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Everything you need to know about implementing Hyper-V

AIDAN FINN PROVIDES A STEP-BY-STEP GUIDE TO SERVER VIRTUALISATION, INCLUDING THE NEXT STEPS TO TAKE IF YOU DECIDE IT'S RIGHT FOR YOUR BUSINESS

About the author

This white paper is written by Aidan Finn, Microsoft MVP. He has worked as a consultant and administrator for the likes of Amdahl DMR, Fujitsu, Barclays and Hypo Real Estate Bank International, where he dealt with large and complex IT infrastructures.

Aidan has worked in the server hosting and outsourcing industry in Ireland where he focused on server management, including VMware VI3, Hyper-V and Microsoft System Center. Currently, Aidan is working as an IT infrastructure consultant lead

Introduction

This white paper introduces the concept of server virtualisation using Microsoft's Hyper-V. It describes how the features of Hyper-V server virtualisation will:

- Reduce the need for an ever-expanding physical server infrastructure, and the costs that come with it
- Preserve the performance of business-critical services
- Improve the reliability of backup and recovery
- Simplify disaster recovery planning and invocation

Most importantly of all, the white paper will look at how Hyper-V can assist the IT department with looking after that piece of IT the business really cares about: the applications or services that enable core business operations and provide decision-making information.

Those who are coming to this topic afresh might benefit by printing out the glossary on page 13 – rather than self-interrupt with passing definitions we will collect them all together at the end. We will highlight any unexplained terms by underling them using a dotted line, like this.



What is server virtualisation?

Server virtualisation is a software solution that partitions physical servers into individual logical units. The concept of server virtualisation is that if a workload only consumes a fraction of a server, then we should be able to consolidate many of those workloads onto a single server.

Server virtualisation divides a physical server into many logical partitions to place insulated workloads onto a single physical server. Each physical machine, or host, runs a software product to provide this server virtualisation. Logical partitions, called virtual machines, are created on the host. Each virtual machine (VM) consumes a share of disk, processor, and memory from the host machine. Each VM has its own operating system, identity, network presence, and security boundary. This means every VM is an independent environment, isolated from the physical host and from the other virtual machines that are placed on the host.

