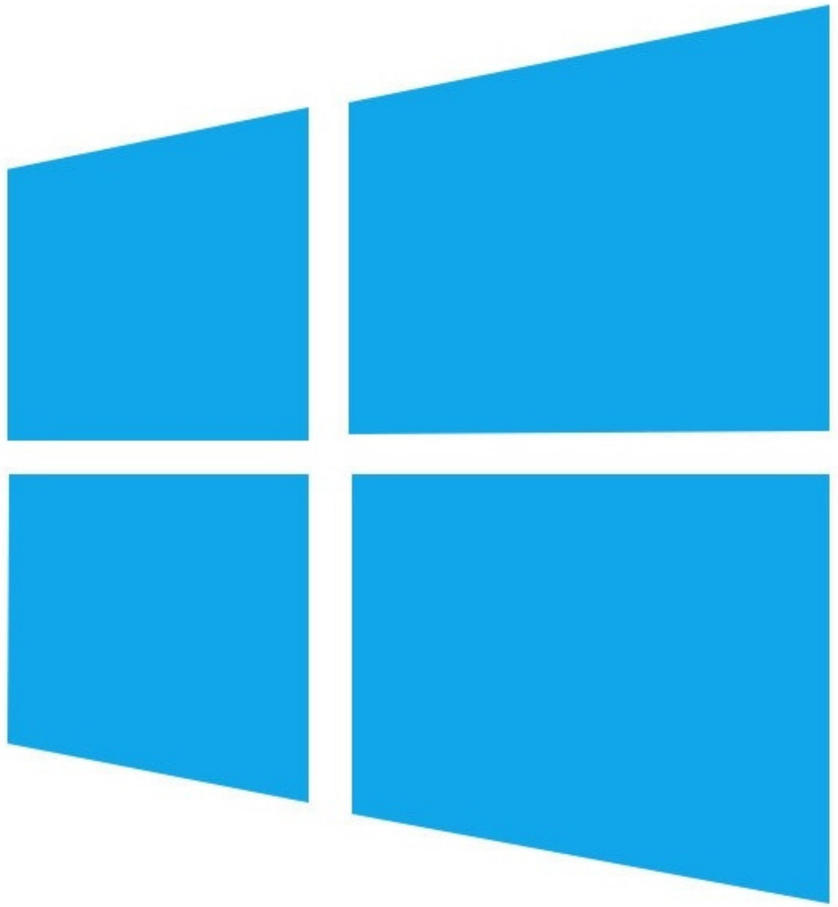
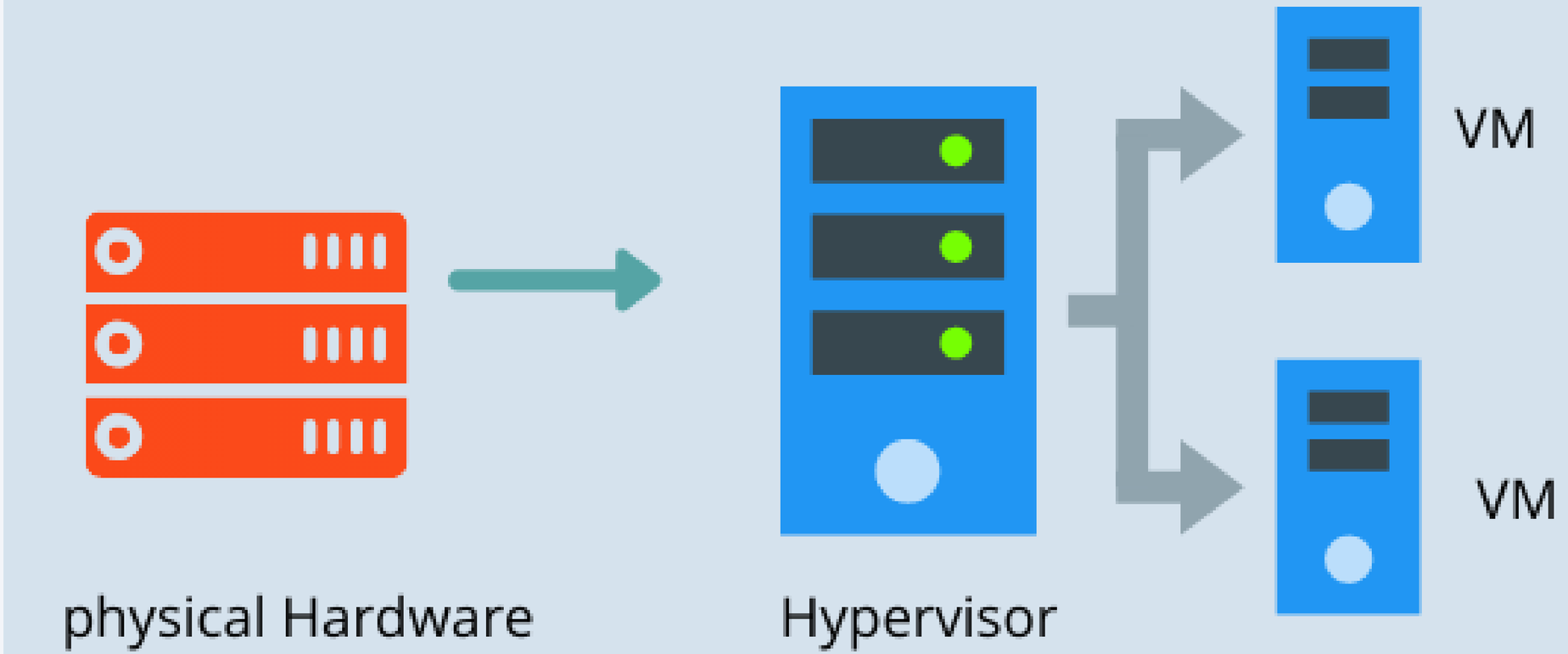


