

Hillingdon Computer Club

Virtual Machines / Containers

September 2025



History of Virtualization

- Emerging technology of the late 70's saw the x86 architecture, mainframes, **hypervisors**, single-use PC's and virtual switches.
- Enabled admins to share resources across networks, cost less to design and improved resource utilisation
- Designed by IBM in 1964 & introduced in the CP-40 to provide time-sharing technology to support more than one simultaneous user. Multitasking was the holy grail at the time.
- In the 2000's VMWare popularized server virtualization. It transformed Data Centres. Now over 90% of Enterprises use VM's

What's a Hypervisor

- The term dates from 1970 when used to describe the software that ran the 360/65 mainframe computer. The term came from 'Supervisor', which is used to describe a kernel of an OS.
- The Hypervisor is therefore a supervisor of supervisors. ('hyper-' being stronger term than 'super-')
- It's now known as a *virtual machine monitor* (VMM) or *virtualizer* and is the software, firmware or hardware that creates and runs a Virtual Machine. A computer that runs a hypervisor has one or more virtual machines.

What's a Virtual Machine

- A **software-based emulation** of a physical computer.
- Runs an **operating system (guest OS)** inside another OS (host).
- Provides **virtual CPU, memory, storage, and network** resources.
- Functions as if it were a completely separate machine.

❖❖ Simple analogy: A VM is like running a “computer inside your computer.”

