Tag 3

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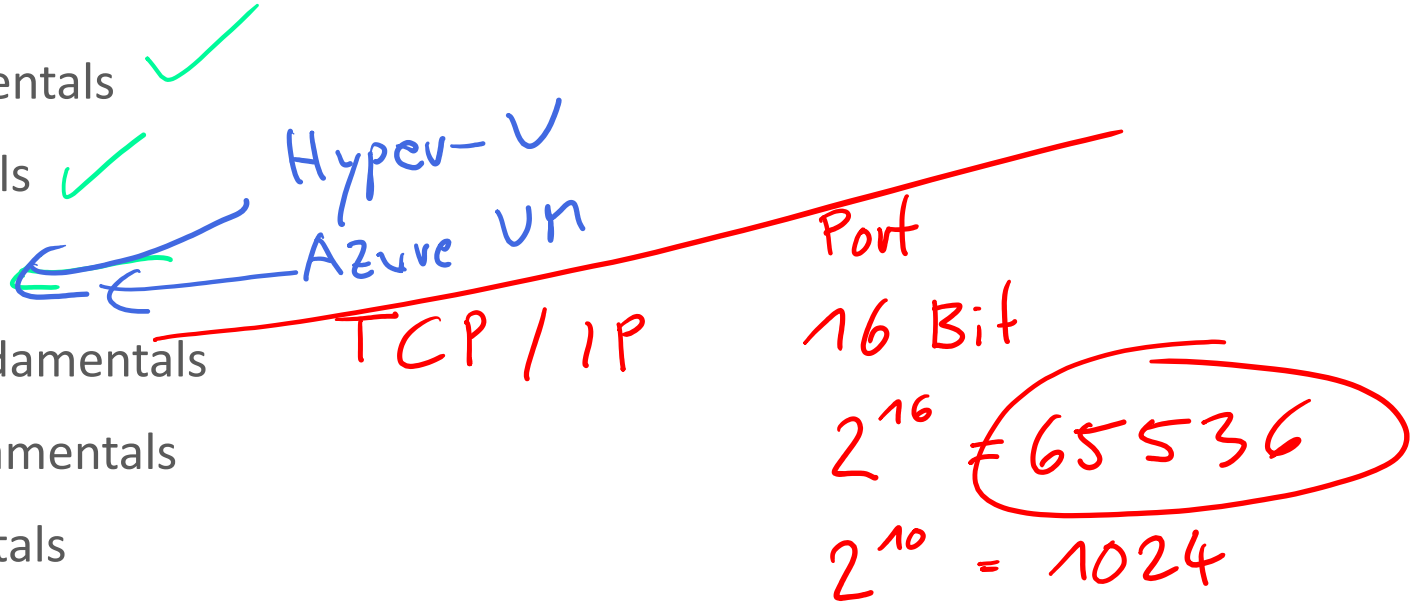
Guten Morgen!

Module 3: Virtualization

Agenda:

1. Azure Architecture Fundamentals
2. Administration Fundamentals
3. Virtualization Fundamentals
4. Network Infrastructure Fundamentals
5. Storage Management Fundamentals
6. Identity Services Fundamentals



Lesson 1: Configure and manage Hyper-V

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AZ-900 No PowerShell

AZ-800

-801

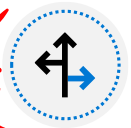
VM-Get ✗

Get VM ✗

Get-VM ✓

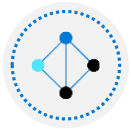
Configure and manage Hyper-V

Overview of Hyper-V



Overview of Hyper-V Manager = Server Manager, WAC, Powershell

Best practices for configuring Hyper-V hosts



Hyper-V networking

Overview of nested virtualization

Knowledge check and resources

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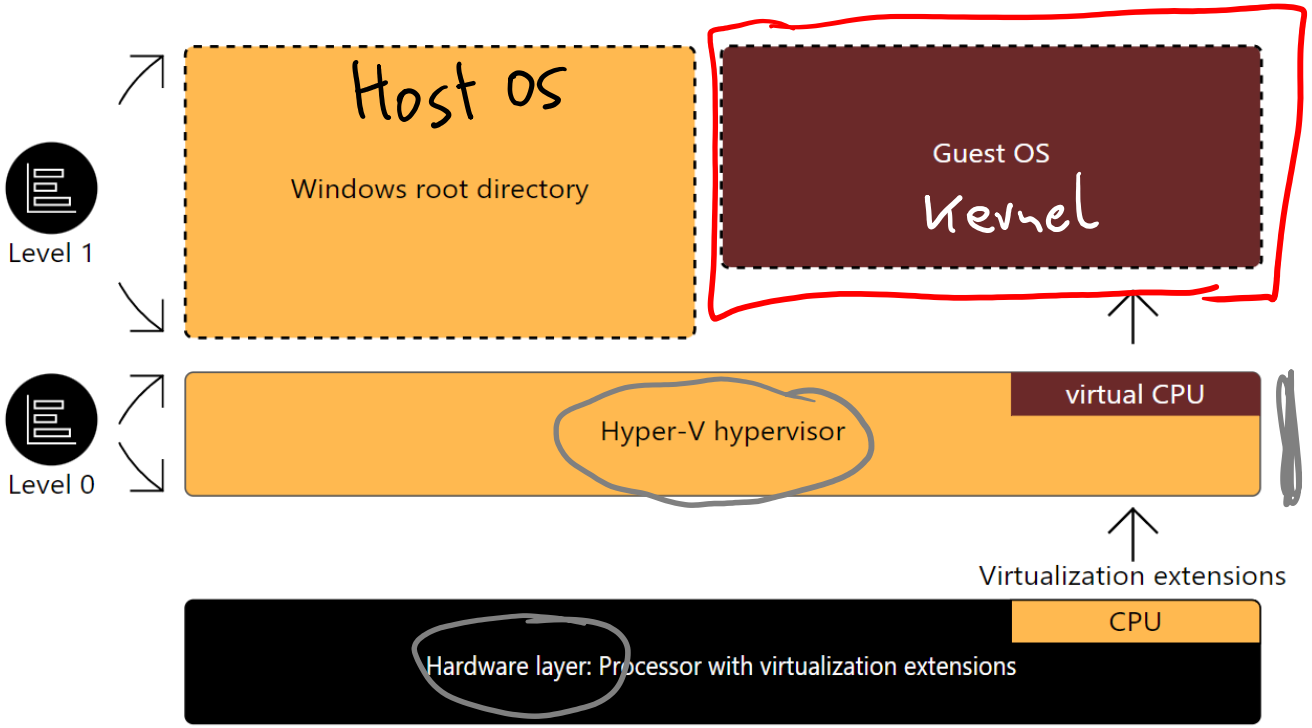
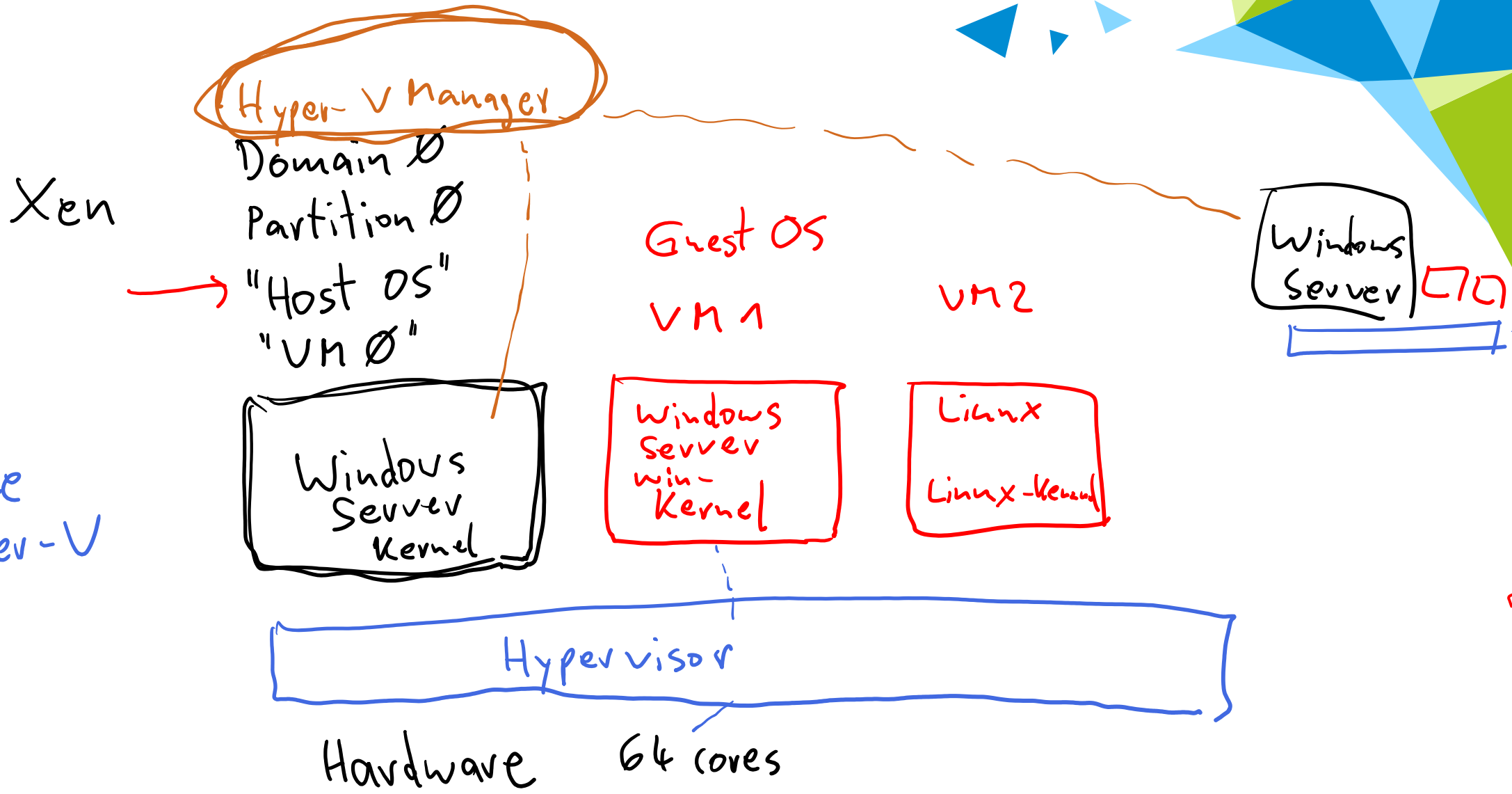
Hyper-V