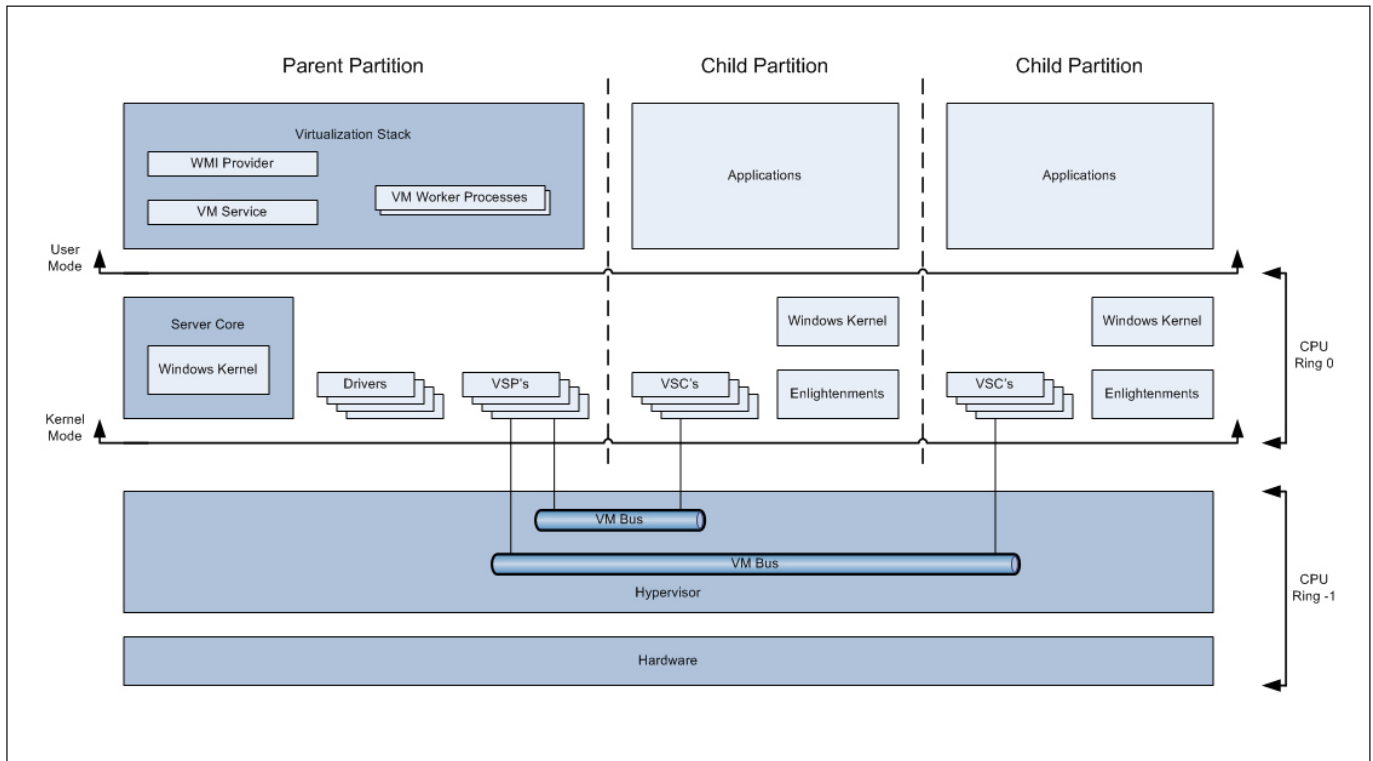
If an organisation had 10% processor utilisation of individual physical server potential, it could potentially place ten VMs with the same application workloads onto just one of those same servers by adding additional memory and storage. This could be achieved with each of those virtual machines having their own operating system, identity, security boundary, maintenance policies, and requirements compliance. The result of this would be that the business would need only 1/10th of the originally required amount of physical hardware. This brings many advantages including reduced cost of ownership and increased IT agility. But that is only the start of the story of server virtualisation and just the tip of the iceberg for Microsoft's Hyper-V.

As a VM, a server is no longer bound to a piece of hardware. It's a set of files that are quickly deployed, backed up and replicated. This can make huge changes to how a business deploys IT services and adjusts to changes in business operations.

What is Hyper-V?

Microsoft developed a server virtualisation technology called Hyper-V and originally released it as part of Windows Server 2008. The addition of this new server role meant a server administrator could deploy Windows Server 2008 R2 and, with just a few mouse clicks, turn that server into an enterprise-ready server virtualisation host. The instant appeal of Hyper-V was that it was a technology any Windows administrator or engineer could quickly adopt. After all, it's Windows, something they have probably been working with for many years. The other attractive trait of Hyper-V was that if you owned Windows Server, then you already owned a server virtualisation solution.

Microsoft designed Hyper-V from scratch to be a secure, manageable, and highly performing server virtualisation solution. The architecture is referred to as a microkernelized hypervisor. The design of Hyper-V is shown in Figure 1. A hypervisor is a very small strip of software that runs on the hardware and partitions the hardware. The host operating system is referred to as the parent partition. Each VM is referred to as a child partition.



↑ Figure 1
The architecture of Hyper-V

Three features of the design stand out. The first feature is that the hypervisor is microkernelized. With this approach, drivers for the host and management functions are placed in the partition, rather than in the hypervisor. This reduces the size of the hypervisor, making it more efficient. This design also means that almost any modern server that can run Windows Server can be used as a Hyper-V virtualisation host, and this opens up the hardware possibilities for a business that is considering the adoption of server virtualisation.

The second feature is that the VMs do not run as applications on the Hyper-V host server's installation of Windows Server. Instead, each VM runs at the same location on the host processors as they would if they were physical machines. This means that the VMs and their workloads, such as SQL Server, will execute just as they would have if they were physical machines, as long as each host server is sized correctly, allowing each VM an adequate share of physical processor, storage, and memory resources.

