

Process/programming language level virtualization

- VMs. In this scenario, the virtualization layer sits as an application program on top of the operating system, and the layer exports an abstraction of a VM that can run programs written and compiled to a particular abstract machine definition.
- Any program written in the HLL and compiled for this VM will be able to run on it. The Microsoft .NET CLR and Java Virtual Machine (JVM) are two good examples of this class of VM.

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- Virtualization at the application level virtualizes an application as a VM. On a traditional OS, an application often runs as a process. Therefore, application-level virtualization is also known as process-level virtualization. The most popular approach is to deploy high level language (HLL).

Levels of Virtualization

Five Levels of Virtualization

Application Level

JVM / .NET CLR

Library Level

WINE / vCUDA

Operating System Level

Virtual Environment / FVM

Hardware Abstraction Level

VMWare / Virtual PC

Instruction Set Architecture Level

BIRD / Dynamo

Conclusion

- Even though there are five levels of virtualization, each enterprise doesn't need to use all of them. It depends on what the company is working on as to which level of virtualization it prefers.
- Companies tend to use virtual machines for development and testing of cross-platform applications. With cloud-based applications on the rise, virtualization has become a must-have for enterprises across the globe.

Virtualization Benefits

- New systems can be setup easily.
- No need to invest in hardware for testing and debugging setups.
- The capability to recover quickly from system corruption.
- Relocating and migrating systems with ease. For example, moving to a more powerful machine can simply be a matter of taking a snapshot of a virtual machine and starting up a new virtual machine based on that snapshot.
- The ease of remote management. Physical access to data centers is tightly controlled these days. The use of virtual machines greatly reduces the need for physical access.
- Multiple operating systems can be run simultaneously on one server.

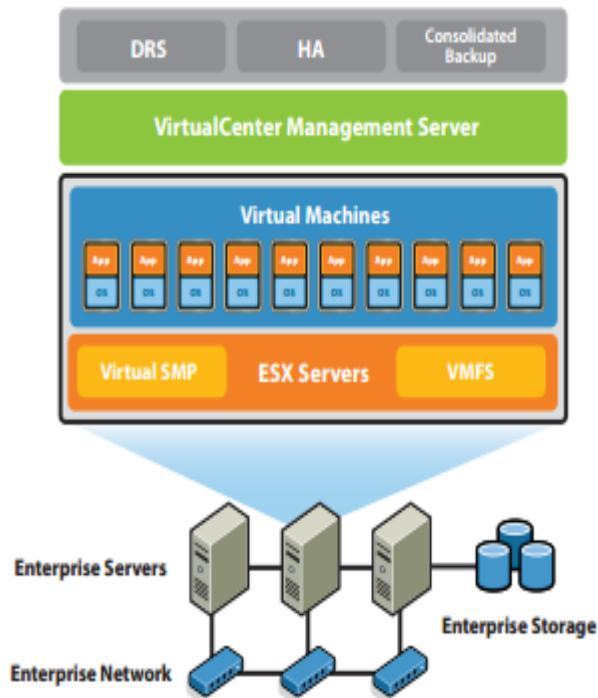
Question

Which of the following provide system resource access to virtual machines?

- a) VMM
- b) VMC
- c) VNM
- d) All of the mentioned

HLL -VM

- Vmware
- Xen
- Hyper-V



- VMware Workstation is the most dependable, high-performing, feature-rich virtualization platform for your Windows or Linux PC.
- It allows one physical PC to run multiple operating systems at the same time.
- No restarting or hard-drive partitioning is required.
- Software developers rely on Workstation to develop and test client-server, Web and cloud applications in a replica of their production environments.

File Edit View VM Tabs Help



Library x

Search icon Type here to search

- + My Computer
- + Shared VMs

Home x

VMware Workstation Beta



Leave Feedback

Leave feedback about this beta on our website.



Create a New Virtual Machine

Create a virtual machine on your local host.



Open a Virtual Machine

Open a local virtual machine.