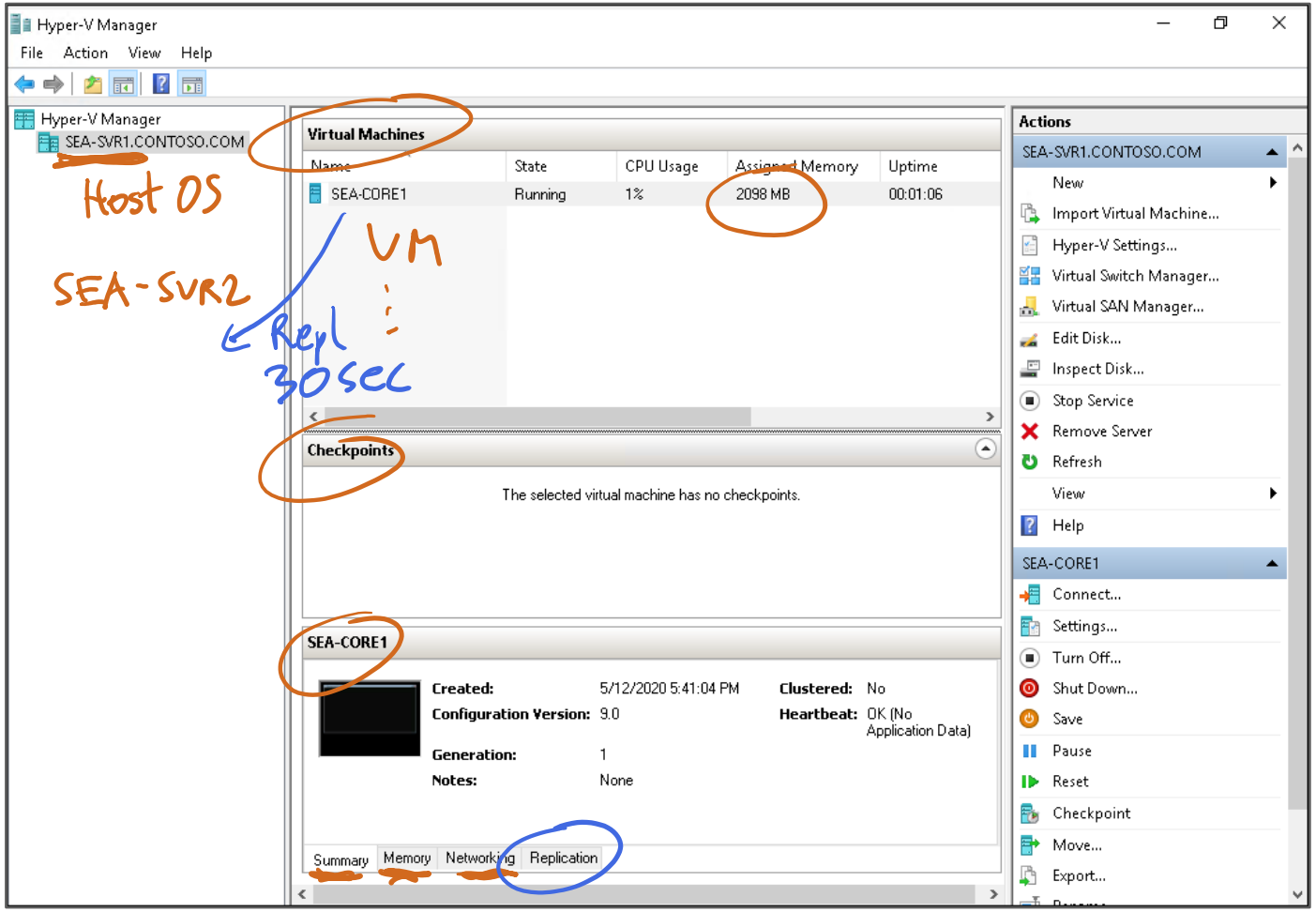
- Hardware virtualization layer
- A role in Windows Server
- Subdivide the hardware capacity of a single host computer
- Provides an isolated space for each VM to run its own operating system (OS)




Hyper-V Manager
Xen
Domain Ø
Partition Ø
"Host OS"
"VM Ø"
Windows Server Kernel
Role
Hyper-V
Guest OS
VM 1
VM 2
Windows Server win-Kernel
Linux
Linux-Kernel
Windows Server
Hypervisor
Hardware
64 cores

Hyper-V Manager

- Graphical Interface
- Supports:
  - Previous versions
  - Web Services (WS)-Management protocol
  - Alternate credential support
- Other management tools include:
  - Windows PowerShell
  - PowerShell Direct
  - Windows Admin Center



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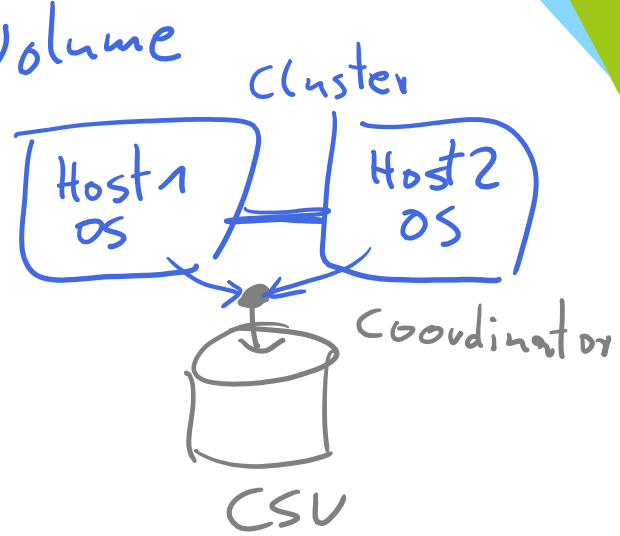
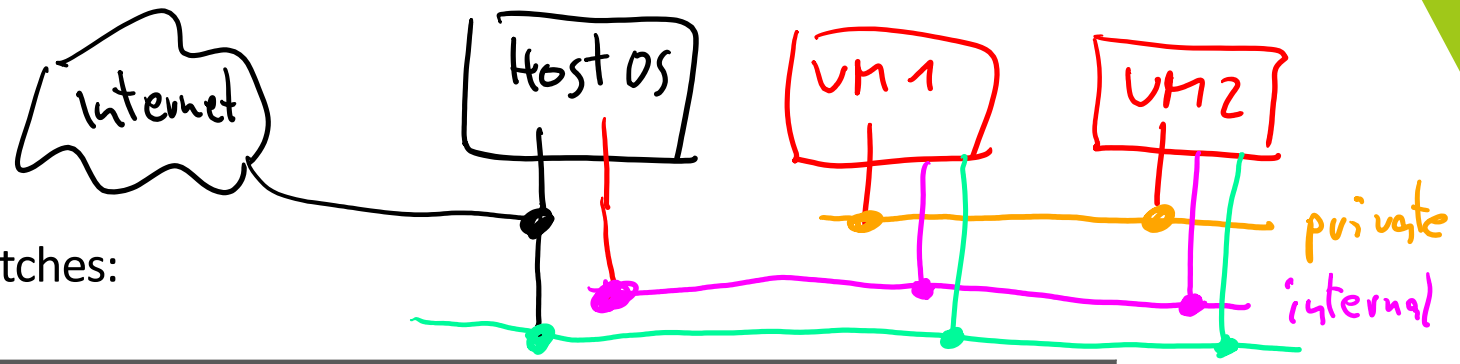
Hyper-V Best Practices

