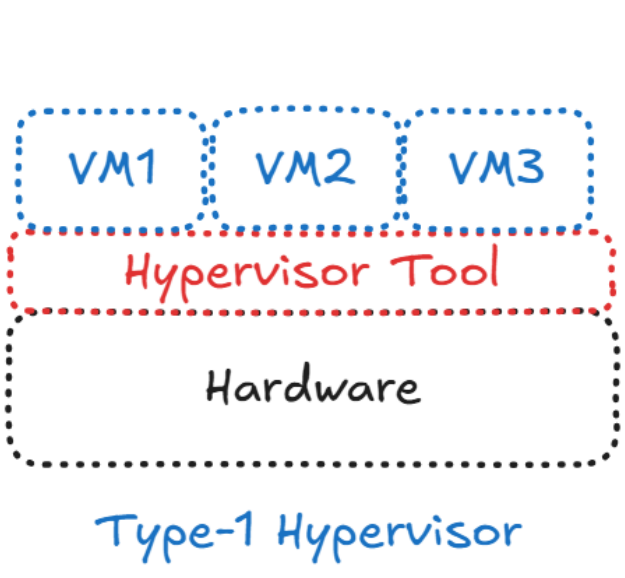
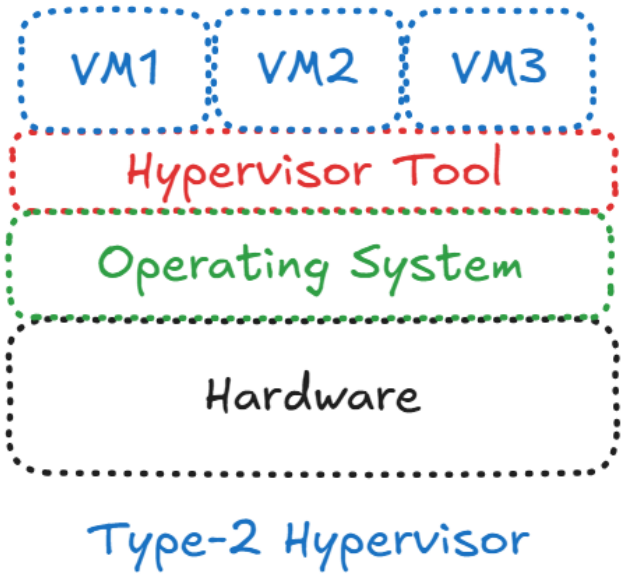
- ✓ To achieve virtualization, we need a software/tool called “Hypervisor”.
- ✓ Hypervisor are of 2 types:
  - Type 1 (Bare-metal) Hypervisor
  - Type 2 (hosted/guest-based) Hypervisor





Type-1 Hypervisor

- ✓ Aka bare-metal Hypervisor
- ✓ These Hypervisors are installed directly on top of the hardware (with no additional OS).
- ✓ These Hypervisors themselves act as an operating system.
- ✓ These Hypervisors are much faster and reliable, so they are best suited for the production environments.
- ✓ Example of Type-1:
  - Microsoft Hyper-V
  - VMWare ESXi
  - Citrix Xen server
  - Proxmox