Microsoft
Hyper-V

Virtualization

Virtualization is the act of creating a virtual version of something, including virtual computer hardware platforms, storage devices, and computer network resources.

Virtualization



What is Hyper - V

- Hyper-V is Microsoft's hardware virtualization product .It lets you create and run a software version of a computer, called a virtual machine.Each virtual machine acts like a complete computer, running an operating system and programs.

- It is a hybrid solution because it leverages both paravirtualization techniques and full hardware virtualization.

- When you need computing resources, virtual machines give you more flexibility, help save time and money, and are a more efficient way to use hardware than just running one operating system on physical hardware.

- Hyper-V runs each virtual machine in its own isolated space, which means you can run more than one virtual machine on the same hardware at the same time. You might want to do this to avoid problems such as a crash affecting the other workloads, or to give different people, groups or services access to different systems.

Full & Para Virtualization

Full Virtualization:

- Guest operating systems are unaware of each other
- Provide support for unmodified guest operating system.
- Hypervisor directly interact with the hardware such as CPU,disks.
- Hypervisor allow to run multiple os simultaneously on host computer.
- Each guest server run on its own operating system
- Few implementations: Oracle's Virtaulbox , VMware server, Microsoft Virtual PC

Full & Para Virtualization

Para Virtualization:

- Unlike full virtualization ,guest servers are aware of one another.
- It cannot support unmodified operating systems (e.g. Windows 2000/XP), its compatibility and portability is poor.
- Hypervisor does not need large amounts of processing power to manage guest os.
- Few implementations:VMware,Xen