- Enough Hardware
- Deploy VMs in separate disks or CSV
- No other server roles to be installed in the Host OS
- Manage Hyper-V remotely
- Run Hyper-V by using a Server Core configuration
- Run the Best Practices Analyzer and resource metering
- Use Generation 2 VMs if supported



Hyper-V networking

- Hyper-V supports the following virtual network adapter types:
  - Legacy network adapter
  - Synthetic network adapter



- Hyper-V supports three types of virtual switches:

Virtual switch type	Description
External	Used to map a network to a specific network adapter or network adapter team. Provides external access outside of the host machine.
Internal	Used to communicate between the virtual machines on a host server and to communicate between the virtual machines and the host itself
Private	Used to only communicate between virtual machines on a Hyper-V host

Lesson 2: Configuring VMs

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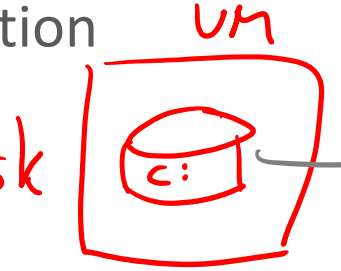
Configuring VMs

- VM Settings and configuration
- VM Storage
- Virtual hard disk formats and types
- Manage VM states and checkpoints



.vhd max 2TB
.vhdx 64TB

static or dynamic

(snapshot)

VM configuration and generation versions

- VM configuration version identifies:
  - Compatibility of the VM components with the version of Hyper-V installed on the host machine
  - Windows Server 2022 host machines support configuration version 10.0 or greater
  - To update a configuration version, use the following command:
    - ***Update-VMVersion <vmname>***

- Generation 1 VMs:
  - Support 32 and 64-bit operating systems
  - Only support boot volumes a maximum of 2 TB
  - Supports legacy BIOS

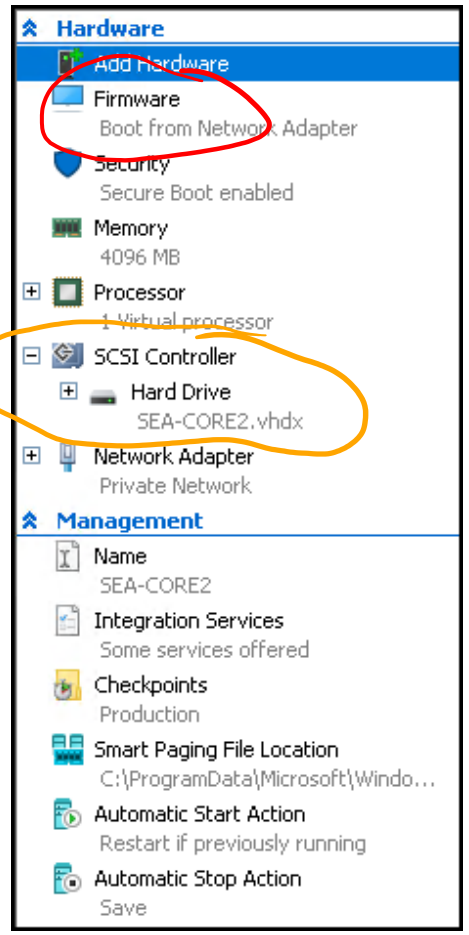
- Generation 2 VMs:
  - Support only 64-bit operating systems
  - Support secure boot and shielded VMs
  - Support boot volumes a maximum of 64 TB
  - Supports Unified Extensible Firmware Interface (UEFI)

VM settings

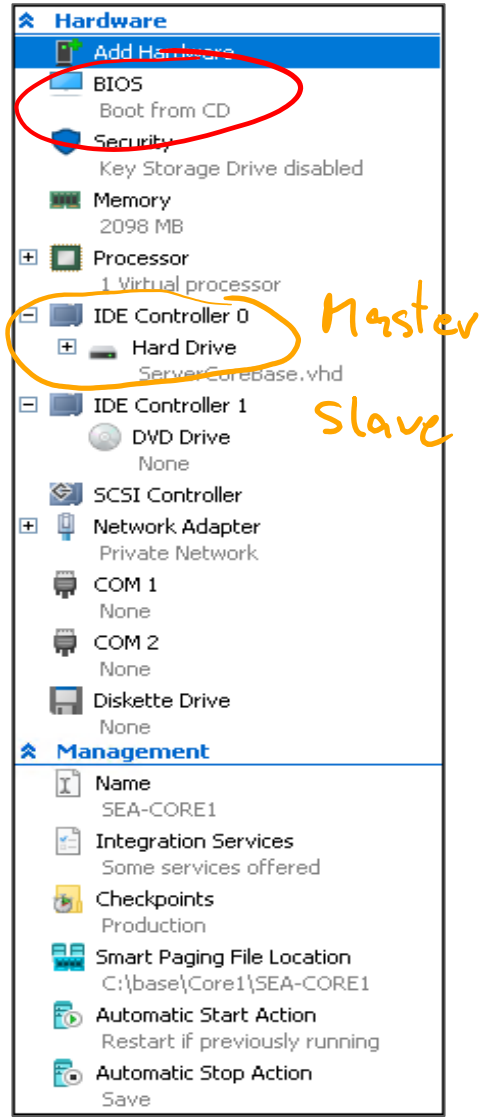
- VM settings are grouped into two main areas:
  - Hardware
  - Management

- Available hardware components depend on the generation version of the VM

Generation 1 settings



Generation 2 settings



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Hyper-V Storage

- Consider the following factors when planning storage for virtual hard disks
  - High-performance connection to storage
  - Redundant storage
  - High-performance storage
  - Adequate growth space

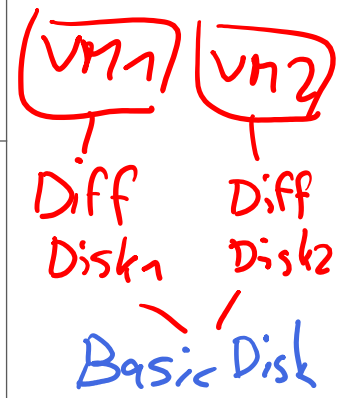
- Supported storage types include
  - Fibre channel connections
  - Server Message Block (SMB) 3.0 file shares

Virtual Hard Disk (1 of 2)

- Virtual hard disk formats include
  - VHD
    - Up to 2040 GB in size
    - Typically used to support older Hyper-V versions
  - VHDX
    - Up to 64 TB in size
    - Recovery from corruption issues
    - Supports larger block size resulting in increased performance

Virtual Hard Disk (2 of 2)

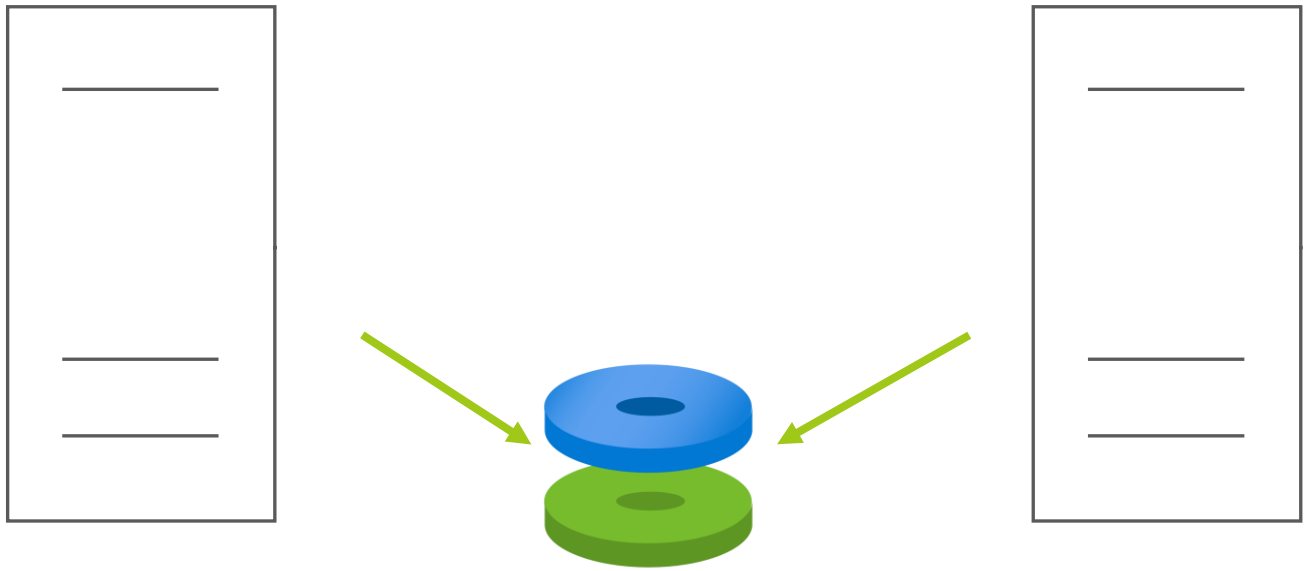
Type of disc	Description
Fixed	Allocates all of the hard disk space immediately
Dynamic	The disk only uses the amount of space that needs to be allocated, and it grows as necessary
Differencing	Associated with another virtual hard disk in a parent-child configuration. Any changes made to the differencing disk does not affect the parent disk.
Pass through	Allows the virtual machine to connect directly to an Internet Small Computer Systems Interface (iSCSI) (logical unit number) LUN or a physical disk attached on the host machine



