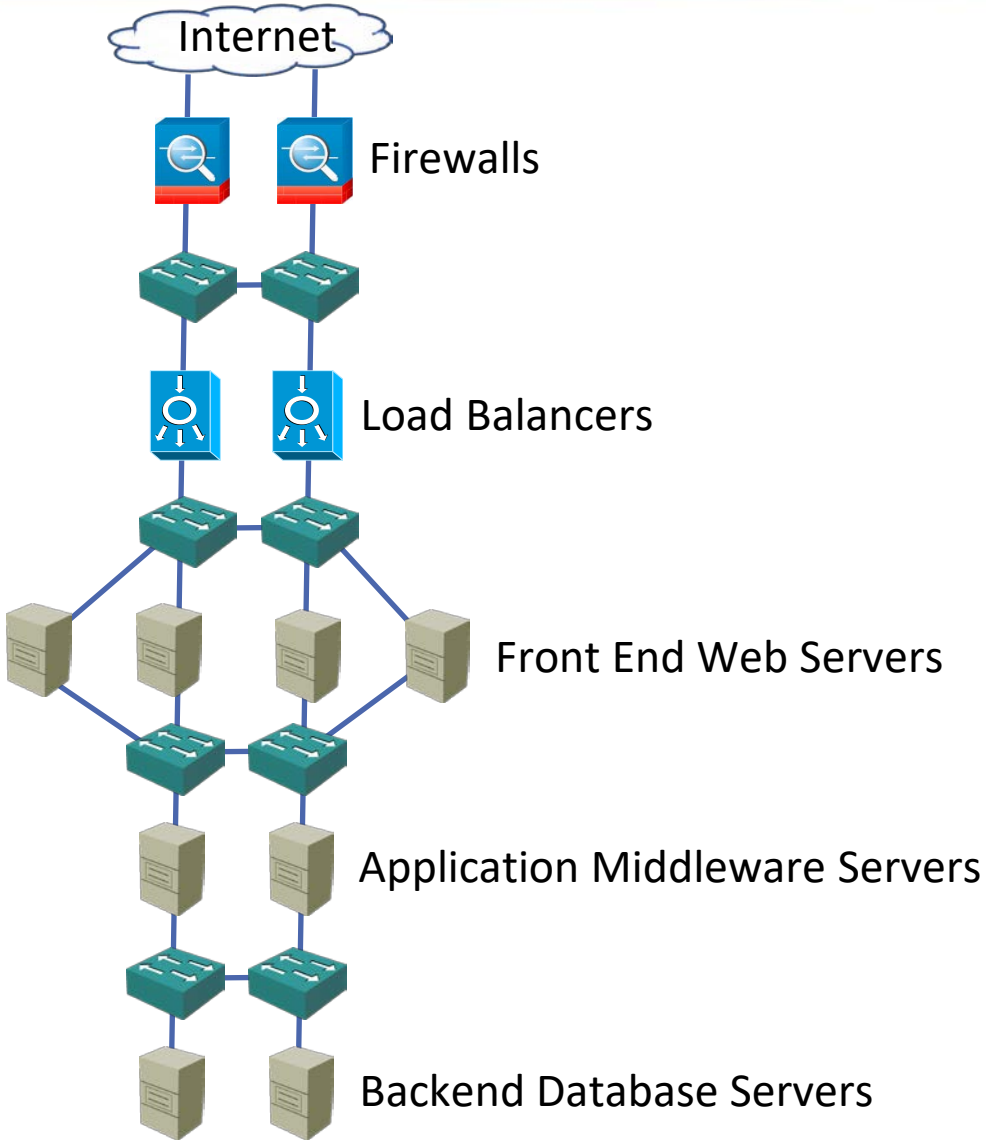
Virtualization

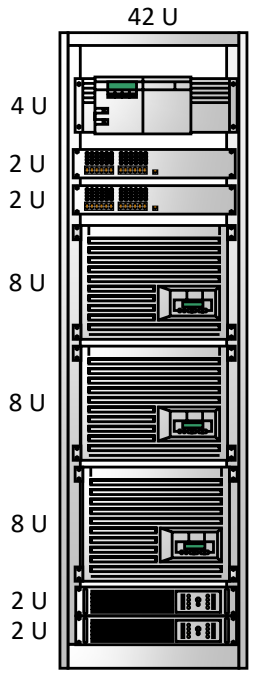
- Virtualization is one of the main enablers of Cloud Computing
- It allows for resource pooling where multiple customers share the underlying hardware
- Virtualization has been around a lot longer than Cloud Computing though
- This lecture focuses on server virtualization because it was the first type available, but the same principles can be applied to virtualize network infrastructure equipment

Virtualization



- The cloud provider does not provision separate physical hardware for every customer
- A customer can sometimes deploy selected dedicated hardware devices at additional cost.