History

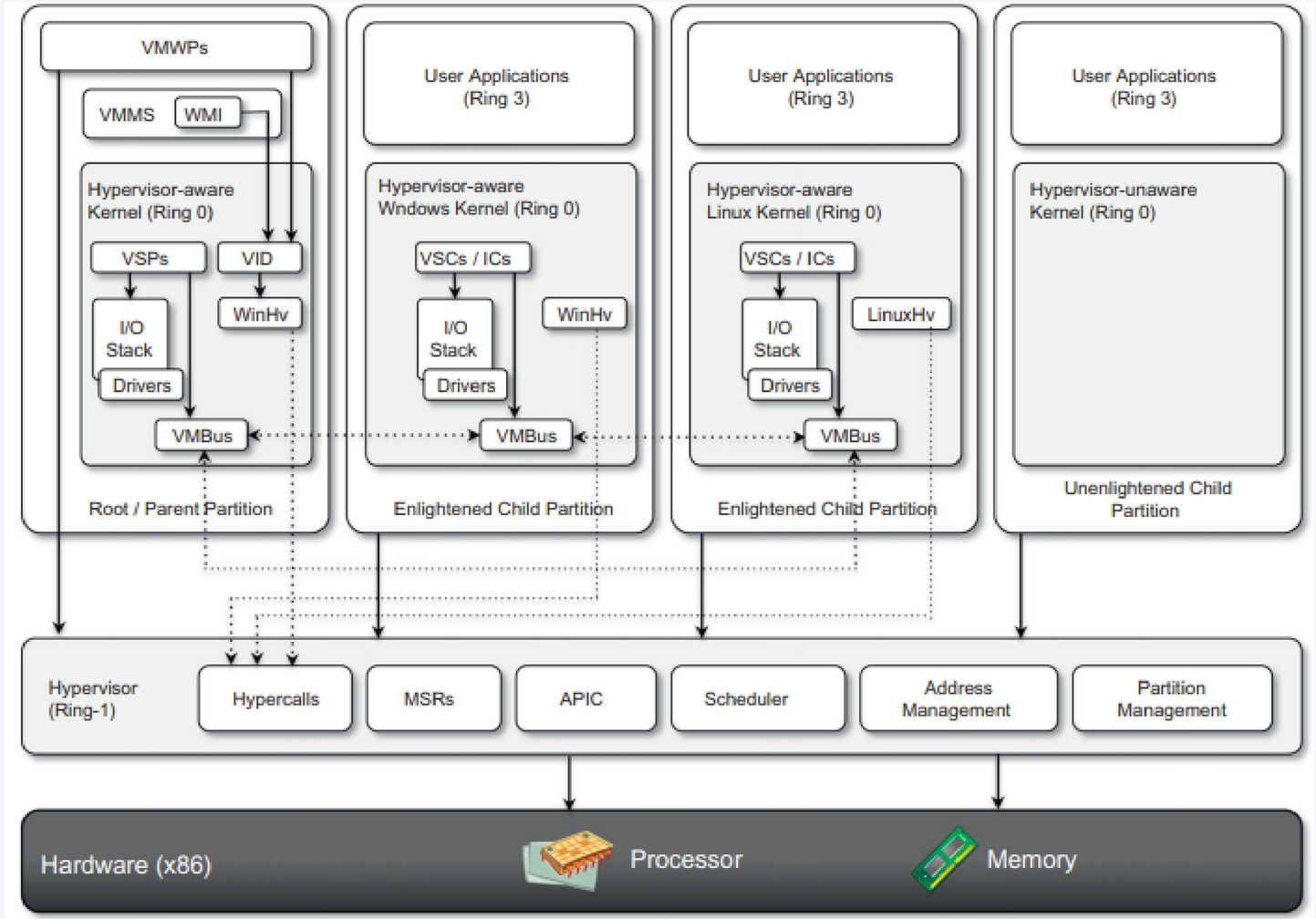
- A beta version of Hyper-V was shipped with certain x86-64 editions of Windows Server 2008.
- The finalized version was released on June 26, 2008 and was delivered through Windows Update.
- Hyper-V has since been released with every version of Windows Server
- Microsoft provides Hyper-V through two channels:

1. **Part of Windows:** Hyper-V is an optional component of Windows Server 2008 and later. It is also available in x64 SKUs of Pro and Enterprise editions of Windows 8, Windows 8.1, Windows 10 and Windows 11.
2. **Hyper-V Server:** It is a freeware edition of Windows Server with limited functionality and Hyper-V component.

Diff between hyper-v and other hypervisers

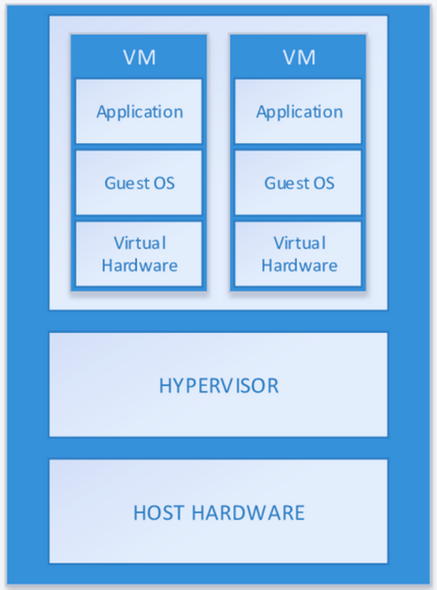
Virtualization using other s/w	Virtualization using hyper-v
• Vms created at software level	• Vms created at hardware level
• Requirements of os are not as such	• Hyperviser require windows pro and windows student version and higher levels
• Two vms can not be used as a single machine	• Two vm machines can be used as a single machine

Architecure and Components



Hypervisor

A hypervisor (or virtual machine monitor, VMM, virtualizer) is similar to an emulator; it is computer software, firmware or hardware that creates and runs virtual machines.



Components in Hyper – V

- Hypercalls interface
- Memory service routines (MSRs)
- Advanced programmable interrupt controller (APIC)
- Scheduler
- Address manager
- Partition manager

Hypercalls interface

This is the entry point for all the partitions for the execution of sensitive instructions

Memory service routines (MSRs)

These are the set of functionalities that control the memory and its access from partitions

Advanced programmable interrupt controller (APIC)

This component represents the interrupt controller, which manages the signals coming from the underlying hardware when some event occurs

Scheduler

This component schedules the virtual processors to run on available physical processors

Address manager

This component is used to manage the virtual network addresses that are allocated to each guest operating system

Partition manager

This component is in charge of performing partition creation, finalization, destruction, enumeration, and configurations. Its services are available through the hypercalls interface API previously discussed

Parent and Child Partitions

- The parent partition executes the host OS and implements the virtualization stack that complements the activity of the hypervisor in running guest OSs. This partition always hosts an instance of the **Windows Server 2008 R2**, which manages the virtualization stack made available to the child partitions.
- The parent partition is also the one that manages the creation, execution, and destruction of child partitions. It does so by means of the Virtualization Infrastructure Driver (VID)
- This partition is the only one that directly accesses device drivers and mediates the access to them by child partitions by hosting the VSPs.