Shared VHDX and VHD Set files

Virtual machine cluster node 1

Virtual machine cluster node 2



Shared VHDX or VHD Set (VHDS)

Manage VM states and checkpoints

- A VM can be in one of the following states:
  - Off
  - Starting
  - Running
  - Paused
  - Saved
- Checkpoints:
  - Allows you to take a snapshot of a virtual machine at a specific point in time
  - Two types of checkpoints
    - Production checkpoints
    - Standard checkpoints
  - Maximum of 50 checkpoints per virtual machine allowed

Lesson 3. Virtual Machines in Azure

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Virtual Machines in Azure

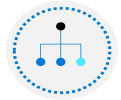
Review Cloud Services Responsibilities

Plan Virtual Machines

Determine Virtual Machine Sizing

Determine Virtual Machine Storage

Create Virtual Machines in the Portal



Connect to Virtual Machines

Connect to Windows Virtual Machines

Connect to Linux Virtual Machines

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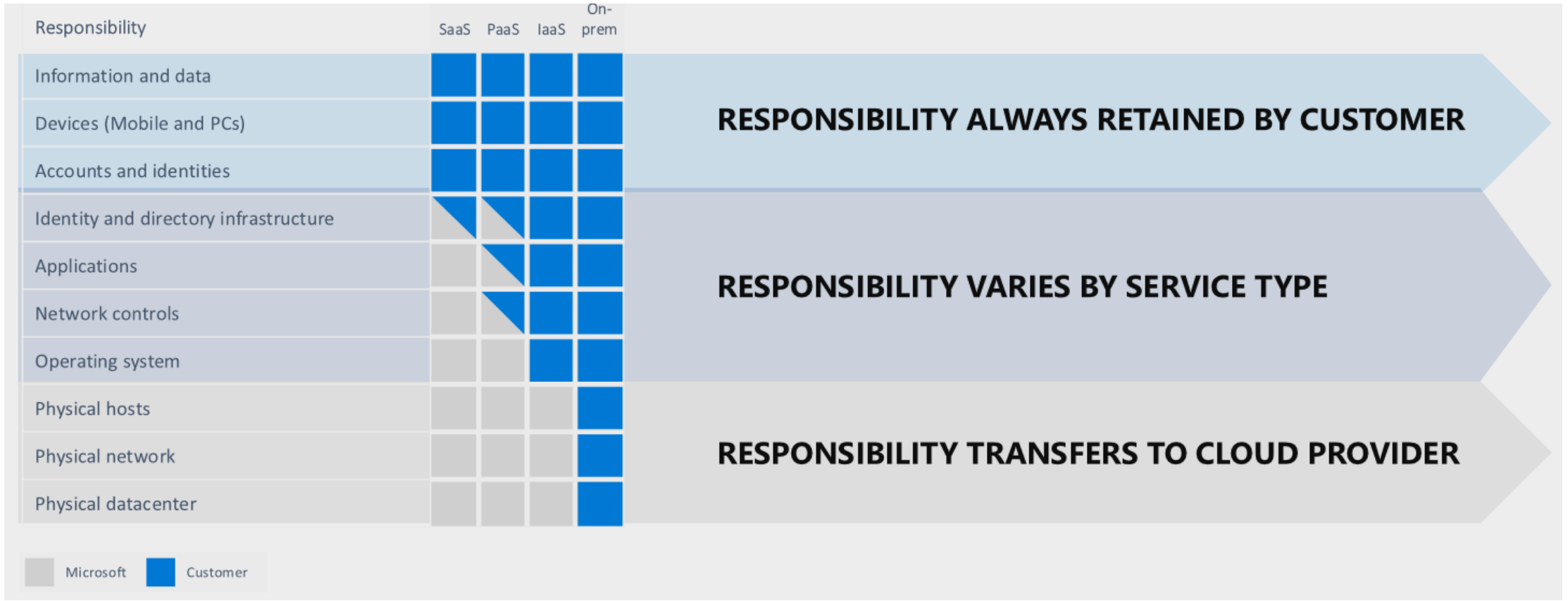
Review Cloud Services Responsibilities



Test and development, website hosting, storage, backup, recovery,
high-performance computing, big data analysis, and extended data center

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Plan Virtual Machines

Start with the network

Name the virtual machine

Choose a location

- Each region has different hardware and service capabilities
- Locate Virtual Machines as close as possible to your users and to ensure compliance and legal obligations

Consider pricing

- Compute costs
- Storage costs (consumption-based and reserved instances)

60+ Azure regions
Available in 140 countries

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Determine Virtual Machine Sizing

A Series - Entry-level for dev/test

B **Series** – Economical bursting

D **Series** – General purpose compute

Dc Series – Protect data in use

E Series – In-memory hyper-threaded applications optimized

F Series – Compute optimized

G Series – Memory and storage optimized

H **Series -** High performance computing

L **Series** – Storage optimized

M Series – Memory optimized

Mv2 Series – Largest memory optimized

N Series – GPU enabled

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Determine Virtual Machine Storage

Each Azure VM has two or more disks:

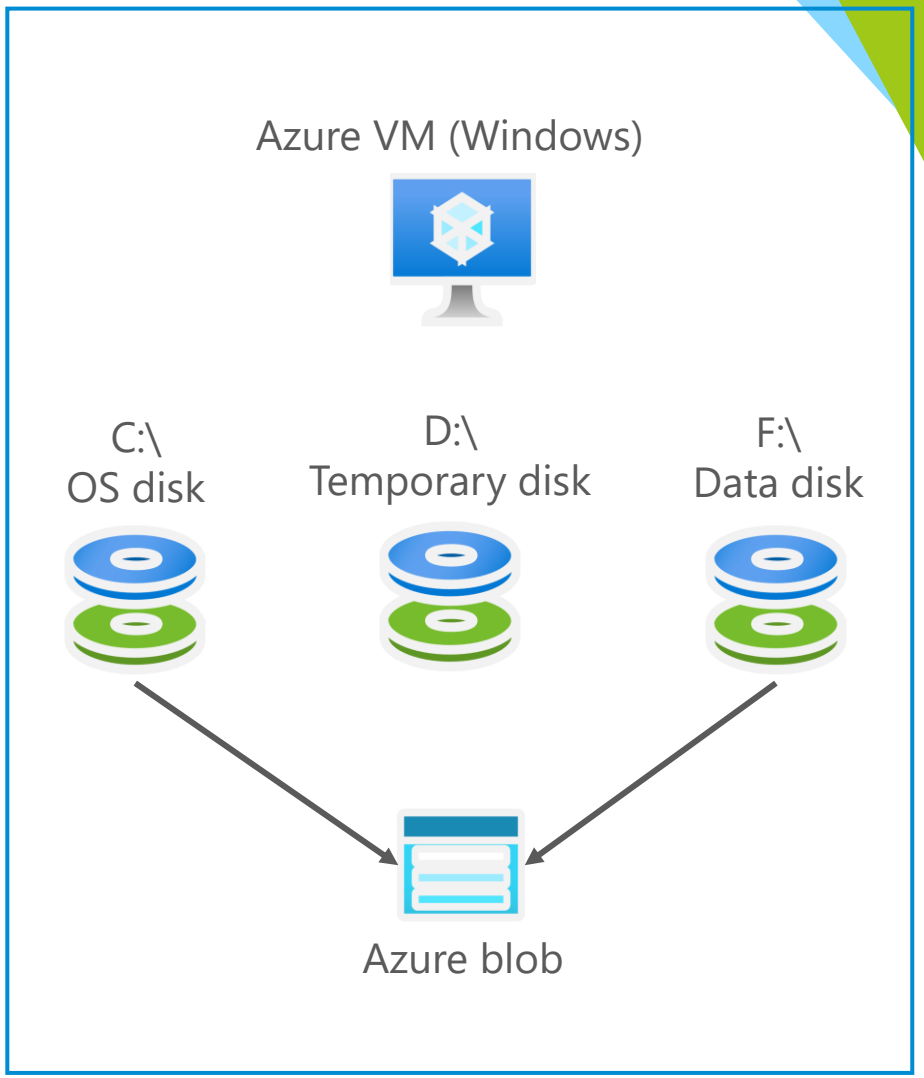
- OS disk
- Temporary disk (contents can be lost)
- Data disks (optional)