Type-2 Hypervisor

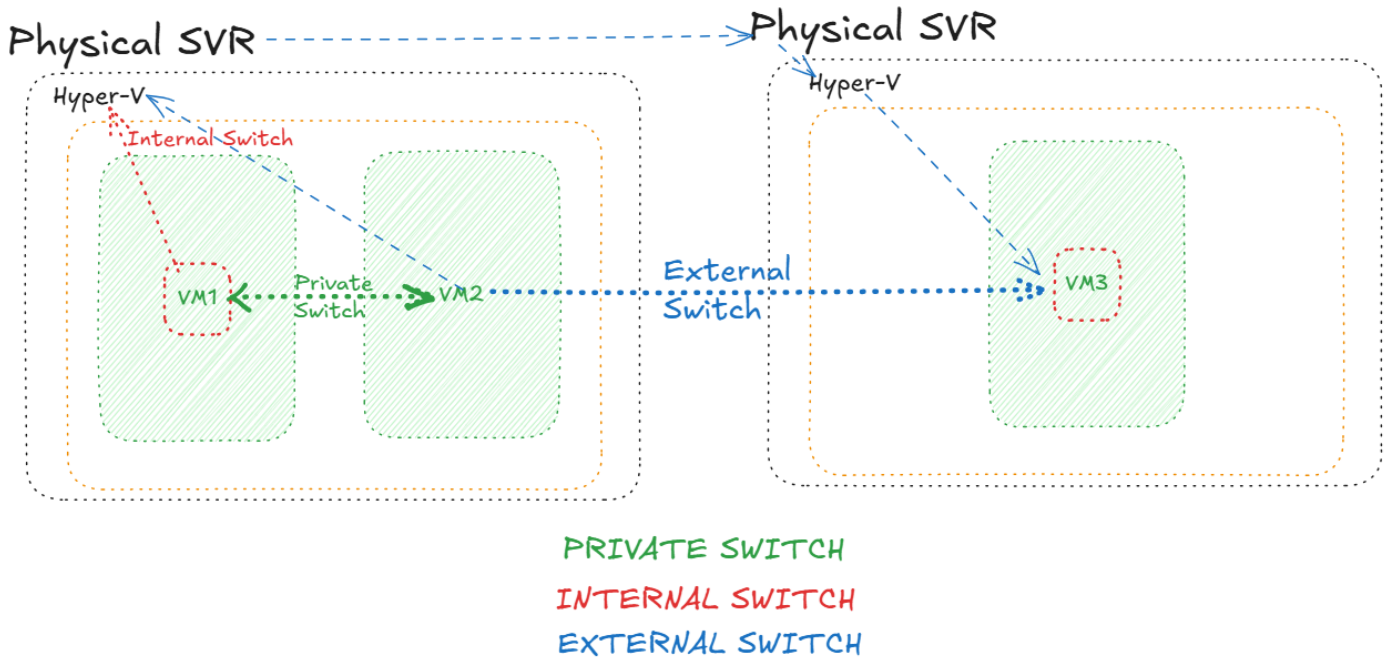
- ✓ These Hypervisors are installed directly on top of an operating system.
- ✓ These Hypervisors **require** an OS to work.
- ✓ These Hypervisors are good for home, training or non-production environment as they are slower in nature.
- ✓ Example of Type-2:
  - Microsoft Hyper-V
  - VMWare Workstation
  - Oracle Virtual Box
  - Linux KVM
  - VMWare fusion (MacOS)
  - VMWare player (free)

Microsoft Hyper-V:

- ✓ Microsoft Hyper-V is the Microsoft's virtualization solution.
- ✓ Microsoft Hyper-V is by default part of:
  - Windows 10/11 Pro Edition → Type-2 hypervisor
  - Windows 10/11 Enterprise Edition → Type-2 hypervisor
- ✓ Microsoft Windows Server OS → Role → Hyper-V → Type-1 hypervisor.
- ✓ In VMWare workstation we have "snapshots", but in Hyper-V we have "**checkpoint**".

In Hyper-V:

- ✓ Networking – it allows you to connect with another virtual machine or on the internet.
- ✓ For connectivity on Hyper-V, we need a switch.
- ✓ Hyper-V contains of 3 types of switches.
  - Private switch
    - This type of switch allows the communication between 2 VMs on same Hyper-V host.
  - Internal switch
    - This type of switch allows the communication between 2 VMs on same Hyper-V host &
    - It also allows the communication between VM and host (where Hyper-V) is installed.
  - External switch
    - This type of switch allows the communication between a VM of one Hyper-V host to another VM of another Hyper-V host.

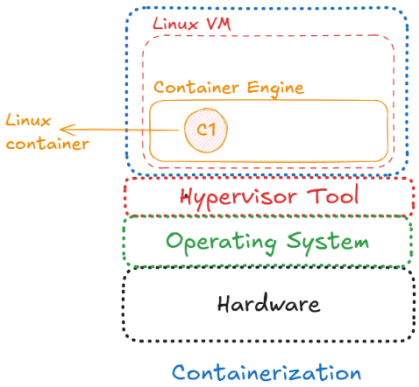


Virtual Machines HDD extensions:

- ✓ .VHD → 2TB → Generation 1
- ✓ .VHDX → 64TB → *Generation 2*

Containers:

- ✓ Containers are the light-weight solution to run an application.
- ✓ These containers are light-weight because it contains only libraries and binaries to run the application.
- ✓ These containers do not carry their own operating system; they share it with the host OS.
- ✓ Due to this, container totally rely on the host operating system.
    - This means if the host machine is a Windows OS, then we can run ONLY windows containers.
    - If the host machine is a Linux OS, then we can run ONLY Linux-based containers.



Containerization

VMWare vSphere Environment:

- VMWare vSphere is an enterprise-grade virtualization platform for creating and managing virtual machines within your own on-premises datacenter.
    - *VMWare* = a company.
    - *vSphere* = product → to work with virtualized (VMs) environment.

✓ It allows organizations to run application securely.