- Apart from the parent and root partition, there is also another type of Hyper-V environment- child partition.
- it is a logical hard drive division in Microsoft Hyper-V environment that runs an isolated operating system, sometimes called as Guest OS. It is managed by parent partition. Virtual machine is a kind of child partition.

What features does Hyper-V have

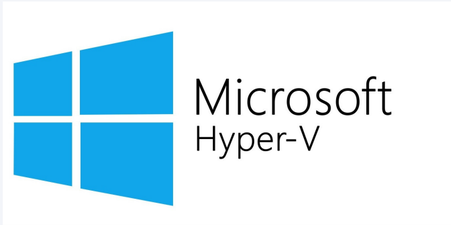
- **Computing environment** - A Hyper-V virtual machine includes the same basic parts as a physical computer, such as memory, processor, storage, and networking.
- **Disaster recovery and backup** - For disaster recovery, Hyper-V Replica creates copies of virtual machines, intended to be stored in another physical location, so you can restore the virtual machine from the copy.
- **Optimization** - Each supported guest operating system has a customized set of services and drivers, called integration services, that make it easier to use the operating system in a Hyper-V virtual machine.

- **Portability** - Features such as live migration, storage migration, and import/export

- **Remote connectivity** - Hyper-V includes Virtual Machine Connection, a remote connection tool for use with both OS. Unlike Remote Desktop, this tool gives you console access, so you can see what's happening in the guest even when the operating system isn't booted yet.

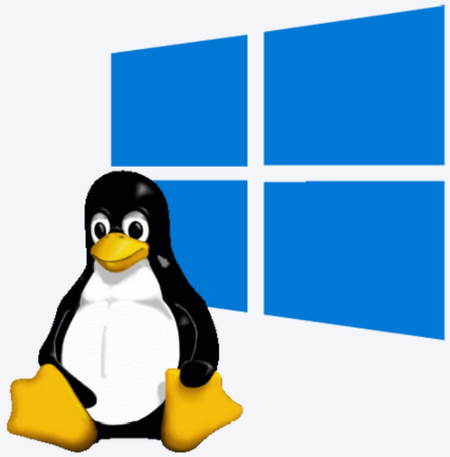
- **Security** - Secure boot and shielded virtual machines help protect against malware and other unauthorized access to a virtual machine and its data.

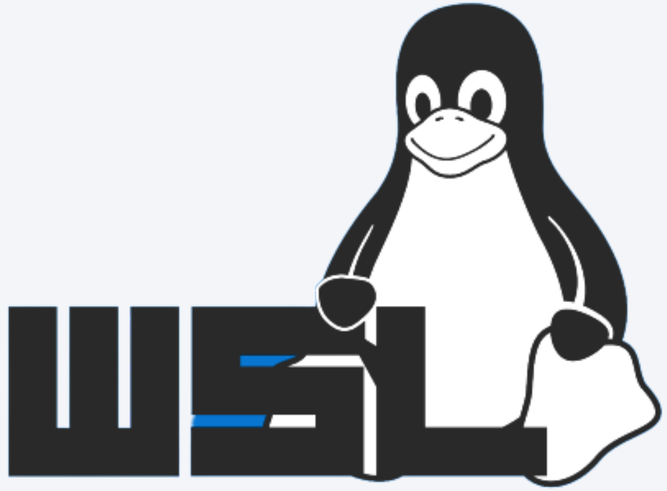
Some ways Hyper-V can help one-



- Establish or expand a private cloud environment.
- Use your hardware more effectively.
- Improve business continuity.
- Establish or expand a virtual desktop infrastructure (VDI).
- Make development and test more efficient.

WSL - Windows Subsystem For Linux





- The Windows Subsystem for Linux (WSL) lets developers run a Linux environment directly on Windows 10. It’s an unmodified OS, but highly integrated into Windows and without the overhead of a virtual machine.

- Unlike traditional VM's, WSL is fast, efficient and needs no initial configuration to get it up and running. WSL provides developers with an advanced, state-of-the-art Linux experience on Windows without any of the complexity.

- WSL has full access to the underlying systems network and files, making it very easy for developers to work on the same projects in both Windows and Linux environments.