OS and data disks reside in Azure Storage accounts:

- Azure-based storage service
- Standard (HDD, SSD) or Premium (SSD), or Ultra (SSD)

When creating an Azure VM, you can choose between:

- Managed disks (recommended)
- Unmanaged disks



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Create Virtual Machines in the Portal

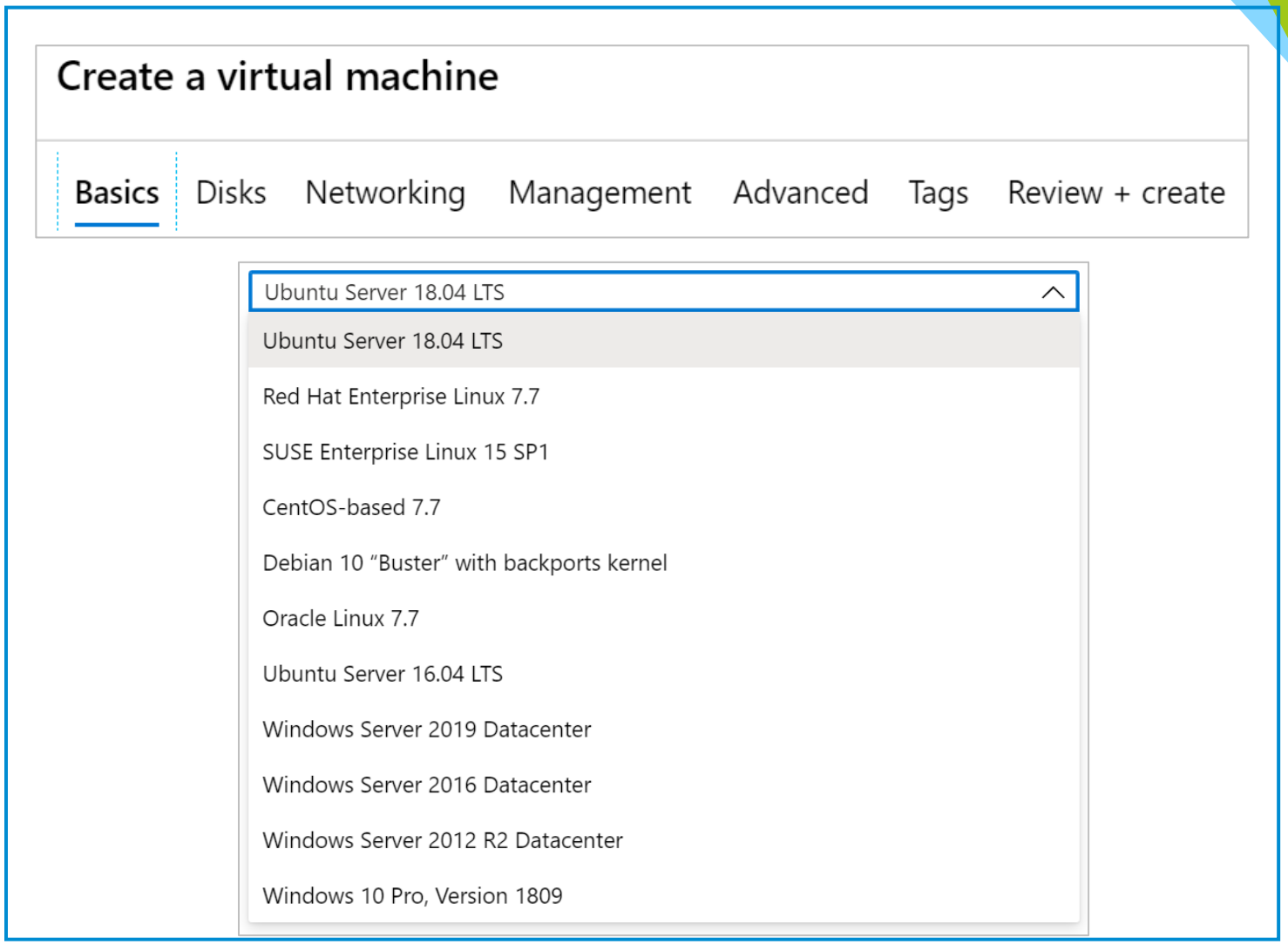
Basic (required) – Project details, Administrator account, Inbound port rules

Disks – OS disk type, data disks

Networking – Virtual networks, load balancing

Management – Monitoring, Auto-shutdown, Backup

Advanced – Add additional configuration, agents, scripts or applications



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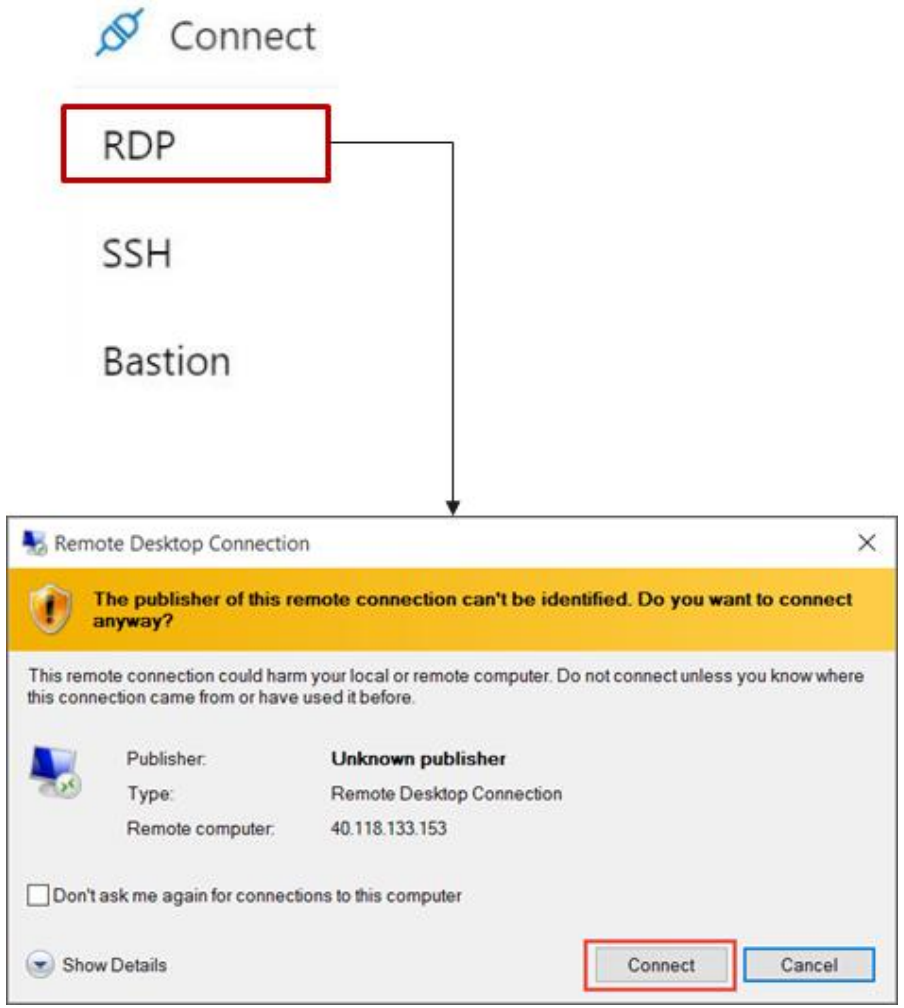
Connect to Windows Virtual Machines

Remote Desktop Protocol (RDP) creates a GUI session and accepts inbound traffic on TCP port 3389

WinRM creates a command-line session so can run scripts



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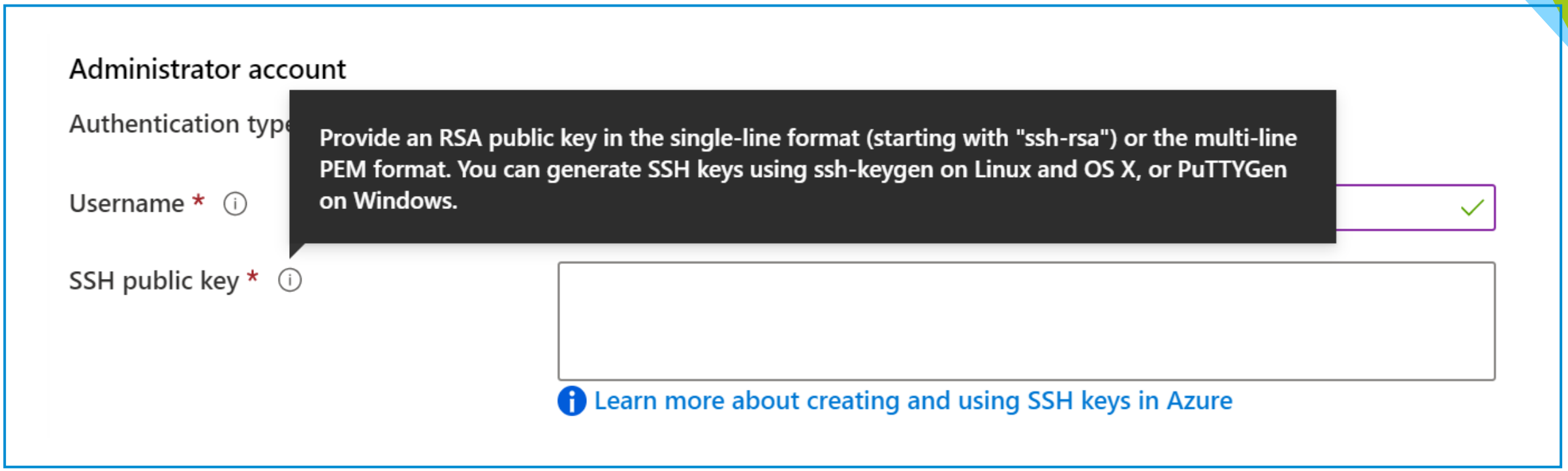
Connect to Linux Virtual Machines