Connect to a Remote Server

Open virtual machines on a remote server.



Help

View the help contents for VMware Workstation.

Product Highlights

New User Interface

The VMware Workstation user interface has been updated with new menus, toolbars, thumbnail views and a Virtual Machine Library. The library is a comprehensive list of all the virtual machines that a user creates, opens or remotely accesses and includes the ability to identify your true favorites and apply filters.

What Happened to Teams?

All of the features of a team still exist and can now be configured without the previous limitations. All Network Adapters can now throttle bandwidth and simulate packet loss, multiple virtual machines can be selected and powered on via the toolbar icon, the delay between VMs starting can be configured as a global setting and LAN segments can be implemented using traditional VMnets.

Sharing Virtual Machines

VMware Workstation now allows users to share virtual machines with their peers. Shared virtual machines are managed by the VMware Host Agent service which runs even when the user is not logged on to their machine. This service is the same service used by other VMware products such as VMware Server and vSphere and provides the security and permissions demanded by virtualization professional.

Remote Connections

VMware Workstation has a new Connect to Server feature that allows remote connections to hosts running Workstation, ESX 4.x and later as well as Virtual Center. After connecting to a vSphere host, try dragging a VM from the local My Computer section of the Virtual Machine Library to a vSphere host. Workstation users can now develop and test their virtual environments on their PC and simply drag them into production!

Key Benefits of VMWare

- Access anytime, anywhere
- Run applications in Windows, Linux and other systems at the same time without restarting.
- Remotely access virtual machines running on Vmware.
- Run as a server to host applications for your team, department or anyone in your organization.
- Create virtual machines that are encrypted, block USB devices and have read-only settings.



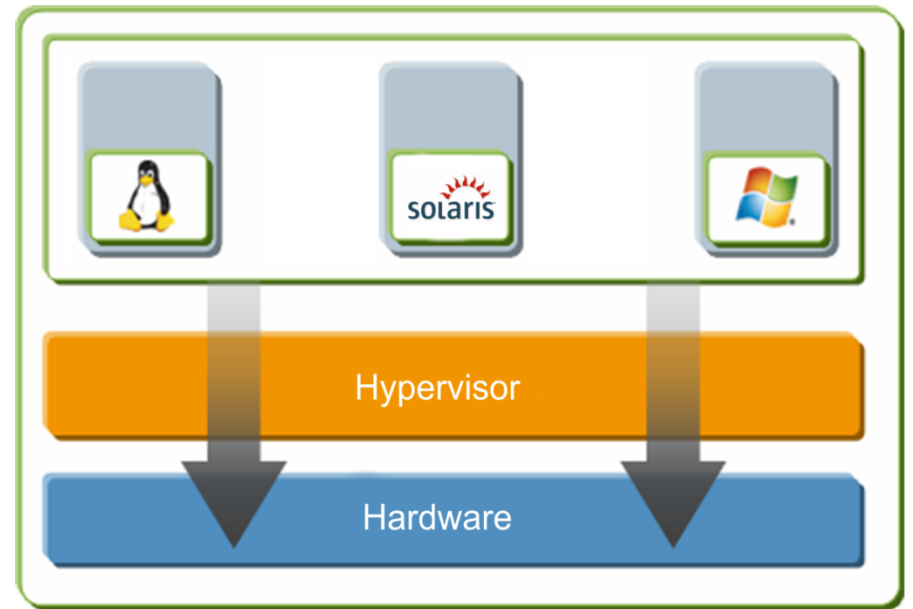
- Xen is a virtual machine monitor for IA-32 (x86, x86-64), IA-64 and PowerPC 970 architectures. It allows several guest operating systems to be executed on the same computer hardware concurrently.
- Xen was initially created by the University of Cambridge, Computer Laboratory and is now developed and maintained by the Xen community as free software, as well as Citrix XenServer Commercial version variant.
- A central part of Amazon.com's cloud computing platform, EC2 allows users to rent virtual computers on which to run their own computer applications.