WSL1

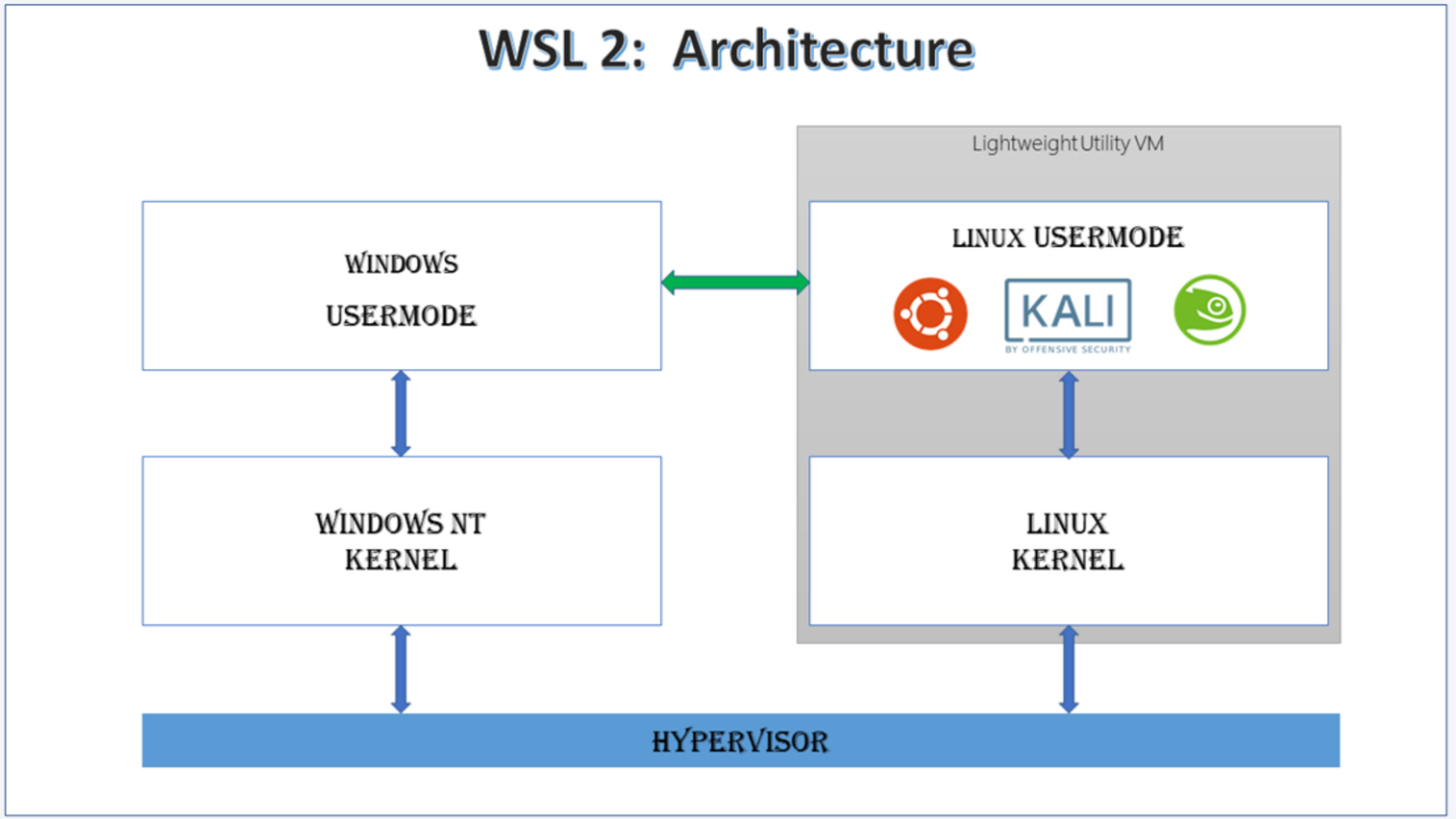
WSL 1 works using a translation layer, it has unmodified binaries for applications such as apt, grep, etc
When these libraries make a system call, such as accessing memory or network, they would usually make a request to the Linux kernel, while in WSL, it requests the translation layer, the translation layer converts the UNIX system call to a call compatible with the Windows NT kernel.

WSL2

The WSL 2 moved into a virtualization-based approach in which you have an actual Linux kernel sitting inside a very lightweight VM powered by the Windows Hypervisor Platform. This made file IO much faster due to the avoidance of the translation layer

This resulted in full system call compatibility and much better performance overall.