Authenticate with a SSH public key or password

SSH is an encrypted connection protocol that allows secure logins over unsecured connections

There are public and private keys

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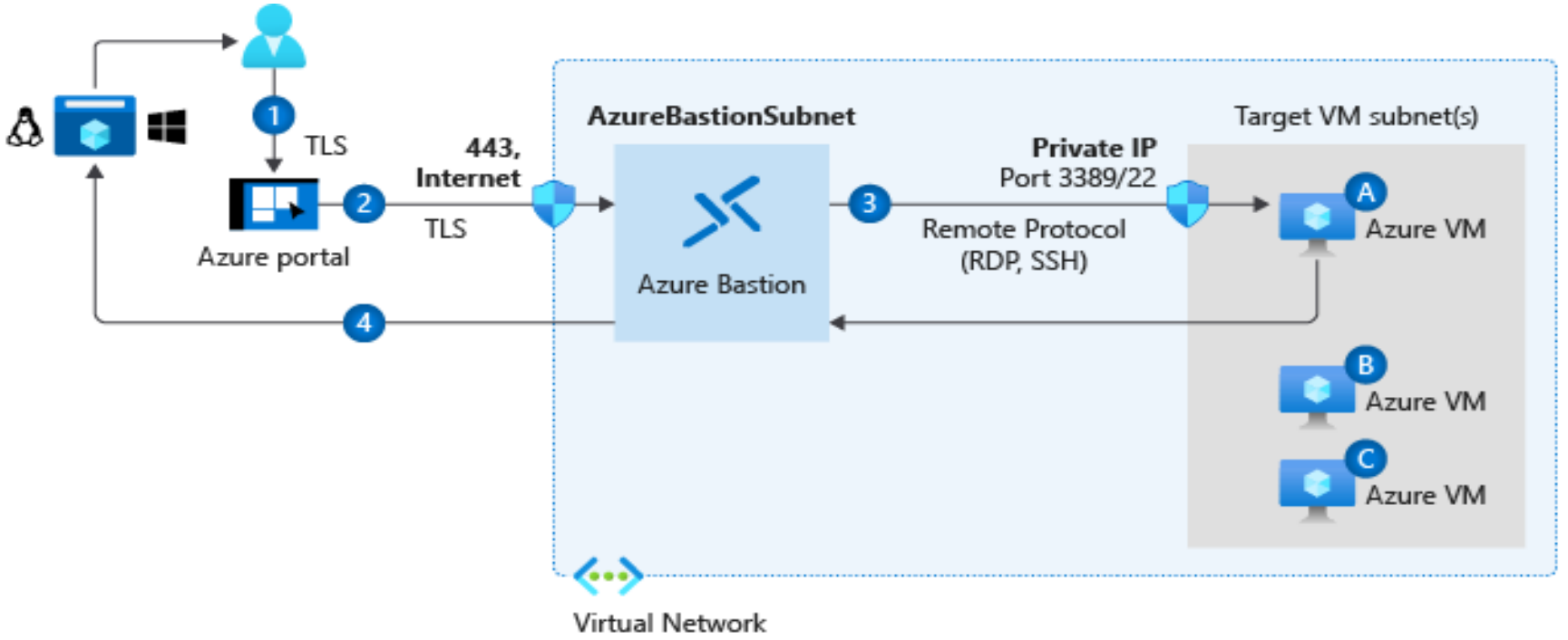
Connect to Virtual Machines



Bastion Subnet for RDP/SSH through the Portal over SSL

Remote Desktop Protocol for Windows-based Virtual Machines

Secure Shell Protocol for Linux based Virtual Machines

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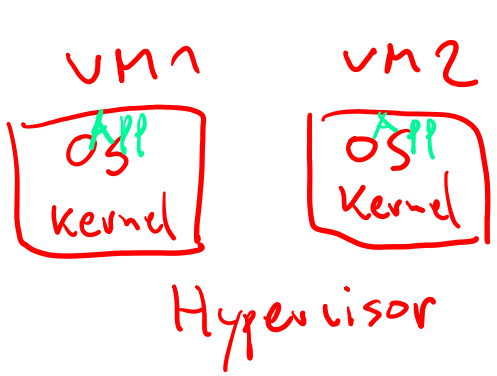
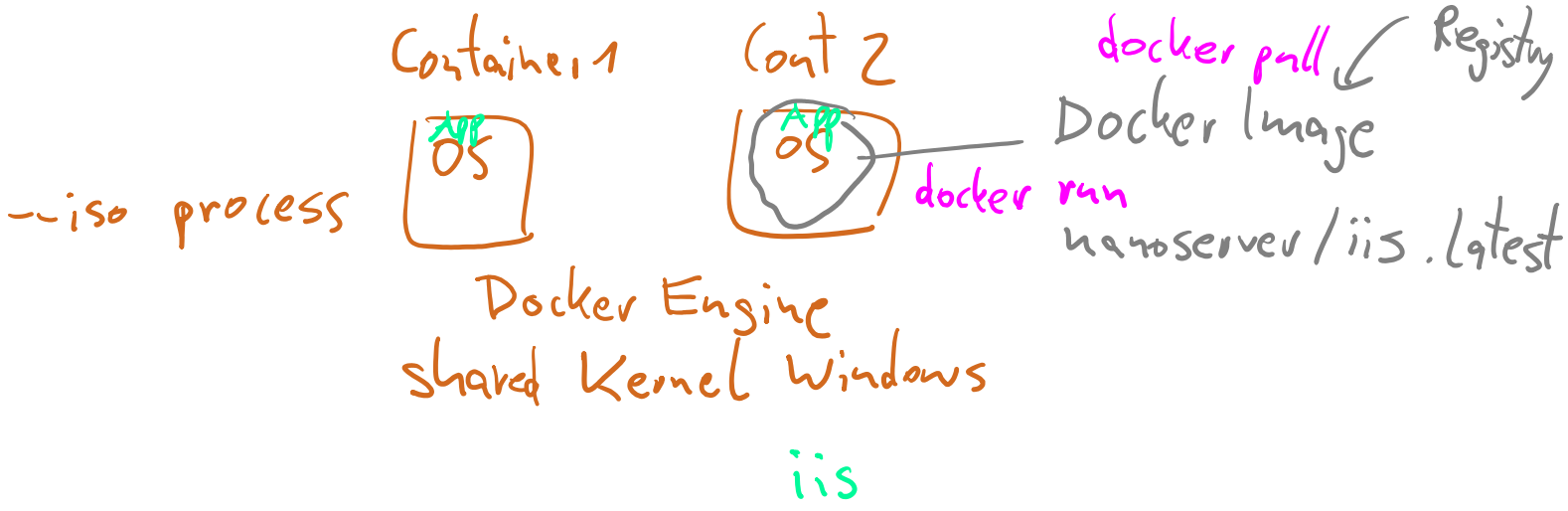
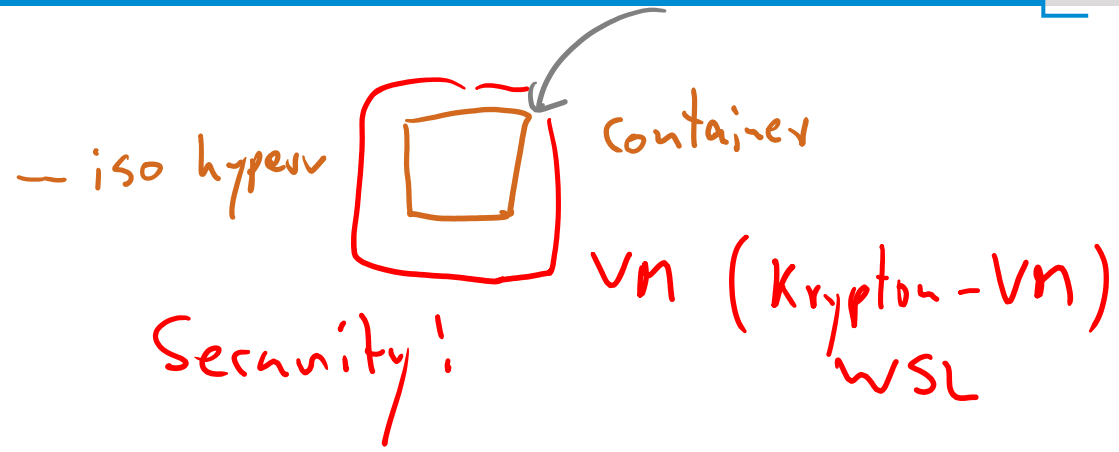




