Cloud Computing Concepts

CS 3132

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Virtualization

Virtualization Technologies [Virtual Infrastructure]

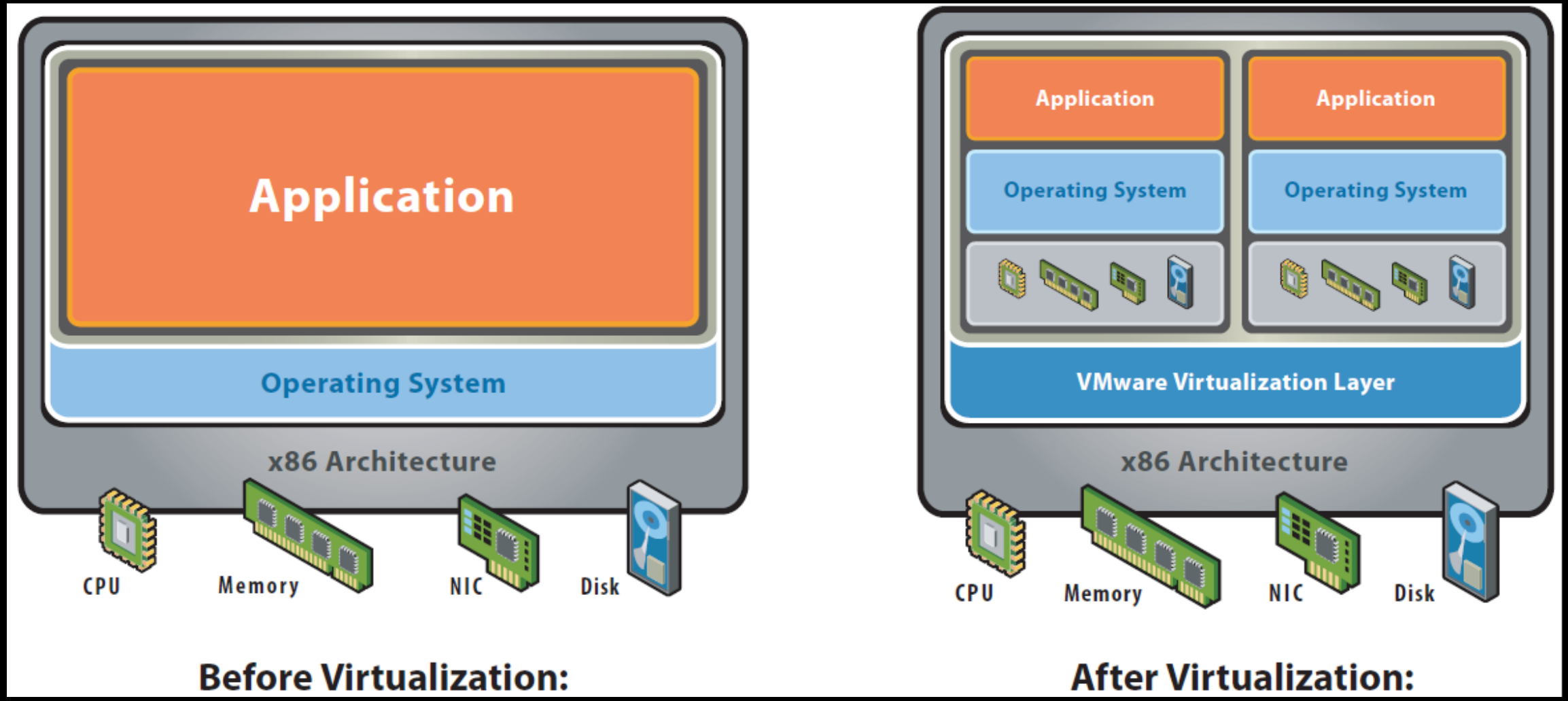
- It provides a layer of abstraction between :

  computing
  storage
  networking hardware

  AND

  the applications running on it

- Virtualization
  - Assigns a logical name for a physical resource
  - Provides a pointer to that physical resource when a request is made


Application
Operating System
x86 Architecture
CPU
Memory
NIC
Disk
Before Virtualization:
Application
Application
Operating System
Operating System
VMware Virtualization Layer
x86 Architecture
CPU
Memory
NIC
Disk
After Virtualization:

Virtualization Technologies

Before Virtualization

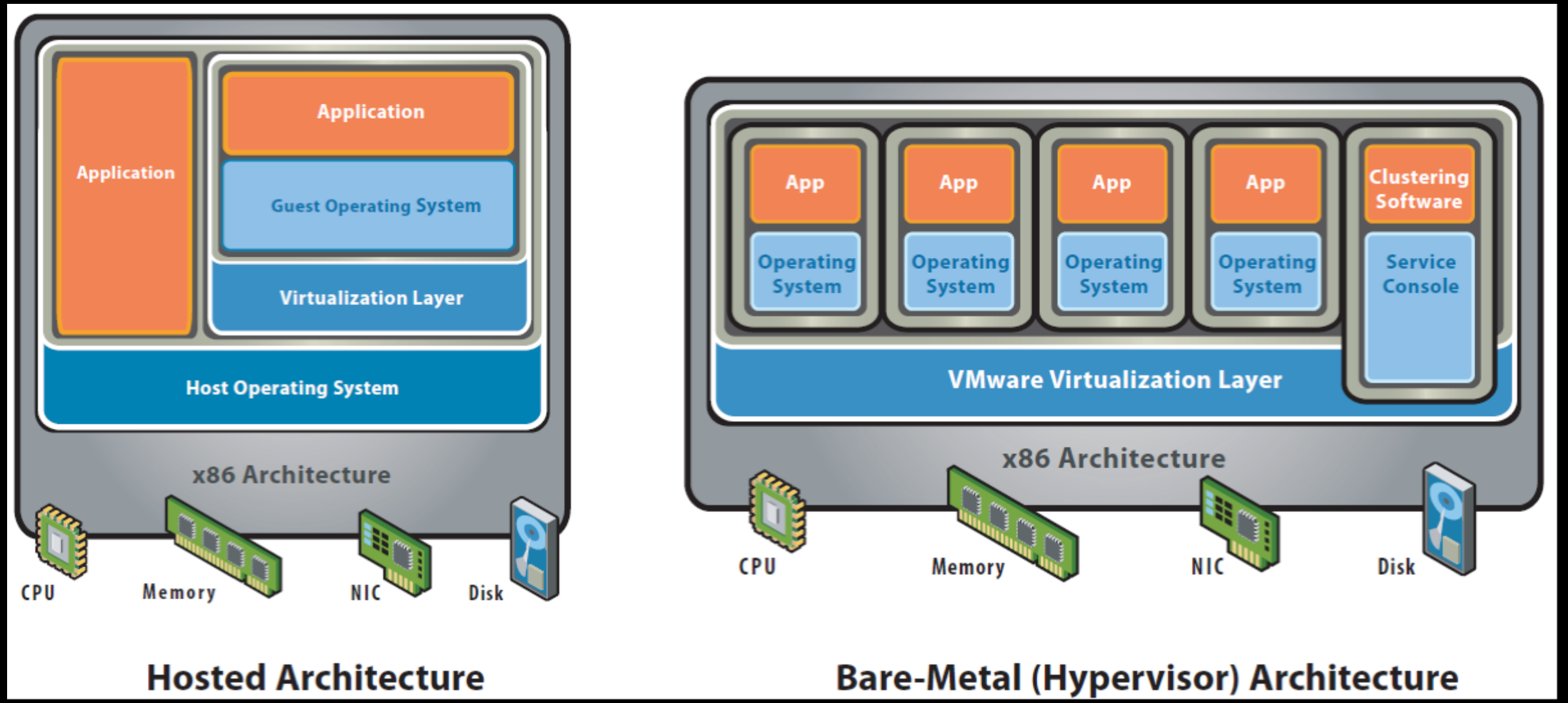
- Single OS image per machine
- Software and hardware tightly coupled
- Running multiple applications on same machine
- Underutilized resources
- Inflexible and costly infrastructure

After Virtualization

- Hardware-independence of operating system and applications
- Virtual machines can be provisioned to any system
- Can manage OS and application as a single unit by encapsulating them into virtual machines (VMs)

Virtualization Technologies- Key benefit

- Ability to **run multiple operating systems** on a single physical system and
- Share the underlying hardware resources – known as ***partitioning***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Clustering Software
Operating System
Operating System
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Service Console
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Bare-Metal (Hypervisor) Architecture

Virtualization Technologies

Hosted Architecture
Type 2 Hypervisor

- Installs and runs as an application
- Relies on host OS for –
  - device support
  - physical resource management
- suitable for end-user computing

Bare-Metal (Hypervisor) Architecture
Type 1 Hypervisor (Native)

- Lean virtualization-centric kernel
- Service Console for agents and helper applications
- Commonly used by enterprise applications
- KVM uses the type 1 hypervisor to host multiple virtual machines on the Linux operating system

Virtualization Technologies

- Hosted Architecture
- Type 2 Hypervisor

- Oracle VM Virtual Box: Cross-platform means that it installs on Windows, Linux, Mac OS X and Solaris x86 computers.