Before Virtualization



Router / Firewall

Switches

Web Server

Database Server

Email Server

Uninterruptible Power Supplies

Before Virtualization

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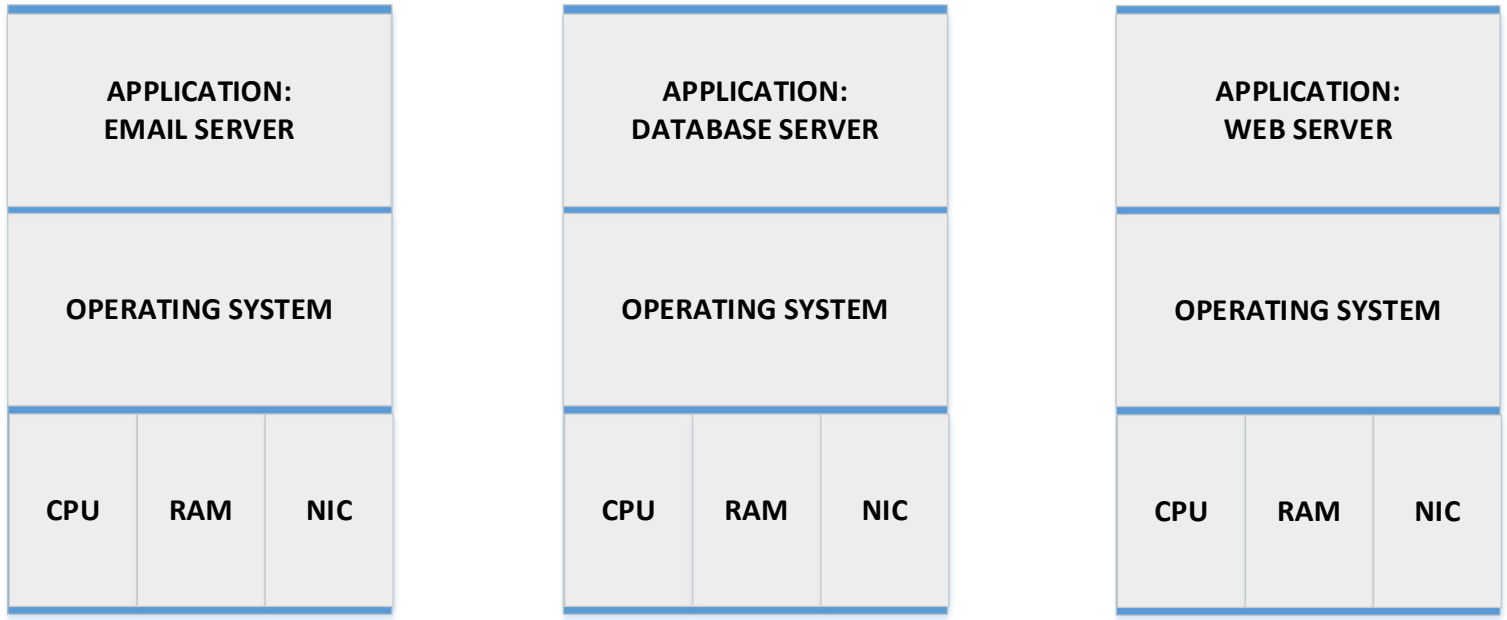
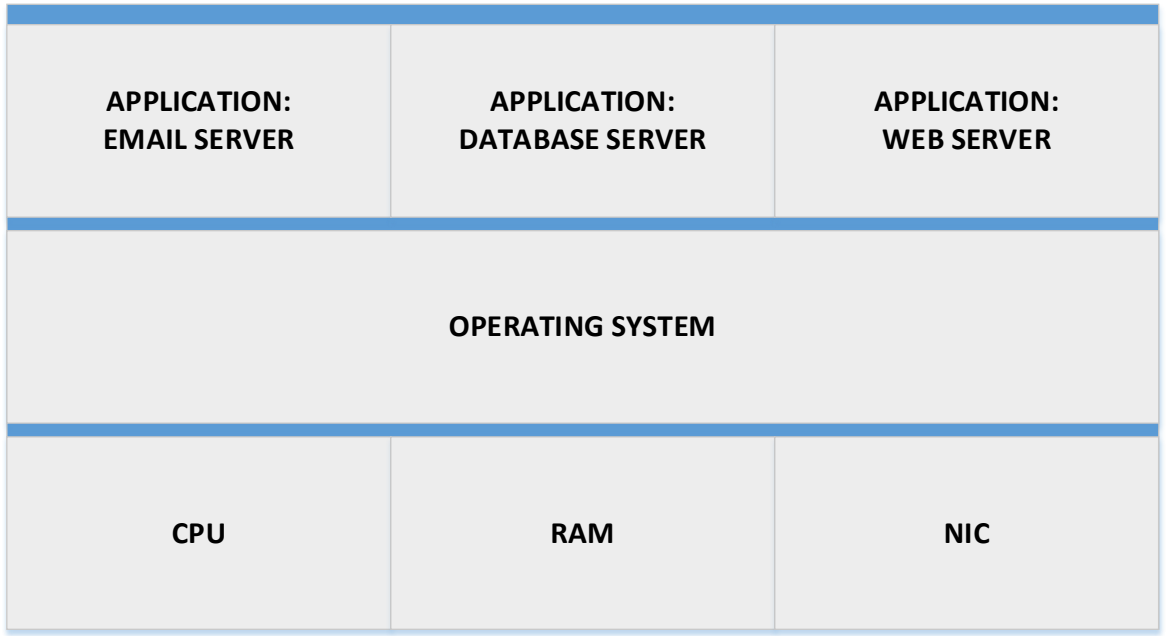