Lesson 4: Containers



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Containers

Define Containers

Containers vs. virtual machines

Container isolation modes

Container in Azure

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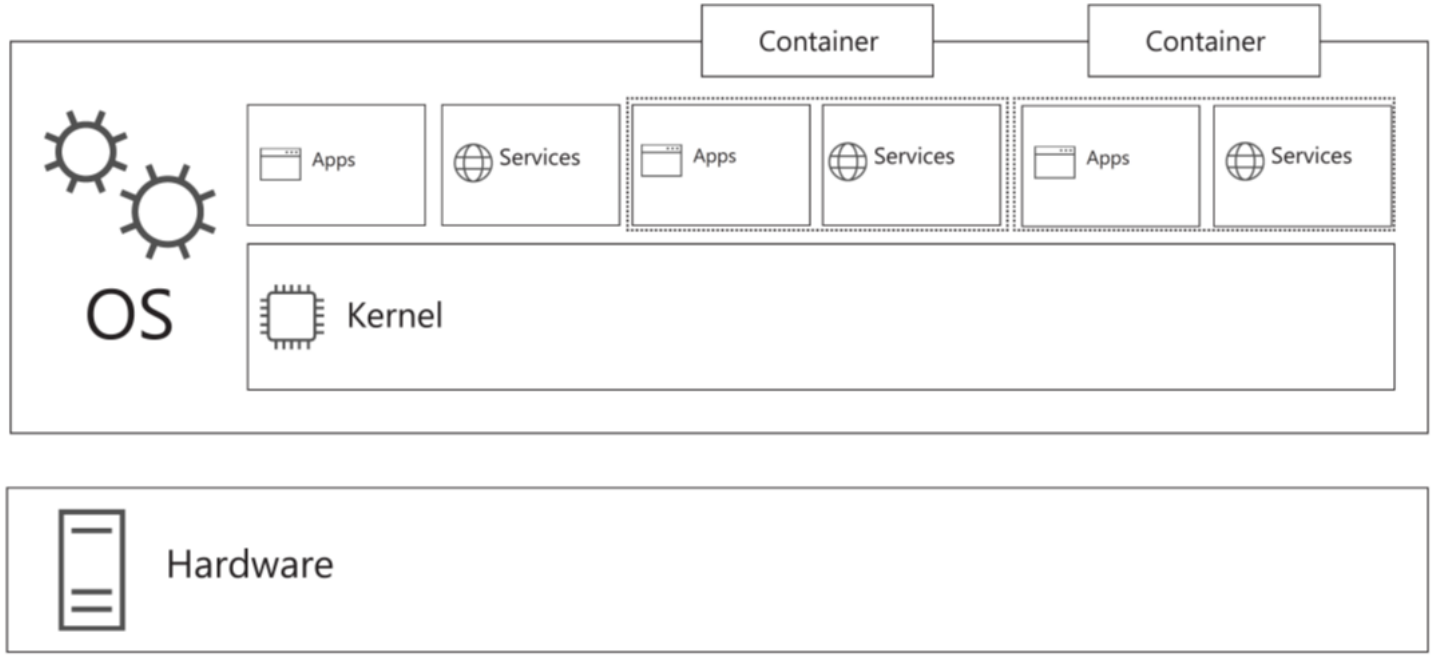
Containers

- Package of an application along with all its dependencies
- Lightweight development and runtime environment for applications

- Benefits of using containers:
  - Ability to run anywhere; local workstation, servers, or provisioned in the cloud
  - Isolation
  - Increased efficiency
  - A consistent development environment



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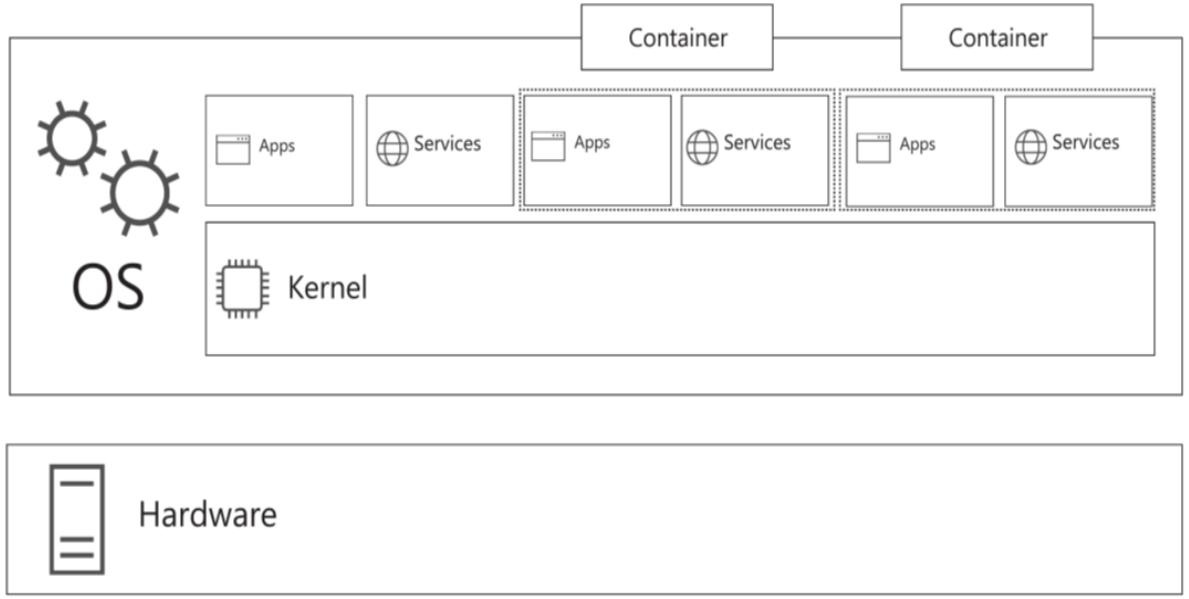
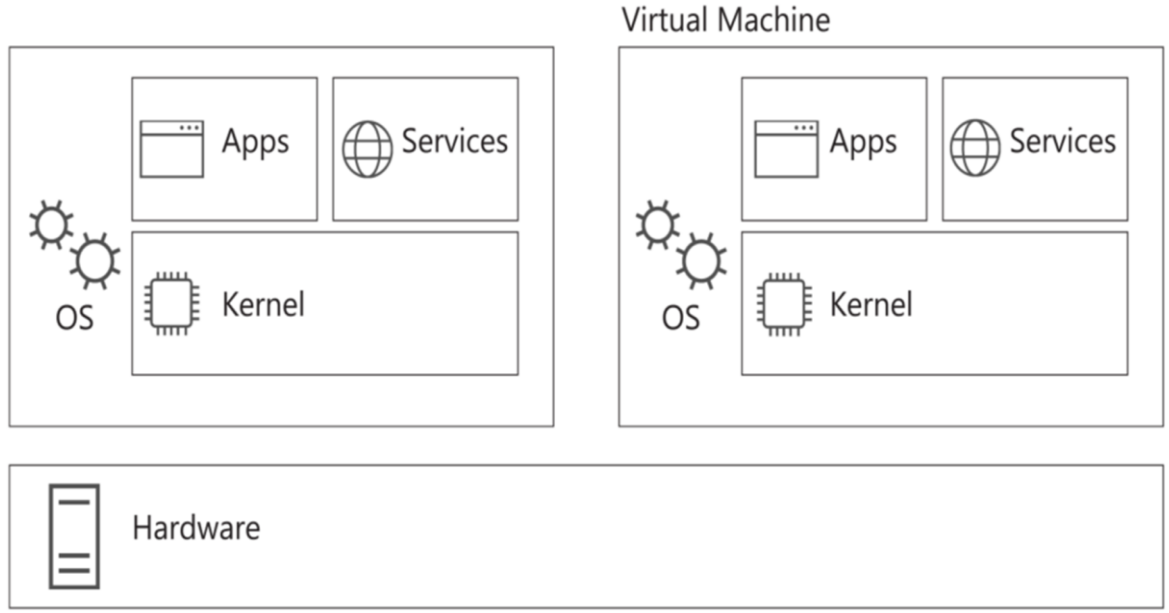
Containers vs. Virtual Machines