Business Bare Bones Servers

Server 1

Payroll

OS Windows Server

Hardware

Apps

Server 2

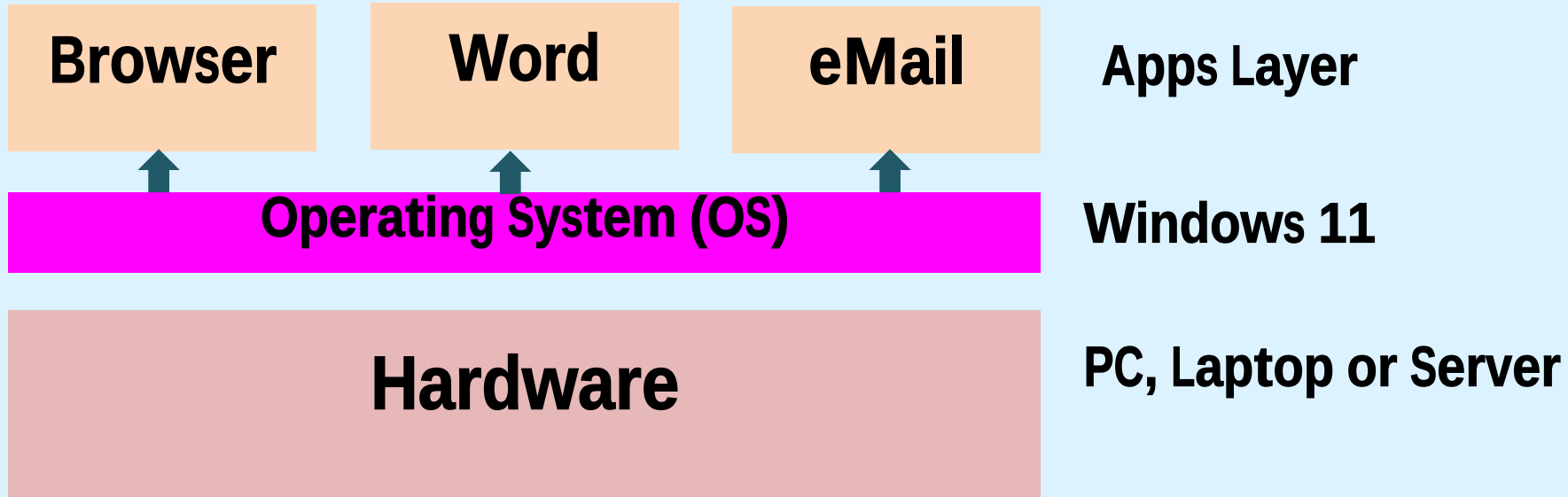
Purchasing

OS Windows Server

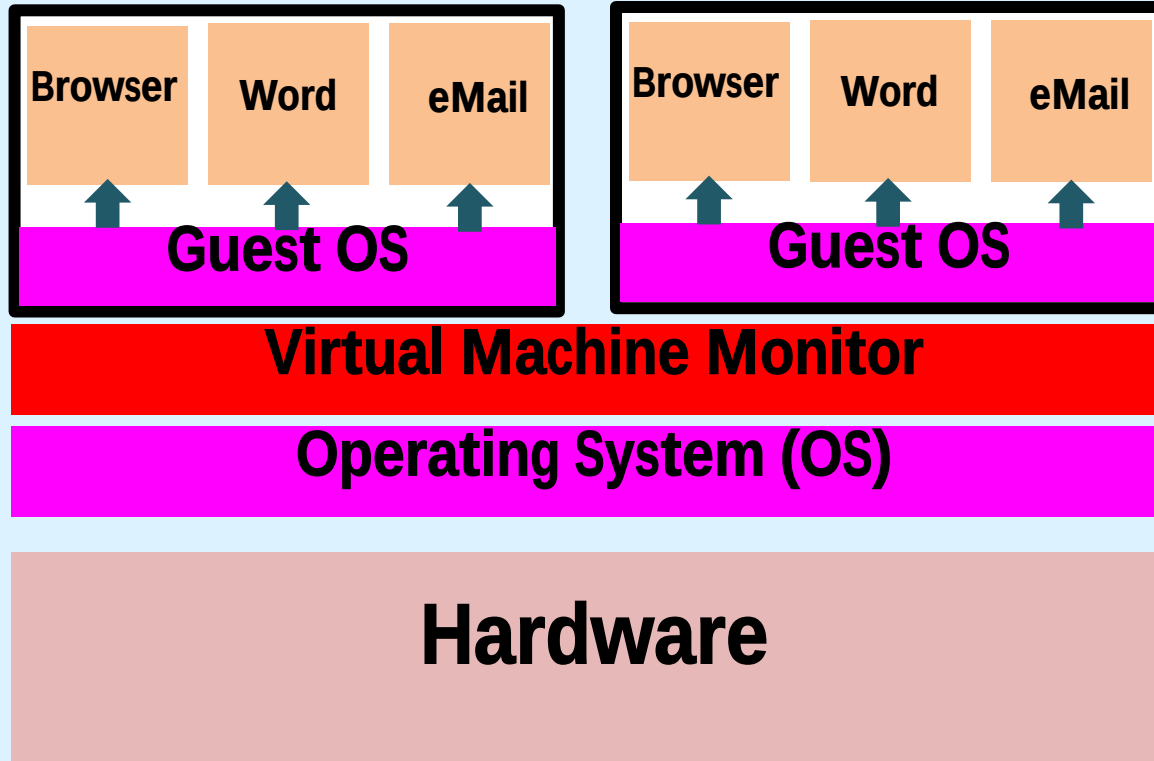
Hardware

- Problem Perhaps Server 2 is used more than server 1
- They could share a bigger server to be more efficient, but
Might need different operating systems
Security

A Bare Bones PC



A VMM Virtualized PC (hosted hypervisor)