- Server utilization (CPU, RAM, NIC etc.) around 15%
- You have to pay for each separate server, and they're all using power, space and cooling

Multiple Applications on Same Server

- Putting multiple applications on the same server would improve utilization
- But it is very bad practice, because if you have a problem with any of your applications they will all be affected



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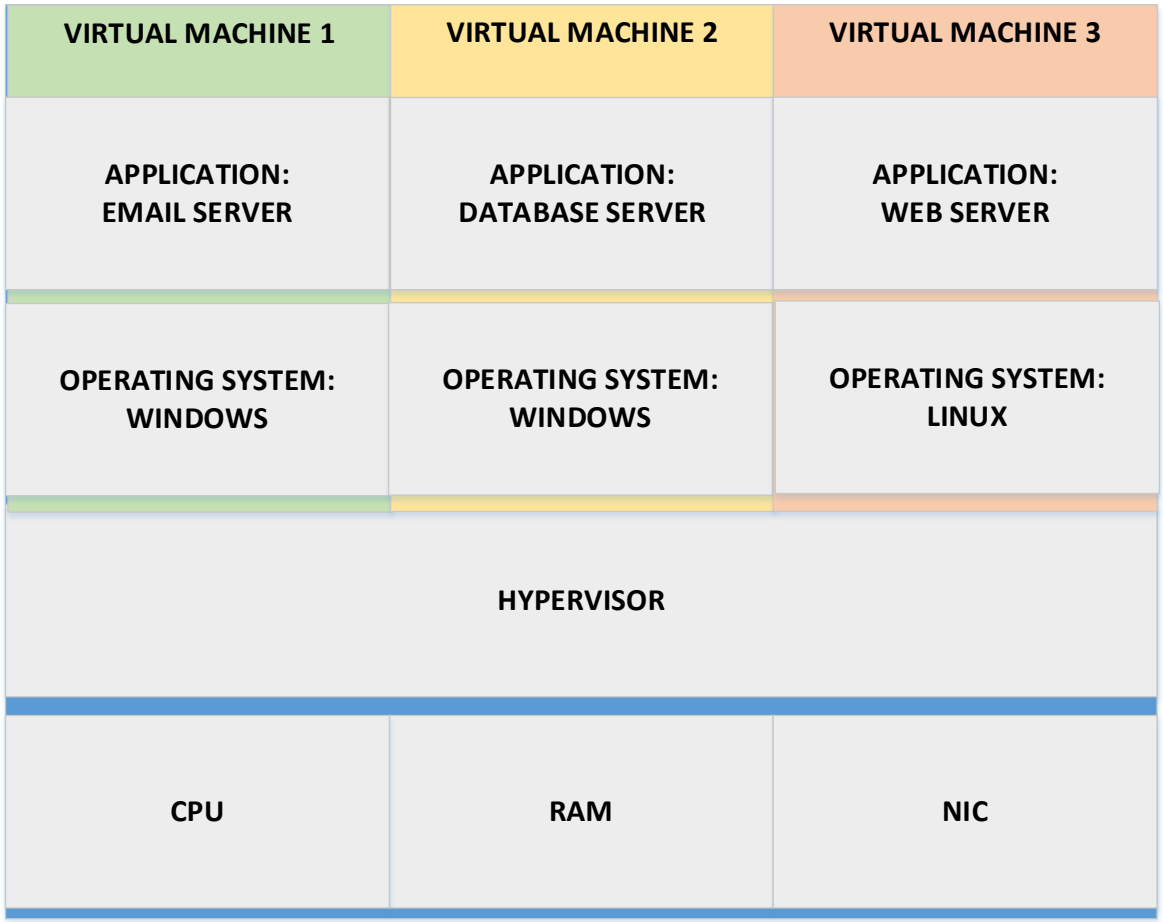
Server Virtualization



