Hyper-V

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ABSTRACT:

Hyper-V is a native hypervisor that enables virtualization. It is a Virtualization software from Microsoft. To bring greater operational efficiencies and reduce costs in deploying and managing corporate wide IT infrastructure, Microsoft has been delivering against an end-to-end virtualization strategy, over the past few years. This paper Focus and describes VMM and Microsoft Hyper-V. This paper provides, the origins of the Microsoft server virtual Technologies and solutions, and the architecture, advantages and disadvantages. It describes differentiators and technical features as well as solution limitations and strengths that conclude with a Focus analysis of Microsoft Hyper-V and VMM.

KEYWORDS:

virtualization, hyper-v, enlightenments, emulation, end to end etc

INTRODUCTION:

Microsoft Hyper-V, codenamed Viridian and formerly known as Windows Server Virtualization, is a native hypervisor; it can create virtual machines on x86-64 systems running Windows.

Virtualization is the creation of a virtual (rather than physical) version of an IT environment, including an operating system (OS), a storage device, etc. Virtualization takes place on the same hardware platform after installing specific software - hypervisor. The hypervisor is an additional layer between physical and virtual spheres; it manages the system's hardware resources so they are distributed efficiently among virtual machines (VMs). The Hyper-V server role in Windows Server lets you create a virtualized server computing environment where you can create and manage virtual machines. You can run multiple operating systems on one physical computer and isolate the operating systems from each other. With this technology, you can improve the efficiency of your computing resources and free up your hardware resources.

THE HISTORY OF VIRTUALIZATION:

The term "virtualization" has been around since the 1960s.Companies realized then that they could save money by moving from a physical to a virtual platform.

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. Hyper-V Server 2008 is limited to a command-line interface used to configure the host OS, physical hardware, and software.
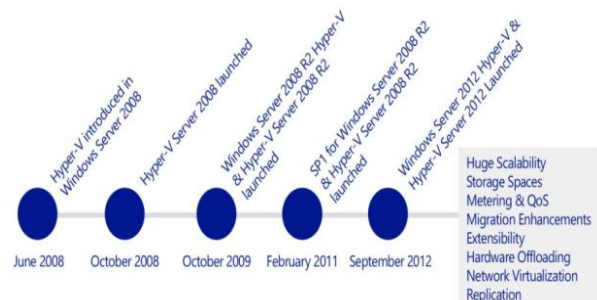
A menu driven CLI interface and some freely downloadable script files simplify configuration. In addition, Hyper-V Server supports remote access via Remote Desktop Connection.You or your company might be interested in virtualization because it can:

- Save you money by reducing the number of servers consuming energy, and by costing less to purchase and maintain;
- Make management, control and inspection of VMs much easier than with traditional servers.
- Give you a flexible environment for various tests—and more!

WHY HYPER-V?

Virtualization technologies help customers' lower costs and deliver greater agility and economies of scale Hyper-V is a leading virtualization platform for today and the transformational opportunity with cloud computing With Hyper-V, it is now easier than ever for organizations to take advantage of the cost savings of virtualization, and make the optimum use of server hardware investments by consolidating multiple server roles as separate virtual machines that are running on a single physical machine. Customers can use Hyper-V to efficiently run multiple operating systems, Windows, Linux, and others, in parallel, on a single server. Windows Server 2012 R2extends this with more features, greater scalability and further inbuilt reliability mechanisms.

In the data center, on the desktop, and now in the cloud, the Microsoft virtualization platform, which is led by Hyper-V and surrounding System Center management tools, simply makes more sense and offers better value for money when compared to the competition.

HYPER-V ARCHITECTURE:

Hyper-V for Microsoft Windows Server 2008 provides the underlying virtualization capabilities within a server using bare-metal hypervisor architecture, as shown in Figure 1.
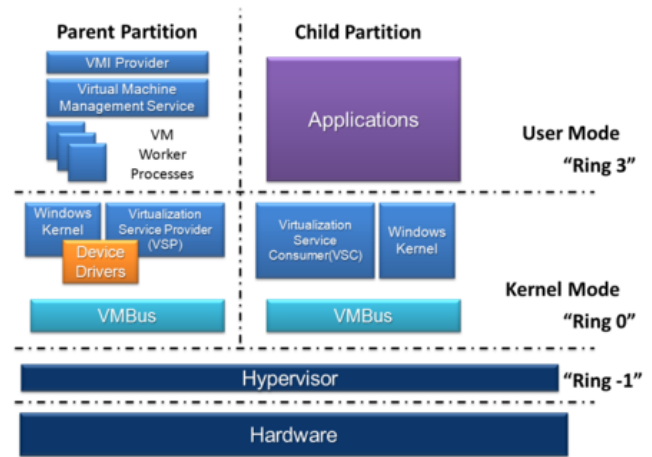
Hyper-V implements isolation of virtual machines in terms of a partition. A partition is a logical unit of isolation, supported by the hypervisor, in which each guest operating system executes. A hypervisor instance has to have at least one parent partition, running a supported version of Windows Server. The virtualization stack runs in the parent partition and has direct access to the hardware devices. The parent partition then creates the child partitions which host the guest OSs. A parent partition creates child partitions using the hypercall API, which is the application programming interface exposed by Hyper-V.

A child partition does not have access to the physical processor, nor does it handle its real interrupts. Instead, it has a virtual view of the processor and runs in Guest Virtual Address, which, depending on the configuration of the hypervisor, might not necessarily be the entire virtual address space. Depending on VM configuration, Hyper-V may expose only a subset of the processors to each partition. The hypervisor handles the interrupts to the processor, and redirects them to the respective partition using a logical Synthetic Interrupt Controller (SynIC). Hyper-V can hardware accelerate the address translation of Guest Virtual Address-spaces by using second level address translation provided by the CPU, referred to as EPT on Intel and RVI (formerly NPT) on AMD.

Child partitions do not have direct access to hardware resources, but instead have a virtual view of the resources, in terms of virtual devices. Any request to the virtual devices is redirected via the VMBus to the devices in the parent partition, which will manage the requests. The VMBus is a logical channel which enables inter-partition communication. The response is also redirected via the VMBus. If the devices in the parent partition are also virtual devices, it will be redirected further until it reaches the parent partition, where it will gain access to the physical devices. Parent partitions run a Virtualization Service Provider (VSP), which connects to the VMBus and handles device access requests from child partitions. Child partition virtual devices internally run a Virtualization Service Client (VSC), which redirect the request to VSPs in the parent partition via the VMBus. This entire process is transparent to the guest OS.

Virtual devices can also take advantage of a Windows Server Virtualization feature, named Enlightened I/O, for storage, networking and graphics subsystems, among others. Enlightened I/O is specialized virtualization-aware implementation of high level communication protocols like SCSI to take advantage of VMBus directly, that allows bypassing any device emulation layer. This makes the communication more efficient, but requires the guest

ADVANTAGES OF HYPER-V
The advantages of running enterprise-level solutions in a Hyper-V virtualized environment include the following:

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. This capability not only takes advantage of new multicore systems, it also means greater virtual machine consolidation ratios per physical host.

Ease of administration:
- Consolidation and centralization of resources simplifies administration.
- Implementation of scale-up and scale out is accommodated with much greater ease.

Significant cost savings:
- Hardware costs are significantly reduced because multiple virtual machines can run on a single physical machine, therefore, a separate physical machine is not required for every computer.
- 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.

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. For more information about System Center Virtual

Key Hyper-V performance characteristics:
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.

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.

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). This may require that the host computer is upgraded or that the guest virtual machines are moved to a more capable host computer.

DISADVANTAGES OF HYPER-V

Some disadvantages of running enterprise-level solutions in a Hyper-V virtualized environment may include:

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.

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. For more information on the supportability of BizTalk Server and SQL Server on Hyper-V.

CONCLUSION:

Microsoft recent Hyper-V technology is a "Microkernalized Type 1" hypervisor which leverages para virtualization (called Enlightenment by Microsoft) in addition to the traditional hardware emulation technique. It exists in two variants: as a stand-alone product called Hyper-V Server and as an installable role in Windows Server.

Server virtualization is very much a standard in today's organizations, and Hyper-V offers a rock-solid and feature rich platform for use in organizations of any size. Technologies like Dynamic Memory enable the creation of high-density virtual machine server environments, and dynamic placement technologies can help rebalance virtual machines that may not have been optimally placed. However, any successful virtualization migration first requires the discovery of resource usage and proper planning to ensure the long term stability of the Hyper-V environment.

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