✓ Major components of VMWare vSphere:

- *VMWare ESXi Server*
    - Full form = Elastic Sky X Integrated
    - It is a "Type-1" Hypervisor.
    - This ESXi gets directly installed on top of hardware (bare-metal) machine.
    - It runs the virtual machines on top of itself.
    - It can be accessed using
        - DCUI (Direct Console User Interface) console and/or
            - DCUI is used very less, due to limited features availability.
        - VMWare vCenter server.
            - This is the standard way to access the ESXi server.
- *VMWare vCenter Server*
    - This provides the centralized management of multiple ESXi servers and the VMs within it.
    - It also manages the storage for the VMs.
    - It manages the compute power (RAM, CPUs) for the VMs and ESXi servers.
    - vCenter server offer features like:
        - DRS (Distributed Resource Schedular)
        - HA (High Availability)
        - FT (fault Tolerance)
        - vMotion (migration)
        - vSAN storage support
    - vCenter server manages all the ESXi hosts using virtual distributed switch (vDS).
- *VMware vSphere Client Tool*
    - The .exe tool got deprecated since vCenter version 6.5
    - Now to access, we use the browser-based (HTML5) tool.

Features:

✓ Distributed Resource Schedular
- DRS is used for balancing the workload across hosts for best performance.

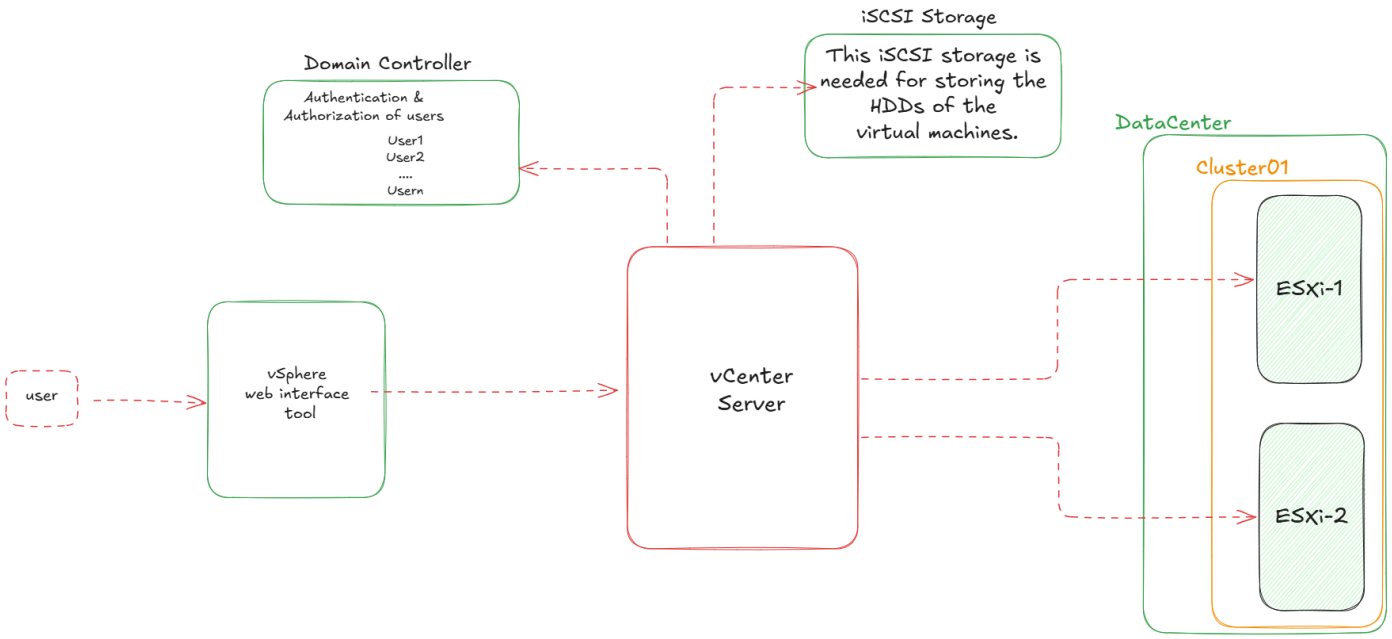
✓ High Availability
- Automatically connecting/restarting the VM to another hosts, in case of host failure.

✓ Fault Tolerance
- Ability to tolerate the fault (issue)

✓ vMotion
- Migrating the VM from one host to another., in case of failure.

✓ Storage vMotion
- Migrating the storage/HDD from one host to another

VMWare vSphere architecture:



1. User logs in to the web interface using vCenter server administrator access.
2. Then vCenter server verifies the credentials from AD.
3. Once authenticated, user is allowed to login with the permission allocated.
4. Then user can start:
    a. Creating VMs
    b. Create or managing storage
        i. Etc.