Popular Type 1 (Bare Metal) Hypervisors

- Type 1 Hypervisors run directly on the system hardware

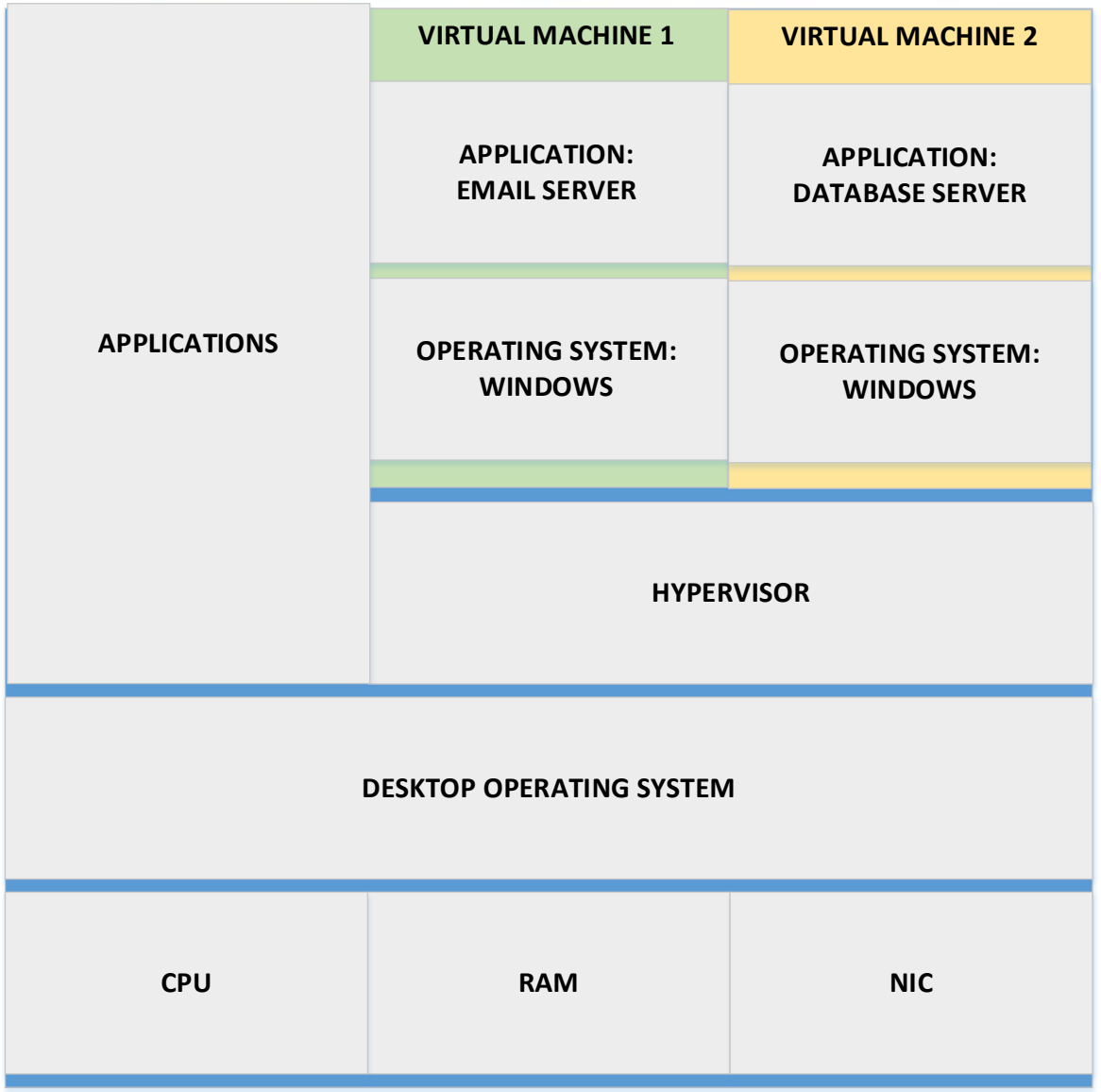
- VMware ESXi (part of the vSphere suite)
- Microsoft Hyper-V
- Red Hat KVM
- Oracle VM Server
- Citrix XenServer

