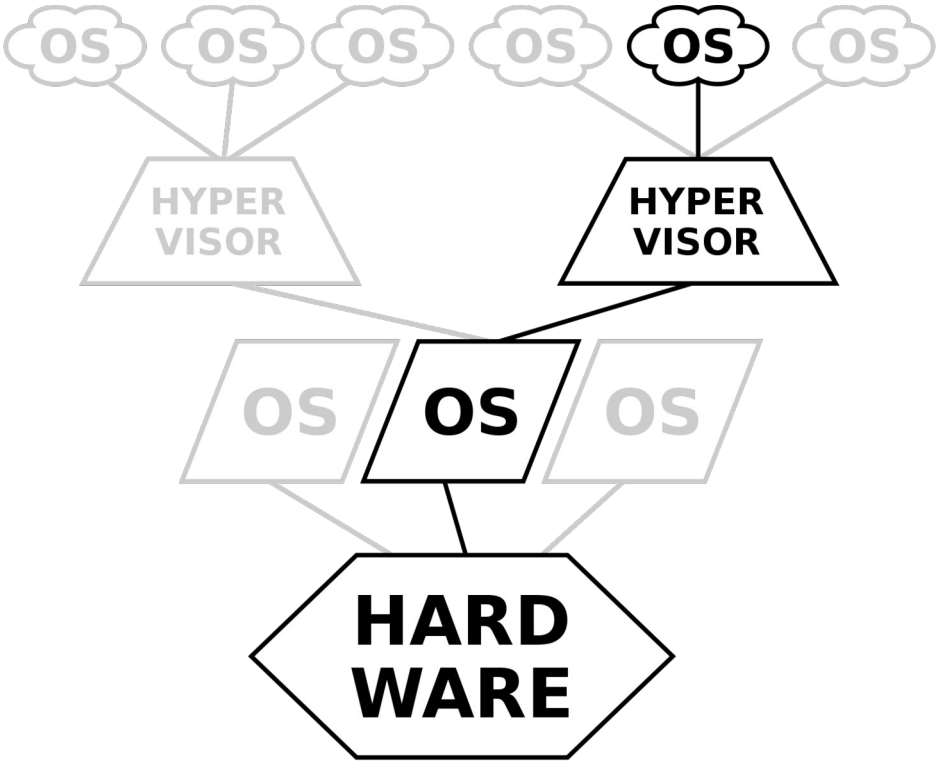
- **Virtual Machines** (VMs) allow multiple OS's to run on a single physical server.
- A **Hypervisor** is used to manage and allocate hardware resources to each VM.
  →**Type 1** Hypervisors (aka *Native* or *Bare-metal*) run directly on top of hardware.
  →**Type 2** Hypervisors (aka *Hosted*) run on top of a *Host OS* (ie. Windows).
- **Type 1** Hypervisors are widely used in data center environments.
- **Type 2** Hypervisors are commonly used on personal devices.
  →ie. running a virtual network lab on your PC using Cisco Modeling Labs (CML).
- The OS in each VM can be the same or different (Windows, Linux, macOS, etc).
- *Bins/Libs* are the software libraries/services needed by the Apps running in each VM.
- A VM allows its app/apps to run in an isolated environment, separate from the apps in other VMs.
- VMs are easy to create, delete, move, etc.
  →A VM can be easily saved and moved between different physical servers.