Apps Layer

VM Layer

VMM

Windows 11

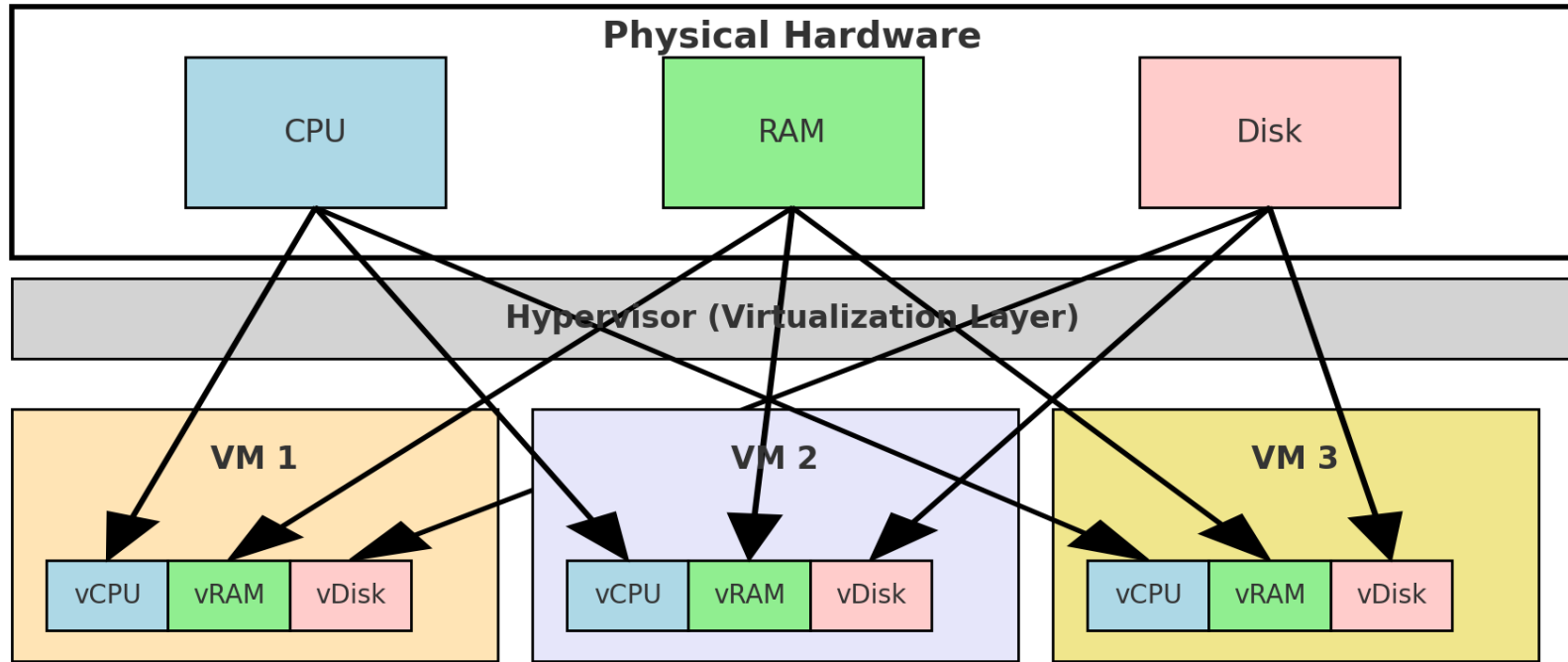
PC, Laptop or Server

Why Virtual Machine are Important today

- **Efficiency:** Maximize hardware utilization by running multiple workloads on one machine.
- **Flexibility:** Run different operating systems (e.g., Linux inside Windows).
- **Cost savings:** Reduce need for dedicated physical servers.
- **Testing & development:** Safe sandbox environments.
- **Cloud computing:** Foundation of IaaS platforms like AWS EC2, Azure VMs, and Google Compute Engine.
- **Isolation:** Keeps environments secure and independent, reducing risk of system-wide crashes.

Architecture of a Virtual Machine

Mapping Physical Resources to Virtual Resources in Multiple VMs



- VM lifecycle (create, snapshot, clone, migrate, delete)

What's a Desktop Virtual Machine

To run applications in a virtualized environment, separate from the underlying OS.

- **How it works:** An application is installed and executed in a virtual layer, reducing dependency on the host OS.

- **Benefits:**

- Avoids conflicts between applications.
- Enables older applications to run on newer operating systems.
- Simplifies deployment across multiple devices.
 - A single file makes it easier to move, clone, Template & back up (snapshot)

- **Examples:** Oracle VirtualBox, VMware Workstation, Microsoft Hyper-V.