Bare-Metal (Hypervisor) Architecture

Type 1 Hypervisor (Native)

- VMware vSphere ESXi
  - **Elastic Sky X**
- vSphere Hypervisor is a bare-metal hypervisor
- XenServer runs directly on server hardware without requiring an underlying operating system
- Oracle VM - Oracle VM Server can be installed on either x86 or SPARC hardware platforms

Hypervisor

The hypervisor is the virtualization software that you install on your physical machine

It is a software layer that acts as an intermediary between the virtual machines and the underlying hardware or host operating system

The hypervisor coordinates access to the physical environment so that several virtual machines have access to their own share of physical resources

For example,

- If the virtual machine requires computing resources, such as computer processing power, the request first goes to the hypervisor. The hypervisor then passes the request to the underlying hardware, which performs the task.

Virtualization

- Already discussed Virtualization, Type 1, Type 2

- Virtualization
  - Assigns a logical name for a physical resource
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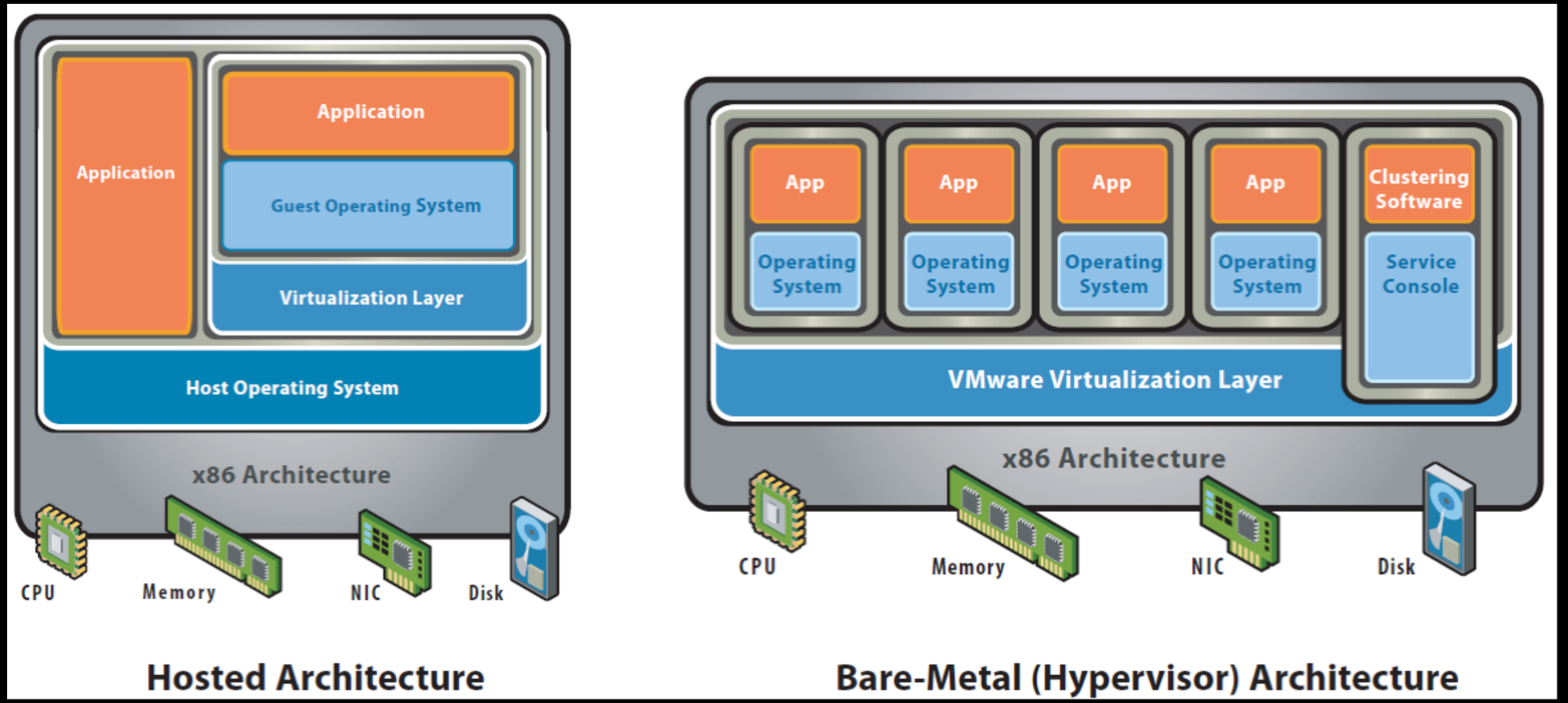
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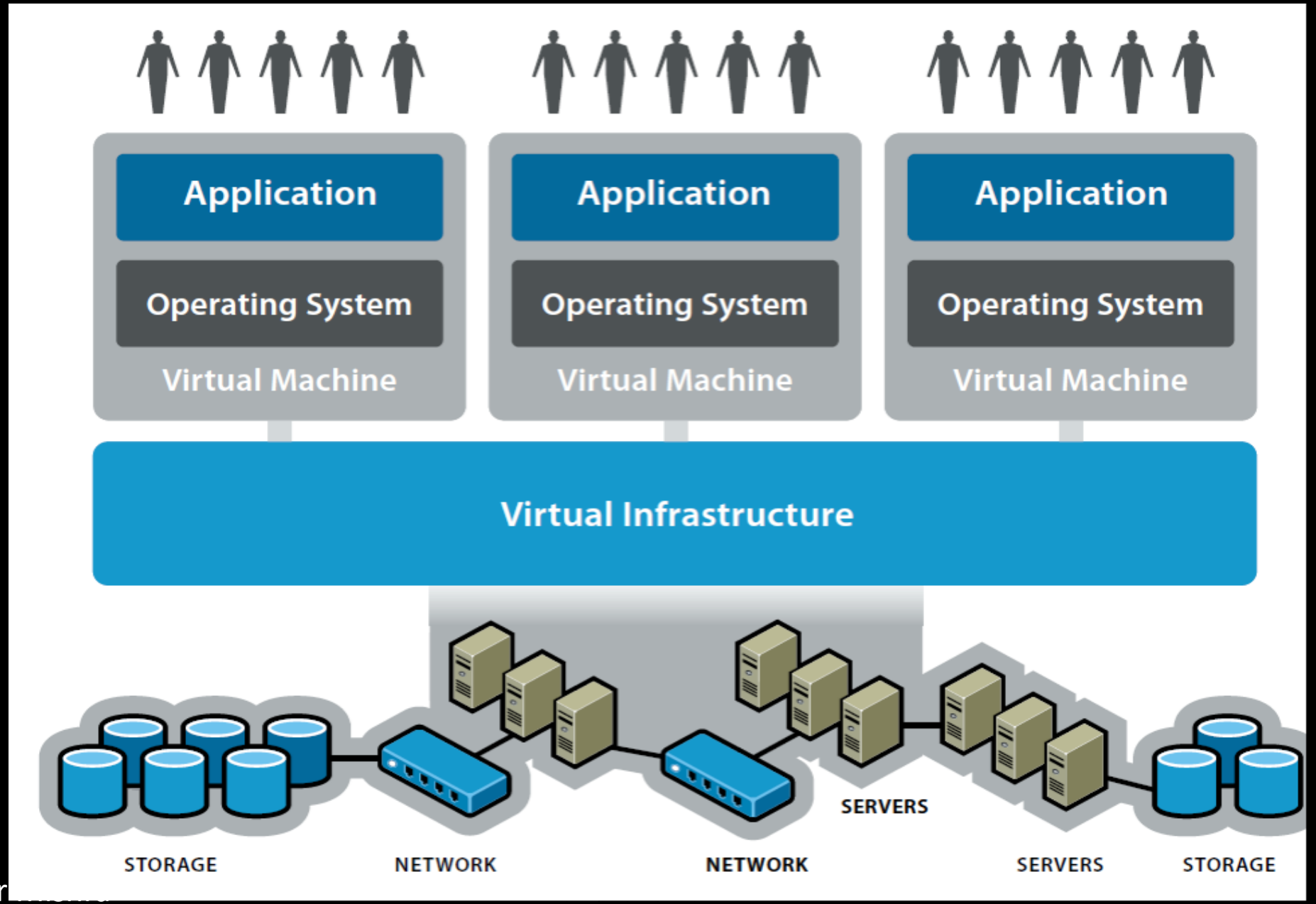
Bare-Metal (Hypervisor) Architecture


Application
Operating System
Virtual Machine
Application
Operating System
Virtual Machine
Application
Operating System
Virtual Machine
Virtual Infrastructure
SERVERS
STORAGE
NETWORK
NETWORK
SERVERS
STORAGE

Virtualization

- Key enabler of the following attributes of cloud computing
- Service-based:
  - A service-based architecture is where clients are abstracted from service providers through service interfaces
- Scalable and elastic:
  - Services can be altered to affect capacity and performance on demand
- Shared services:
  - Resources are pooled in order to create greater efficiencies.

Virtualization Technologies

- Virtual Machine
  - A representation of a real machine using software that provides an operating environment which can run or host a guest OS
- Guest OS
  - An OS running in a virtual machine environment
- Virtual Machine Monitor
  - Software that runs in a layer between
  - A hypervisor or host OS and one or more VM