WSL2


WSL 2: Architecture
Lightweight Utility VM
WINDOWS
USERMODE
LINUX USERMODE
KALI
BY OFFENSIVE SECURITY
WINDOWS NT
KERNEL
LINUX
KERNEL
HYPERVISOR

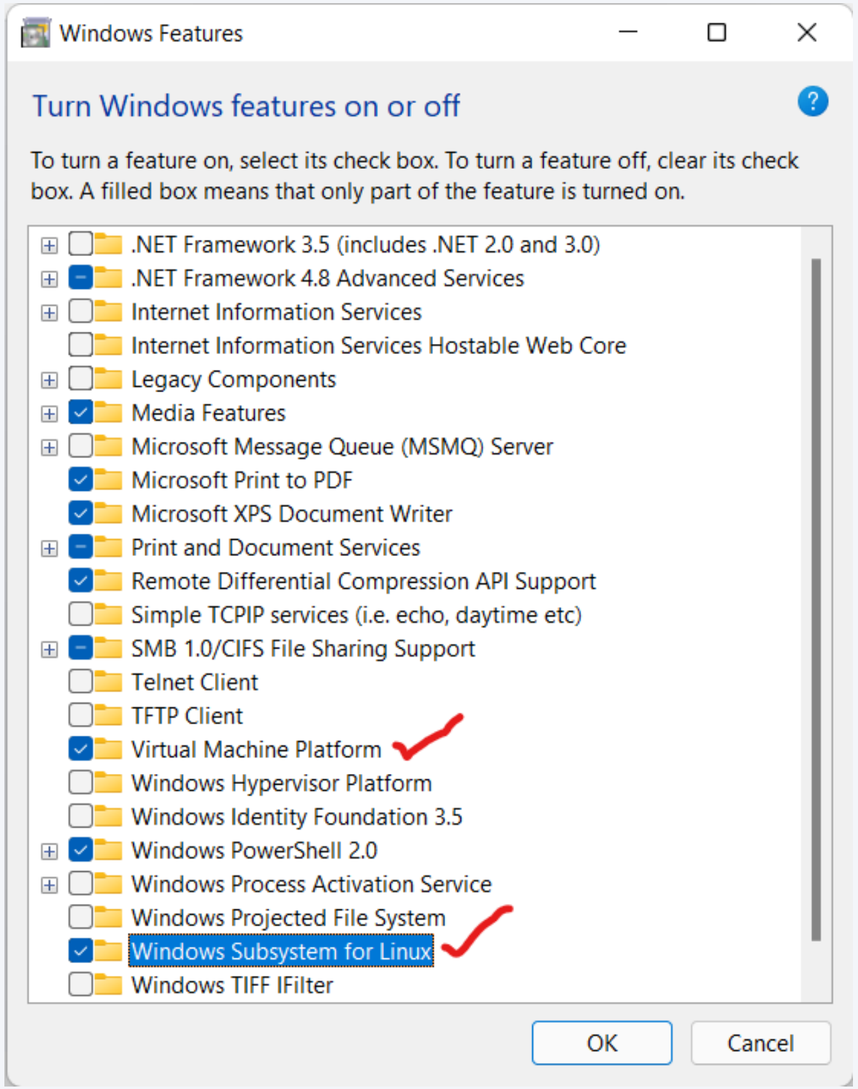
Why Hyper-V is a hybrid solution ???

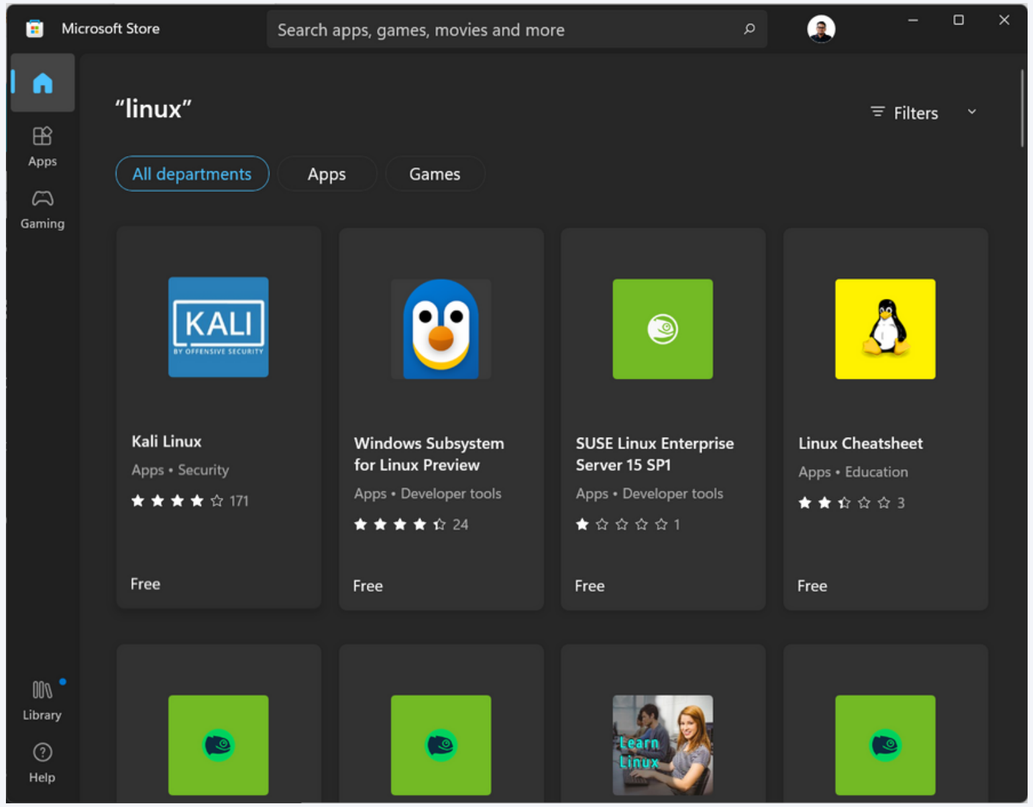
Why called as a flexible virtualization platform ??