- **Use Cases:** Users with legacy applications, users wanting to run multiple OS's to benefit from specific OS apps.

Where to get the VirtualBox App

VirtualBox

HomeDownloadDocumentationCommunity

Download VirtualBox

The VirtualBox Extension Pack is available for personal and educational use on this page under the PUEL license. The VirtualBox Extension Pack is also available under commercial or enterprise terms. By downloading, you agree to the terms and conditions of the respective license.

VirtualBox Platform Packages

VirtualBox 7.2.2 platform packages

-  [Windows hosts](#)
-  [macOS / Intel hosts](#)
-  [macOS / Apple Silicon hosts](#)
-  [Linux distributions](#)
-  [Solaris hosts](#)
-  [Solaris 11 IPS hosts](#)

Platform packages are released under the terms of the [GPL version 3](#)

VirtualBox Extension Pack

VirtualBox 7.2.2 Extension Pack

This VirtualBox Extension Pack Personal Use and Educational License governs your access to and use of the VirtualBox Extension Pack. It does not apply to the VirtualBox base package and/or its source code, which are licensed under version 3 of the GNU General Public License "GPL").

See our [FAQ](#) for answers to common questions.

VirtualBox Extension Pack Personal Use and Educational License (PUEL)

[PUEL License FAQ](#)[PUEL License Text](#)[Accept and download](#)

Change Log

[List of changes](#)

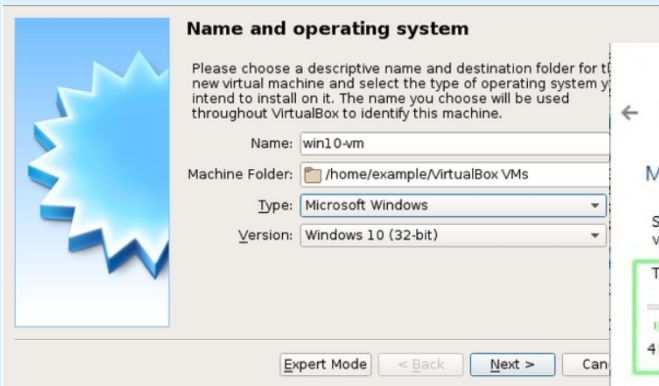
File Checksums

[SHA256 checksums](#) [MD5 checksums](#)

User Guide

[User Guide \(PDF\)](#) [User Guide \(HTML\)](#)

Creating a new Virtual Machine



Name and operating system

Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

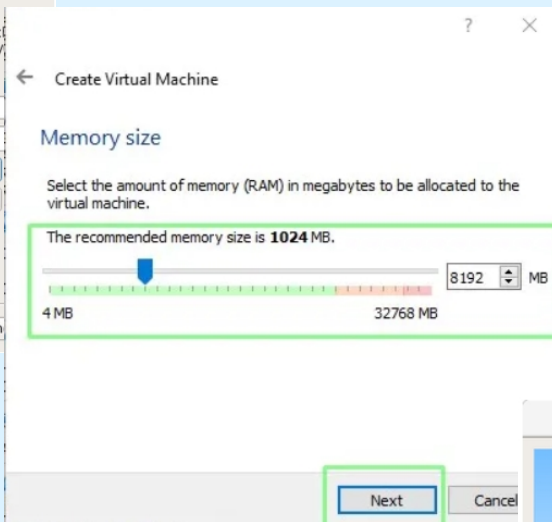
Name: win10-vm

Machine Folder: /home/example/VirtualBox VMs

Type: Microsoft Windows

Version: Windows 10 (32-bit)

Expert Mode < Back Next > Cancel



Create Virtual Machine

Memory size

Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is **1024 MB**.

4 MB 32768 MB

8192 MB

Next Cancel



Create Virtual Machine

Hard disk

If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.

If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.

The recommended size of the hard disk is **50.00 GB**.