Virtual Machines



TYPE 1

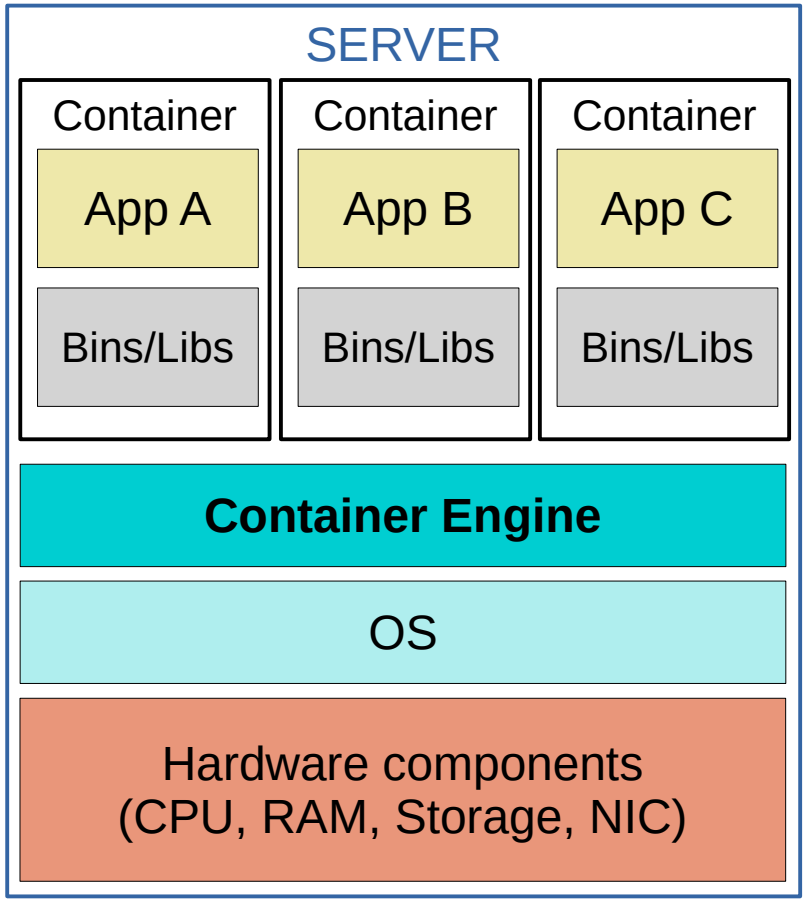
native
(bare metal)



TYPE 2

hosted

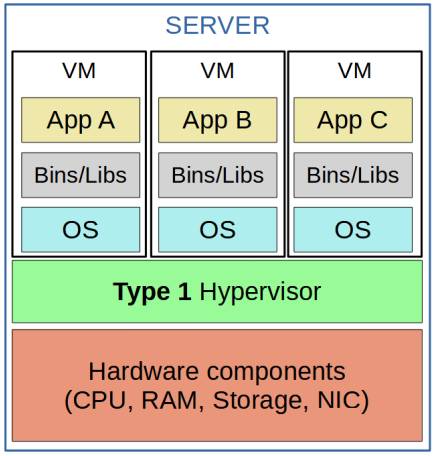
Containers

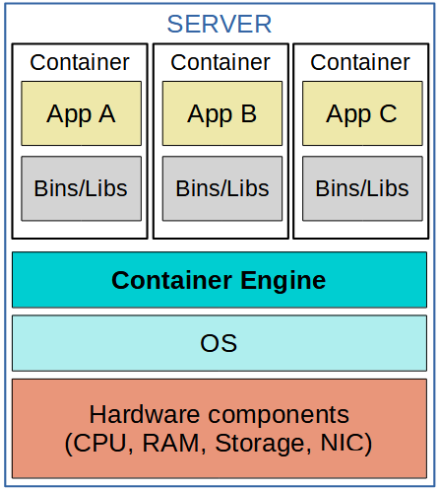


- **Containers** are software packages that contain an App and all dependencies (*Bins/Libs* in the diagram) for the contained App to run.
  → Multiple Apps can be run in a single container, but this is not how containers are usually used.
- Containers run on a **Container Engine** (ie. Docker Engine)
  → The container engine is run on a host OS (usually Linux).
- Containers are lightweight (small in size) and include only the dependencies required to run the specific App.
- A **Container Orchestrator** is a software platform for automating the deployment, management, scaling etc. of containers.
  → **Kubernetes** (originally designed by Google) is the most popular container orchestrator.
  → **Docker Swarm** is Docker's container orchestration tool.
- In small numbers manual operation is possible, but large-scale systems (ie. with *Microservices*) can require thousands of containers.