Xen Architecture

Virtual machine layer

Hypervisor layer

Hardware/physical layer



Hardware or physical layer:

Physical hardware components including memory, CPU, network cards, and disk drives.

Hypervisor layer:

Thin layer of software that runs on top of the hardware. The Xen hypervisor gives each virtual machine a dedicated view of the hardware.

Virtual machine layer:

Operating system hosted on the hypervisor and appearing to the user as a separate physical computer. However, the machine shares physical resources with other virtual machines, and it is portable because the virtual machine is abstracted from the physical hardware.

Hyper-V

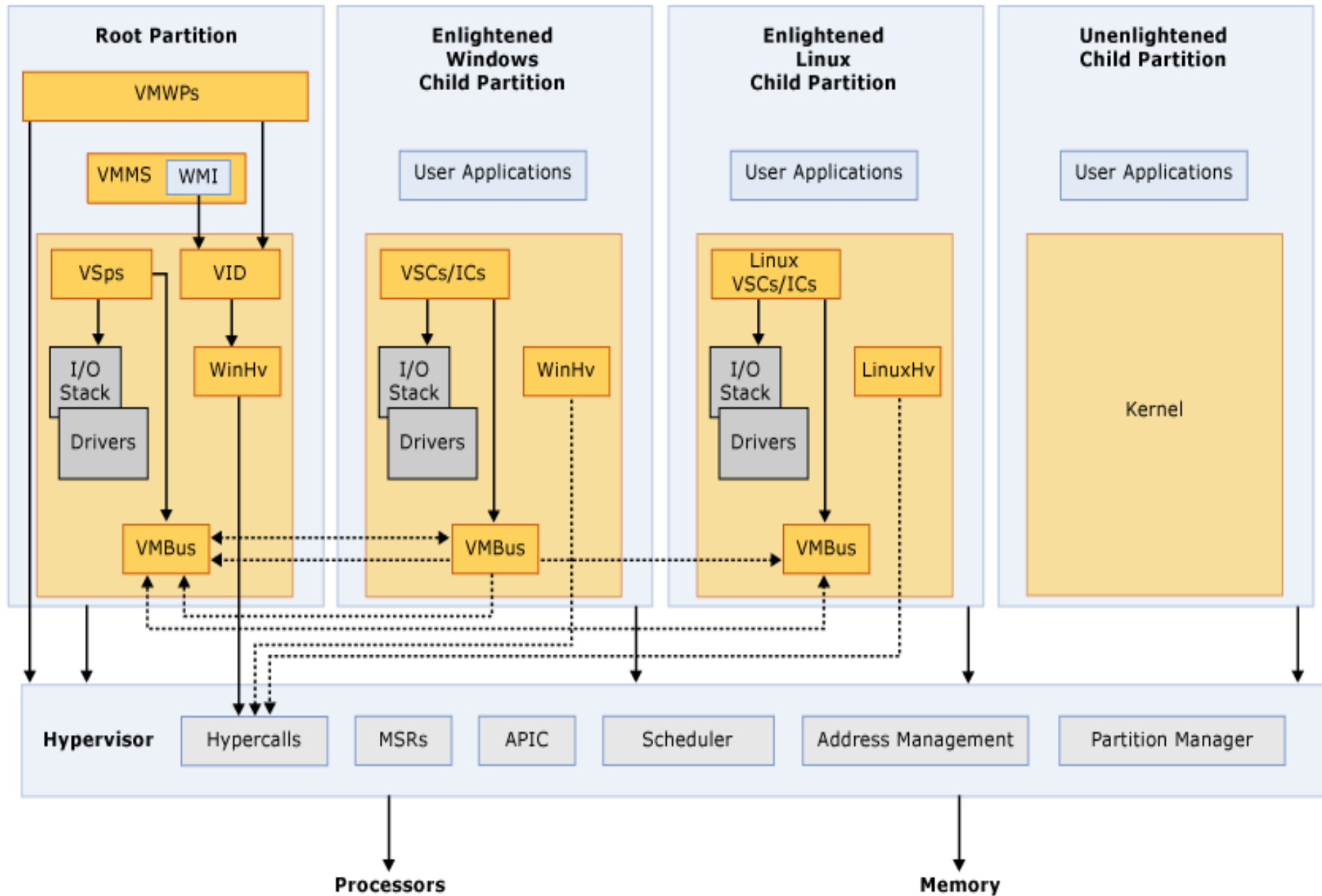
- Hyper-V is the primary engine that drives Windows Server 2008 “beyond virtualization” initiative.
- The primary responsibility of Windows Server 2008 Hyper-V is to provide the tool kit that organizations will use to create a shared pool of compute, network, and storage resources where servers and applications can be virtualized for consolidation, scalability, and mobility purposes.