Popular Type 2 Hypervisors

- Type 2 Hypervisors run on top of a host operating system

- VMware Workstation, Player and Fusion
- VirtualBox
- QEMU
- Parallels

Type 2 Hypervisor



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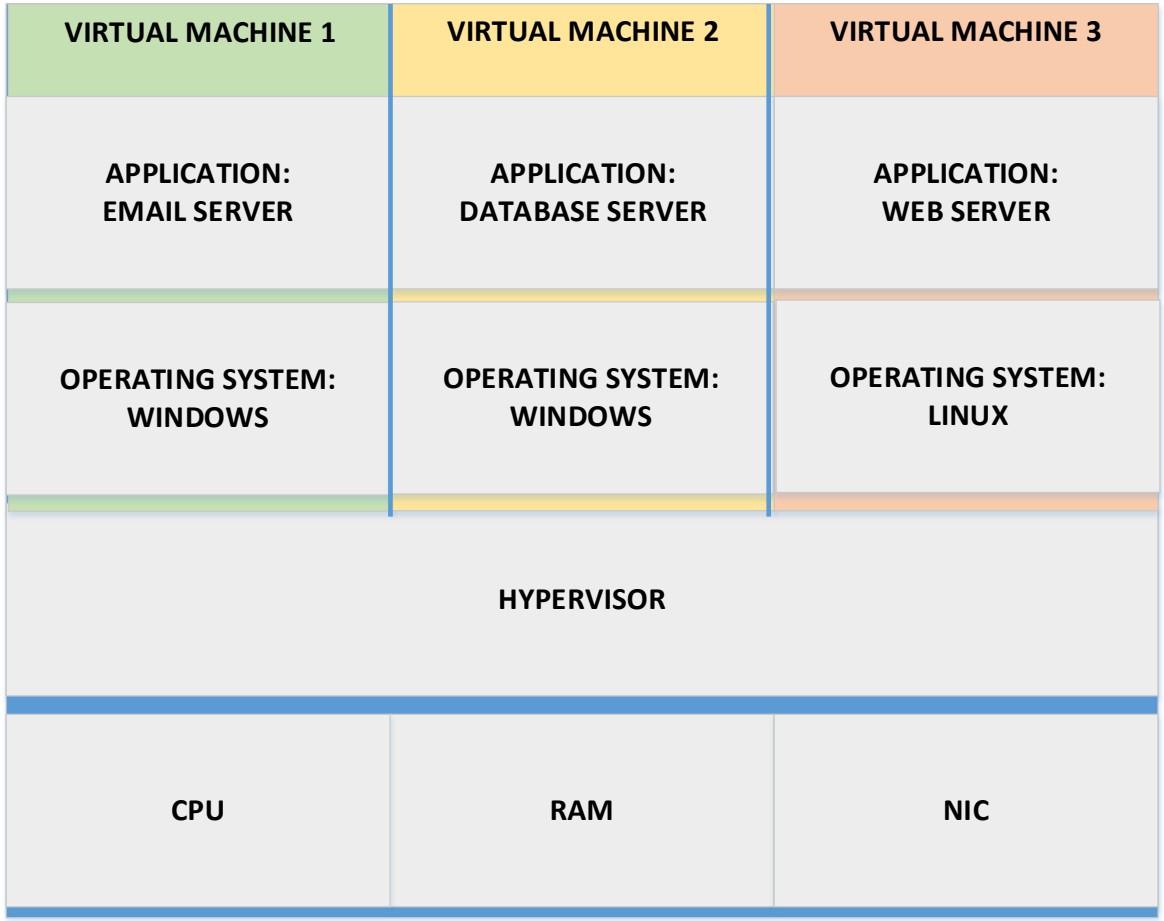
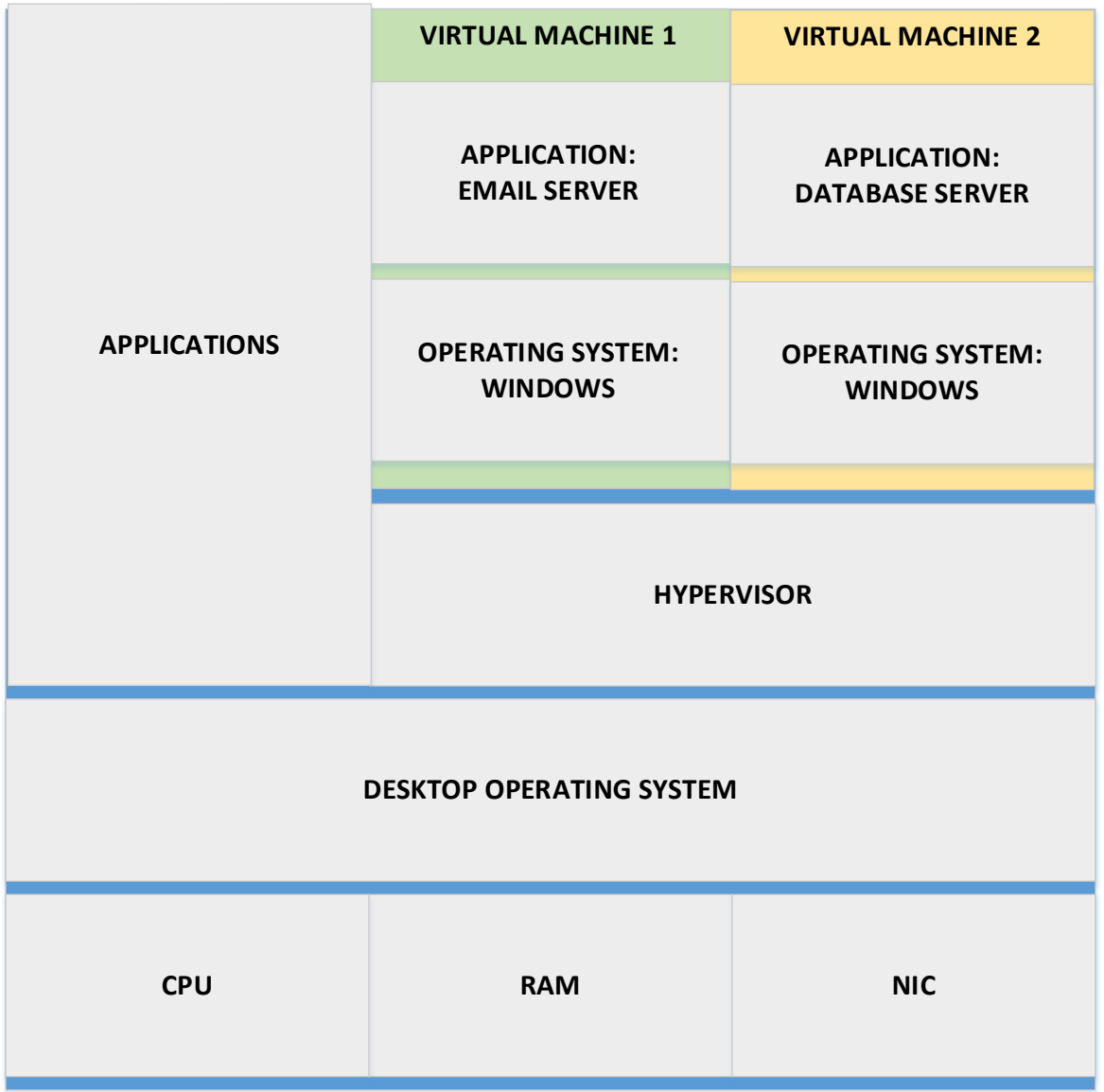
Type 1 vs Type 2 Hypervisor