Microservice Architecture is an approach to software architecture that divides a larger solution into smaller parts (microservices).
→ Those microservices all run in containers that can be orchestrated by Kubernetes (or another platform).

VMs vs Containers





- **VMs** can take minutes to boot up as each VM runs its own OS.
- **Containers** can boot up in milliseconds.

- **VMs** take up more disk space (gigabytes).
- **Containers** take up very little disk space (megabytes).

- **VMs** use more CPU/RAM resources (each VM must run its own OS).
- **Containers** use much fewer CPU/RAM resources (shared OS).

- **VMs** are portable and can move between physical systems running the same hypervisor.
- **Containers** are more portable; they are smaller, faster to boot up, and Docker containers can be run on nearly any container service.

- **VMs** are more isolated because each VM runs its own OS.
- **Containers** are less isolated because they all run on the same OS; if the OS crashes, all containers running on it are effected.

There is a major movement toward the use of containers, especially with the rise of microservices, automation, and DevOps (the combination of Software **Dev**elopment and IT **Op**eration**s**), but VMs are still widely used today.

Things we covered

- Review of Virtual Machines
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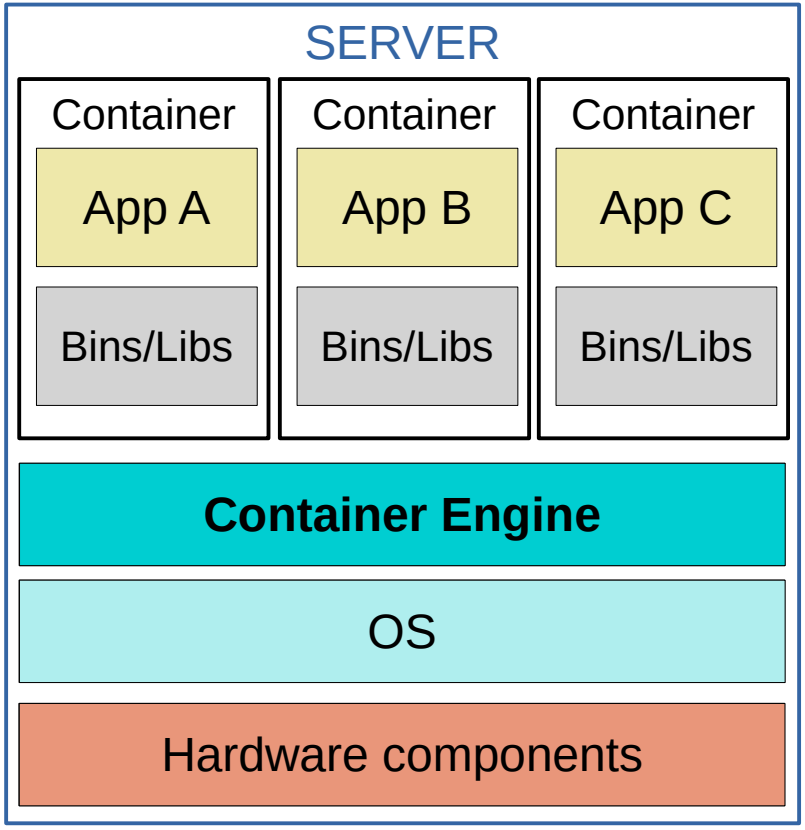
- Containers (ie. Docker)

- Virtual Machines vs. Containers

Quiz 1

Identify the three components below that containers run on top of.



Quiz 2

Which of the following are examples of container orchestrators? (select two)

a) Docker Engine

b) Docker Swarm

c) Kubernetes

d) Hyper-V

Quiz 3

Which of the following statements about VMs and containers are true? (select three)

a) VMs require more resources.

b) Containers take more time to boot up.

c) VMs are more isolated.

d) An OS runs in each container.

e) Containers are often tens of gigabytes in size.

f) Containers all run on a host OS.