Hyper-V Architecture

- Hyper-V is a hypervisor-based virtualization platform and an enabling technology for one of Windows Server 2008 R2's marquee features, Live Migration.
- Guest operating systems running in a Hyper-V virtual machine provide performance approaching the performance of an operating system running on physical hardware *if* the necessary virtual server client (VSC) drivers and services are installed on the guest operating system.
- Hyper-V virtual server client (VSC) code, also known as Hyper-V enlightened I/O, enables direct access to the Hyper-V “Virtual Machine Bus” and is available with the installation of Hyper-V integration services.

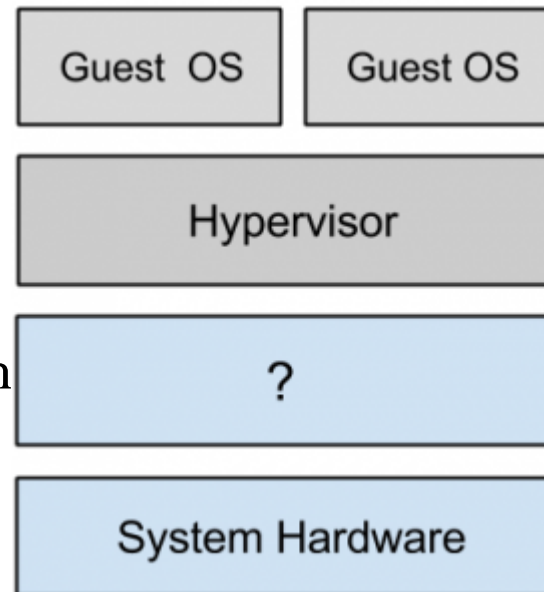
- Both Windows Server 2008 R2 and Windows 7 support Hyper-V enlightened I/O with Hyper-V integration services.
- Hyper-V supports isolation in terms of a partition. The Microsoft hypervisor must have at least one parent, or root, partition, running Windows Server 2008 R2.
- The root partition then creates the child partitions which host the guest operating systems.
- Child partitions also do not have direct access to other hardware resources and are presented a virtual view of the resources, as virtual devices (VDevs).

Hyper-V High Level Architecture



Question

- Which of the following should be placed in second lowermost layer for the following figure?



- a) Host Operating System
- b) Software
- c) VM
- d) None of the mentioned

Hyper-V Performance Characteristics

- **Improved hardware sharing architecture** - Hyper-V provides improved access and utilization of core resources, such as disk, networking, and video when running guest operating systems with a hypervisor-aware kernel and which are equipped with requisite virtual server client (VSC) code (known as Hyper-V enlightened I/O).
- **Critical disk performance for I/O intensive applications** - Disk performance is critical for disk I/O intensive enterprise applications such as Microsoft BizTalk Server and in addition to Hyper-V enlightened I/O; Hyper-V provides “Passthrough” disk support which provides disk performance on par with physical disk performance.