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Containers

- Containers are similar to virtual machines, but they virtualize software layers above the operating system level.
- They are software packages that contain an application or microservice and the dependencies required to run it (system executables, libraries).
- They are considered ‘lightweight’ because they are smaller in size than virtual machines.
- They are fast to provision and highly portable across different machines and environments.
- Docker is the most well-known container engine.

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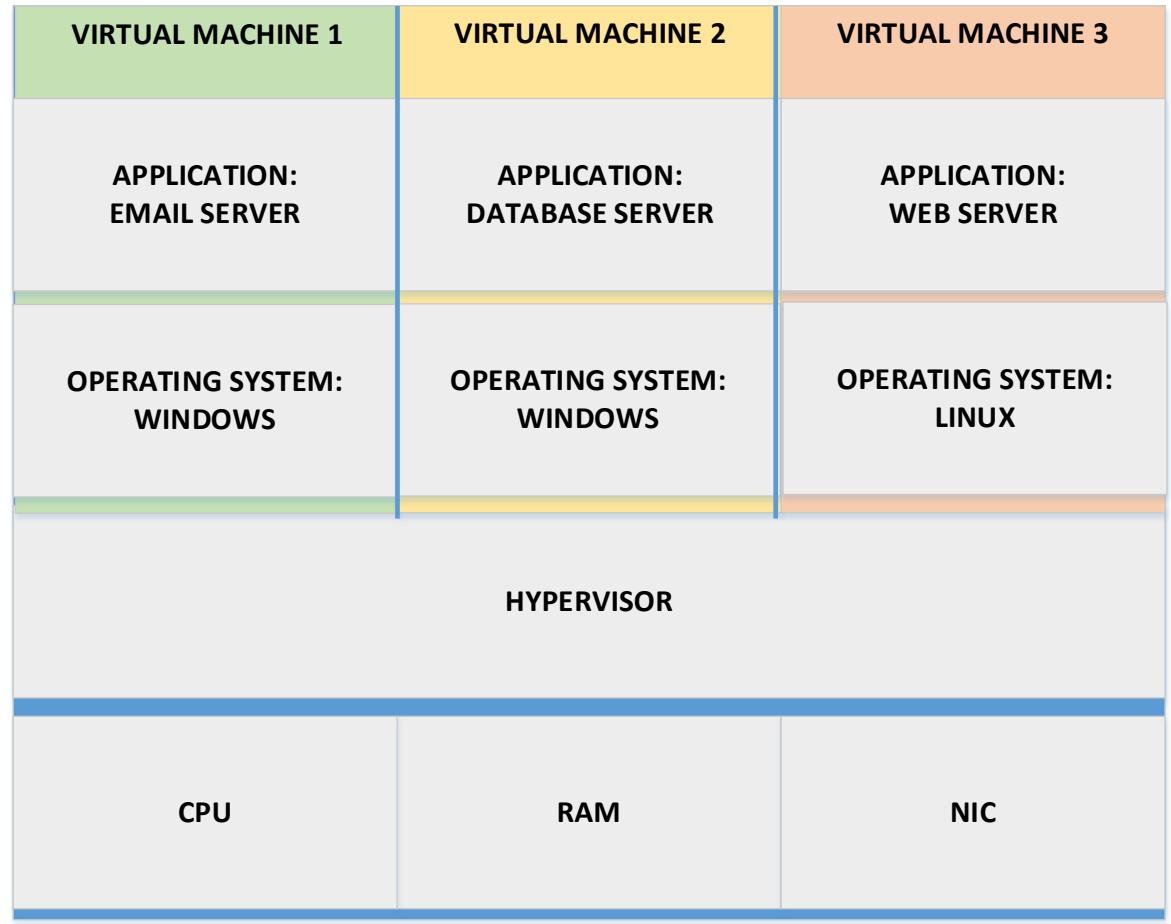
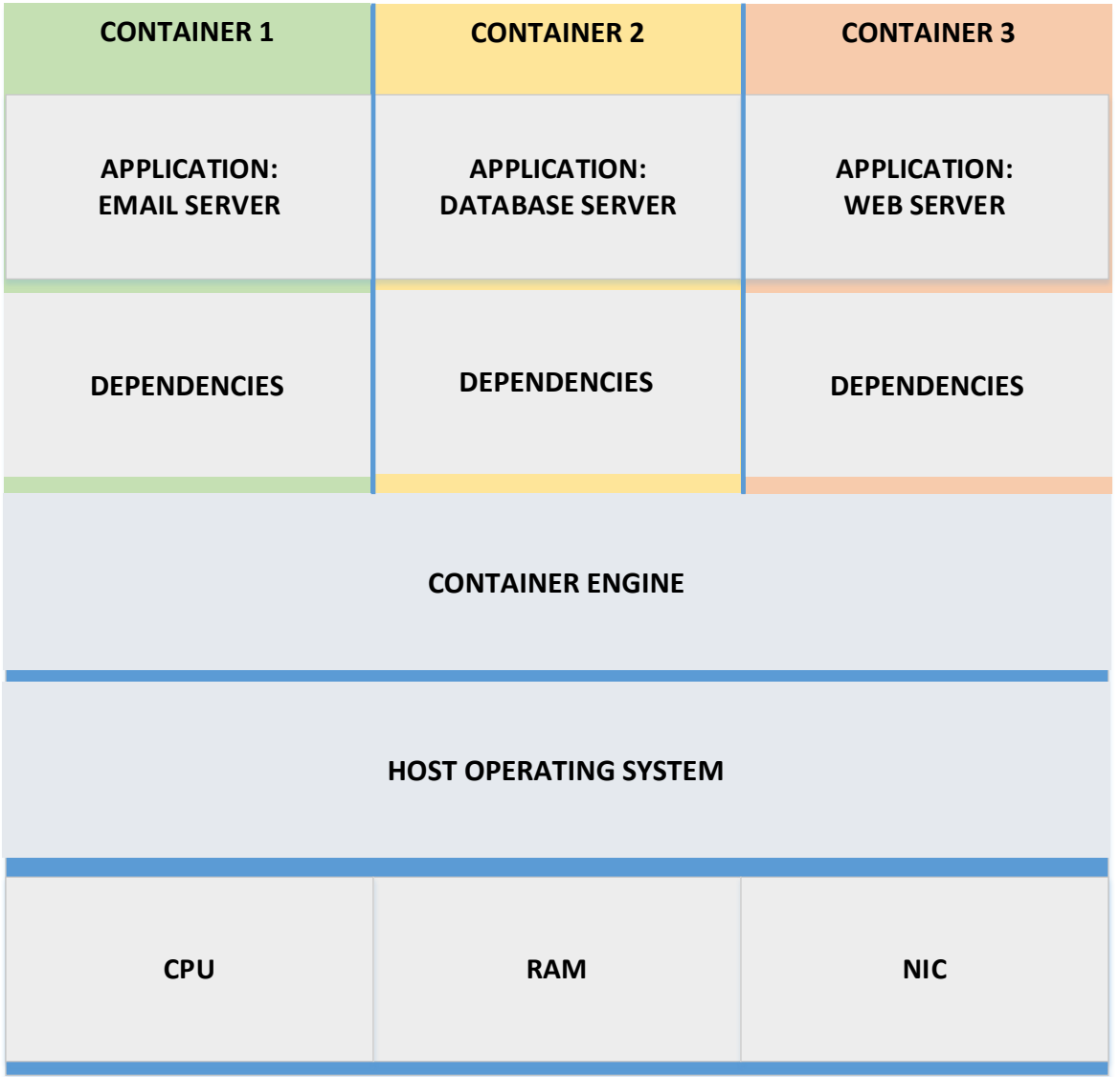
Type 1 Hypervisor vs Containers





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