☐ Do not add a virtual hard disk

☒ Create a virtual hard disk now

☐ Use an existing virtual hard disk file

Empty

< Back Create Cancel



Create Virtual Hard Disk

File location and size

Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.

win10-vm

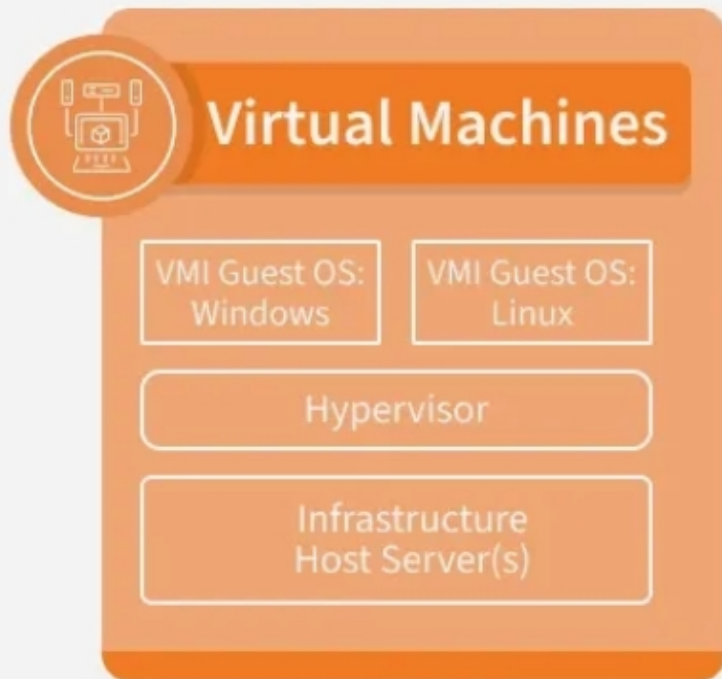
Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.