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- **Processor hardware-assisted virtualization support** – Hyper-V takes full advantage of processor hardware-assisted virtualization support that is available with recent processor technology.
- **Multi-core (SMP) guest operating system support** – Hyper-V provides the ability to support up to four processors in a virtual machine environment, which allows applications to take full advantage of multi-threading functionality in a virtual machine.

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- **Both 32-bit and 64-bit guest operating system support** — Hyper-V provides broad support for simultaneously running different types of operating systems, including 32-bit and 64-bit systems across different server platforms, such as Windows, Linux, and others.

Question

The program which provide partitioning, isolation or abstraction is called?

- A. virtualization hypervisor
- B. software hypervisor
- C. hardware hypervisor
- D. system hypervisor

Question

A hypervisor is sometimes also called a?

- A. VMA
- B. VMS
- C. VMM
- D. VMR

Advantages of Hyper-V

- **Consolidation of hardware resources** - Multiple physical servers can be easily consolidated into comparatively fewer servers by implementing virtualization with Hyper-V. Consolidation accommodates full use of deployed hardware resources. Hyper-V in Windows Server 2008 R2 can now access up to 64 logical CPUs on host computers.
- **Ease of administration:**
 - Consolidation and centralization of resources simplifies administration.
 - Implementation of scale-up and scale out is accommodated with much greater ease.

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- **Significant cost savings:**
 - Hardware costs are significantly reduced because multiple virtual machines can run on a single physical machine
 - Hyper-V licensing costs are included with the license cost of Windows Server 2008 R2.
 - Power requirements may be significantly reduced by consolidating existing applications onto a virtualized Hyper-V environment due to the reduced physical hardware “footprint” that is required.

- **Fault tolerance support through Hyper-V clustering** – Because Hyper-V is a cluster aware application, Windows Server 2008 SP2 provides native host clustering support for virtual machines created in a Hyper-V virtualized environment.
- **Ease of deployment and management:**
 - Consolidation of existing servers into fewer physical servers simplifies deployment.
 - A comprehensive Hyper-V management solution is available with System Center Virtual Machine Manager.
- **Proven track record** - Key Microsoft Web sites MSDN (<http://msdn.microsoft.com>) and TechNet (<http://technet.microsoft.com>) are hosted in Hyper-V environments.

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- **Comprehensive product support** — Because Microsoft enterprise applications (such as Exchange Server and SQL Server) are fully tested running in Hyper-V, Microsoft provides code fix support for these applications when deployed and run in a Hyper-V environment.
- **Scalability** — Additional processing power, network bandwidth, and storage capacity can be accomplished quickly and easily by apportioning additional available resources from the host computer to the guest virtual machine(s).

Disadvantages of Hyper-V

- **Hardware requirements** – Due to the demands of server consolidation, Hyper-V virtual machines tend to
 - consume more CPU and memory, and
 - require greater disk I/O bandwidth than physical servers with comparable computing loads.
- Because the Hyper-V server role is only available for 64-bit and all editions of Windows Server 2008 R2 are 64-bit only, the physical hardware must support hardware-assisted virtualization. This means the processor must be compatible with Intel VT or AMD Virtualization (AMD-V) technology, the system BIOS must support Data Execution Prevention (DEP), and DEP must be enabled.

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- **Software requirements** – While most Microsoft software is supported running on Hyper-V virtual machines,
 - some Microsoft software is still in the process of being tested to ensure compatibility with a Hyper-V virtualized environment.
 - For example, most Microsoft enterprise level applications either support running on Hyper-V or are in the process of being tested for support on Hyper-V. All versions of BizTalk Server since BizTalk Server 2004 are supported running on Hyper-V.

Question

Hypervisor runs directly on underlying host system. It is also known as?

- A. Bare metal hypervisor
- B. Native Hypervisor
- C. Hosted Hypervisor
- D. Both A and B

Question

Parallels Desktop is an example of?

- A. TYPE-1 Hypervisor
- B. DISPATCHER
- C. TYPE-2 Hypervisor
- D. INTERPRETER

Taxonomy of Virtualisation Techniques