Containers



Virtual Machines



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Container Isolation Modes

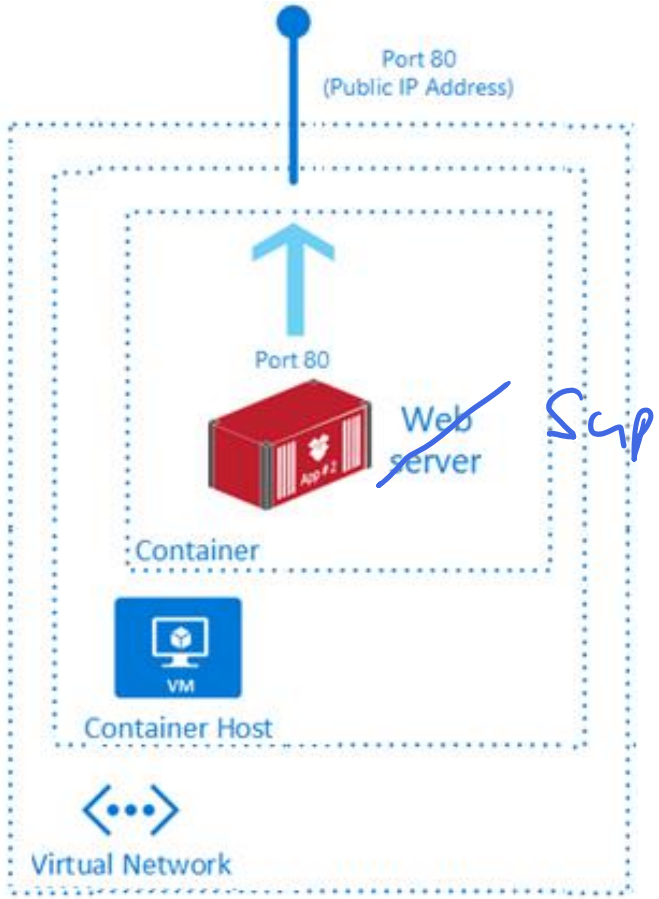
- Process Isolation
  - “Traditional” isolation mode
  - Containers share the same kernel with each other and the host
  - Each container has its own user mode
  - Does not provide security-enhanced isolation
  - Uses the following switch when starting a container using Docker:
  - **–isolation=process**
- Hyper-V Isolation
  - Each container runs inside of a highly optimized virtual machine
  - Each container gains its own kernel and an enhanced level of stability and security
  - Also provides hardware-level isolation between each container and the host
  - Uses the following switch when starting a container using Docker:
  - **–isolation=hyperv**

Client: docker pull image run stop

Server: Dock Engine

Explore Azure Container Instances Benefits

- PaaS Service
- Fast startup times
- Public IP connectivity and DNS name
- Isolation features
- Custom sizes
- Persistent storage
- Linux and Windows Containers
- Co-scheduled Groups
- Virtual network Deployment



Fastest way to run a container in Azure without provisioning a VM

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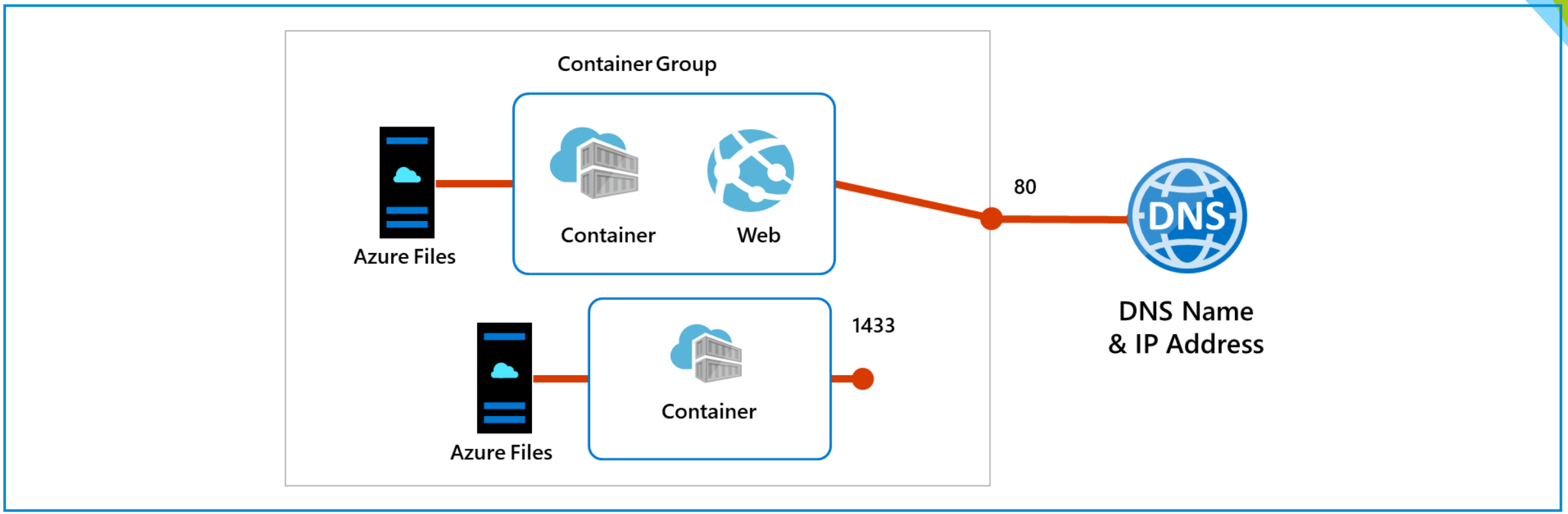
Implement Container Groups



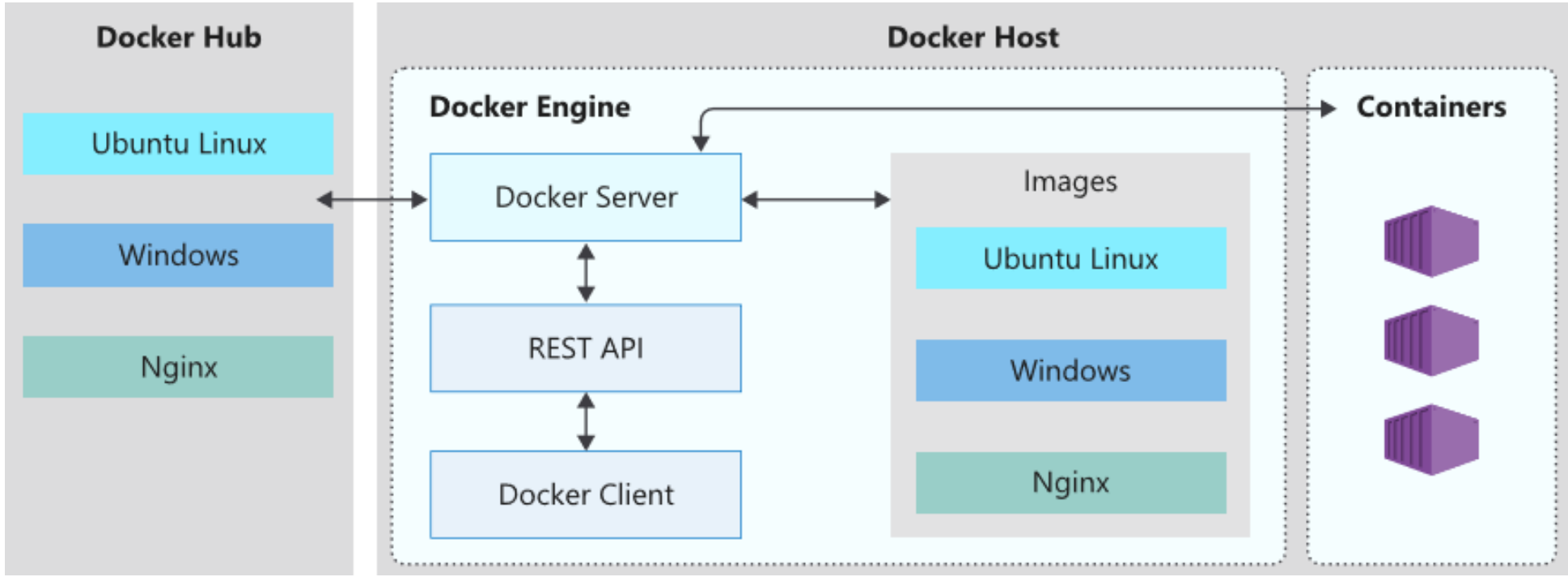
Top-level resource in Azure Container Instances

A collection of containers that get scheduled on the same host

The containers in the group share a lifecycle, resources, local network, and storage volumes

Understand the Docker Platform

Docker Desktop → Win



Enables developers to host applications within a container

A container is a standardized “unit of software“ that contains everything required for an application to run

Available on both Linux and Windows and can be hosted on Azure

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The End