4.00 MB 2.00 TB

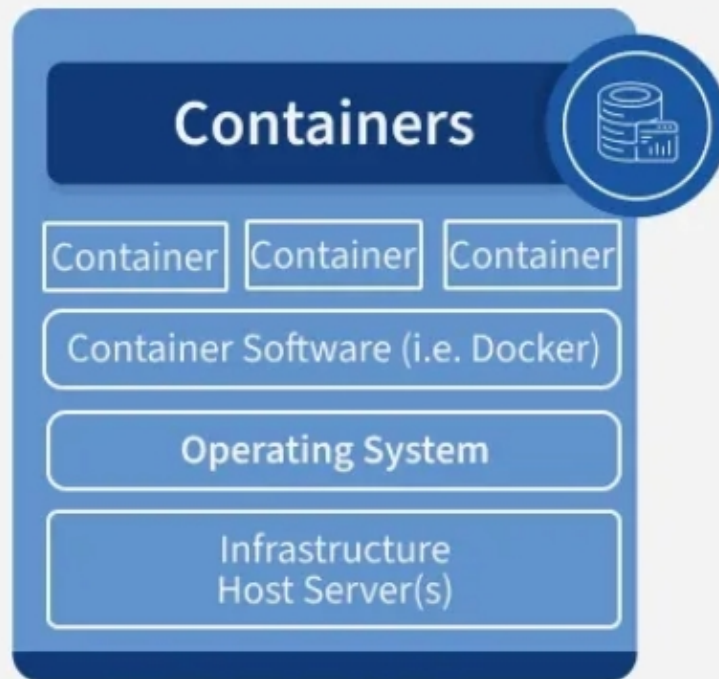
50.00 GB

< Back Create Cancel

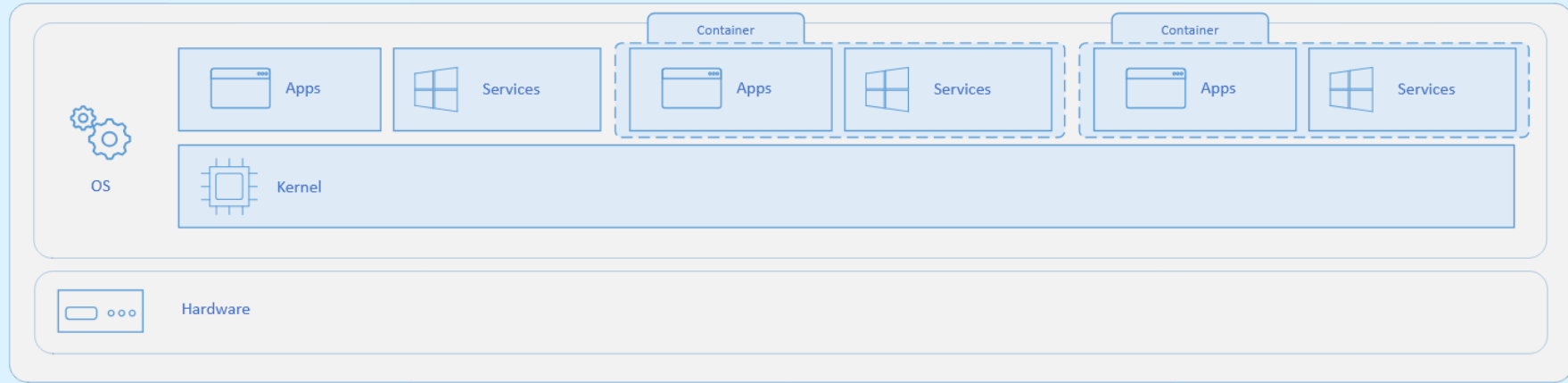
What are Containers



Vs



What are Containers



A container is an isolated, lightweight way of handling virtualization that doesn't use a hypervisor and so enjoys faster resource provisioning & availability of apps. Containers build on top of the host operating system's kernel and contain only apps and some lightweight operating system APIs and services that run in user mode.

Although around for decades, containers have taken off since Docker was released in 2013, an open source platform to create and manage containers

What are Containers

Key Characteristics of Containers:

- Isolation: Each container runs in its own environment
- Portability: Containers can run on any system that supports the container runtime
- Scalability: Containers can be easily scaled up or down to handle varying loads.

2. Benefits of Using Containers

- Containers ensure that applications run the same way regardless of where they are deployed.
- Containers use fewer resources than VMs, allowing better utilization of hardware.
- Faster Deployment: Containers can be started and stopped quickly
- Examples : Docker, Kubernetes (with Minikube), Windows (needs Pro & Hyper-V).

Dual Boot

Just want to run two Operating Systems on a PC

- Perhaps you might want Windows 10 and Linux or Win 10 & Win 11, it's easy to set up a dual Boot.
- Install Windows first
- Use Rufus Bootable USB Drive & download a disk image (ISO file).
- Create a Bootable drive
- In windows Disk Management, Shrink Volume to the size you want for the new OS
- Turn off Fast Boot in Power Settings
- Change BIOS to disable Secure Boot & set Boot order to USB first
- Install 2nd OS & select Install <OS2> alongside <OS1>
- Once installed, when you boot, you'll get a menu asking to choose which OS you want to Boot. You can have more than 2 OS's.

Dual Boot

Just want to run two Operating Systems on a PC

- Perhaps you might want Windows 10 and Linux or Win 10 & Win 11, it's easy to set up a dual Boot.
- Other apps for Dual Booting;
 - Grub2Win
 - EasyBCD
 - RefiND Boot Manager
 - Clover EFI bootloader
 - Grub 2



Demo

References

- Explanation of Virtual Machines <https://www.youtube.com/watch?v=FZR0rG3HKIk>
- Explanation of Containers <https://www.youtube.com/watch?v=0qotVMX-J5s>
- VirtualBox <https://www.virtualbox.org/>
- Vmware <https://www.techspot.com/downloads/189-vmware-workstation-for-windows.html>
- Microsoft Hyper-v <https://learn.microsoft.com/en-us/windows-server/virtualization/hyper-v/get-started/Install-Hyper-V?tabs=powershell&pivots=windows>
- Docker <https://www.docker.com/>



The End