Requirements

- Windows Server 2008 and above
- Windows Server platforms running on an x64 architecture
- 64-bit processor

DEMO - WSL2


Windows Features
Turn Windows features on or off
To turn a feature on, select its check box. To turn a feature off, clear its check box. A filled box means that only part of the feature is turned on.
.NET Framework 3.5 (includes .NET 2.0 and 3.0)
.NET Framework 4.8 Advanced Services
Internet Information Services
Internet Information Services Hostable Web Core
Legacy Components
Media Features
Microsoft Message Queue (MSMQ) Server
Microsoft Print to PDF
Microsoft XPS Document Writer
Print and Document Services
Remote Differential Compression API Support
Simple TCPIP services (i.e. echo, daytime etc)
SMB 1.0/CIFS File Sharing Support
Telnet Client
TFTP Client
Virtual Machine Platform
Windows Hypervisor Platform
Windows Identity Foundation 3.5
Windows PowerShell 2.0
Windows Process Activation Service
Windows Projected File System
Windows Subsystem for Linux
Windows TIFF IFilter
OK
Cancel


Microsoft Store
Search apps, games, movies and more
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Filters
All departments
Apps
Games
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Gaming
Library
Help
Kali Linux
Apps • Security
171
Free
Windows Subsystem for Linux Preview
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Linux Cheatsheet
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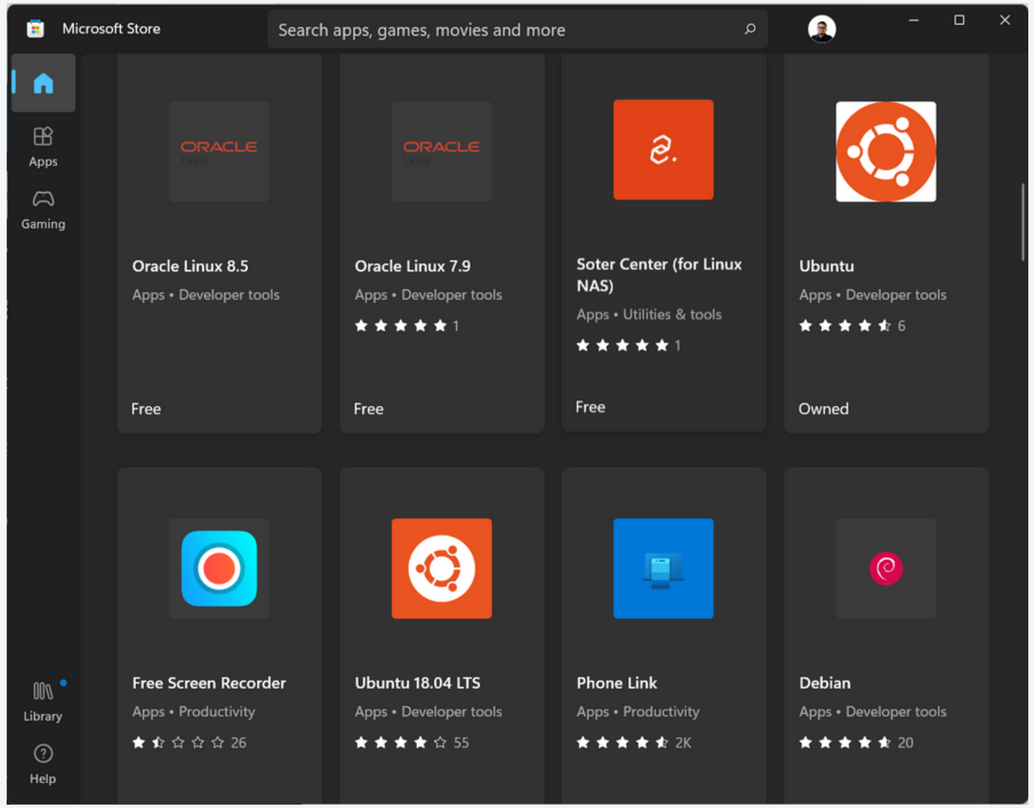
Learn Linux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Help
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Oracle Linux 7.9
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Free
Soter Center (for Linux NAS)
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Owned
Free Screen Recorder
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Phone Link
Apps • Productivity
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Debian
Apps • Developer tools
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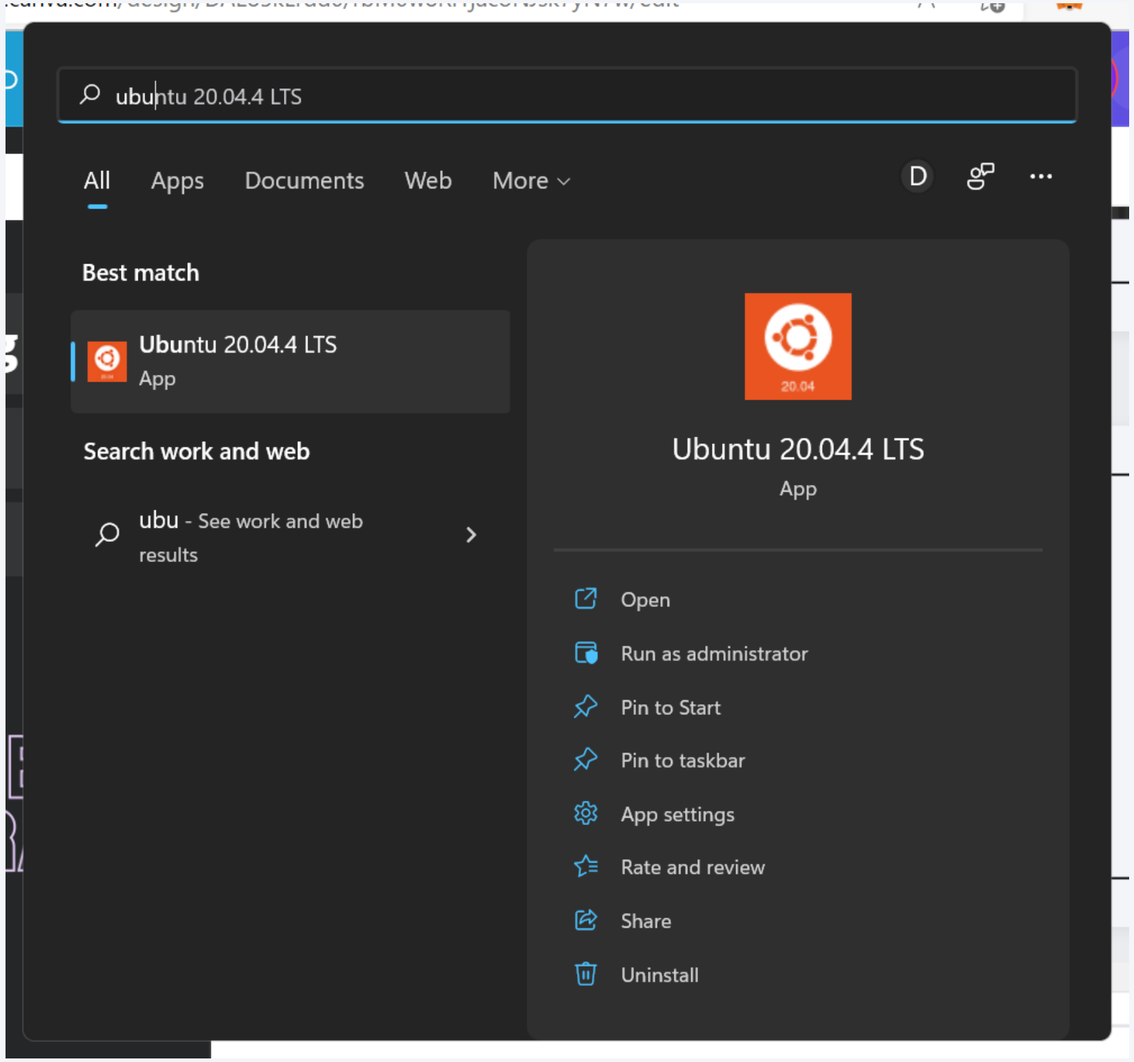
ubuntu 20.04.4 LTS
All
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More
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Search work and web
ubu - See work and web results
20.04
Ubuntu 20.04.4 LTS
App
Open
Run as administrator
Pin to Start
Pin to taskbar
App settings
Rate and review
Share
Uninstall


Thank you!