The third feature that should be noted is that Hyper-V is designed to be secure. It requires a hardware feature known as Data Execution Prevention to be enabled in the physical host server. This means that communications between the VMs (child partitions) and the host (parent partition) are protected by the Hyper-V host hardware against a common form of attack referred to as a buffer overflow.

Windows Server 2008 R2 followed the 2008 release, adding new functionality. This included Live Migration (the ability to move a VM from one host to another with no downtime for the VM), simplified storage, and even better performance thanks to the ability to leverage advancements in server hardware.



Service Pack 1 for Windows Server 2008 R2 adds more functionality. RemoteFX is a new feature allowing the virtualisation of graphics cards for virtual desktop virtualisation (VDI), and Dynamic Memory optimises the allocation of physical memory to VMs and greatly increases the numbers of VMs that can be placed on a Hyper-V host server.

Microsoft supports many versions and editions of Windows as VM operating systems on Hyper-V. Nor are you restricted to a single set of OSes: Hyper-V is designed to work in a heterogeneous enterprise environment. Hyper-V also supports VMs that are running SUSE Linux Enterprise Server, Red Hat Enterprise Linux and CentOS as guest operating systems, using a set of Microsoft-written integration components. Microsoft released this code, which was then included in the Linux kernel. This allows a wide variety of Linux distributions to work efficiently as Hyper-V VM operating systems.

How Hyper-V can reduce wastage and save money

In the era of client-server computing that has been dominant since the early 1990s, there has been one recommended way to deploy applications in the computer room or data centre. Best practice has always been to deploy one role to each server. This increased the reliability of servers, and made them easier to secure, back up, patch, and upgrade.

However, over the years, businesses have had to add more and more servers. Not only do core business requirements need to be serviced, but various other obligations have to be dealt with. Remote locations full of replica servers, applications to assist with regulatory compliance, and the ever-evolving growth in IT service opportunities have added even more servers into the bulging computer room. A mid-size business of 1,000 employees could find itself paying for the privilege of powering up 100 or more servers.

Consolidating server costs

Gartner estimates http://blogs.gartner.com/david_cappuccio/2009/02/15/data-center-efficiency-beyond-pue-and-dcie/ that the average utilisation of traditional physical servers is somewhere between 7% and 15%. Each of those under-utilised servers has acquisition, rack space, networking, power, licensing, maintenance and cooling costs. That means the typical organisation wastes between 85% and 93% of its server infrastructure investment, not to mention the recurring costs of ownership over the lifetime of those servers.

A well accepted rule of thumb is that the three-year cost of ownership of a server is at least equal to its original purchase cost. This means the business is paying 100% of the cost of purchasing and owning those servers, but is only getting up to 15% of the return on investment. Is it any wonder many businesses view their IT department as a black hole in their budget?



Server virtualisation with Hyper-V allows you to remove the costs of acquiring, deploying and owning servers in a number of ways. Virtual machines are files. It's possible to respond to some pressing requirement by deploying a new customised virtual machine in just a few minutes, rather than causing the business to wait several weeks for a physical server to be requested, purchased, racked, installed and prepared.

Many virtual machines can be installed on a single host server and this reduces the amount of rack space as well as the size of the physical network required to run the organisation's required server workloads. With fewer physical servers one has smaller maintenance contracts. The reduced physical server footprint greatly reduces the need to provide electricity for servers, network devices, and air conditioning equipment. The power savings alone can pay for the deployment of a new virtualisation solution.

Reducing licensing costs

Licensing costs and management can also be reduced greatly by choosing the right licensing model for your organisation. Purchasing Windows Server Datacenter edition will license a Hyper-V host server and all of the Windows Server virtual machines that will be placed on it. This can be significantly cheaper than purchasing individual copies of Windows Server Standard or Enterprise editions for each virtual machine. It also means you no longer have to count servers or VMs for license compliance; you just track the number of hosts.

Other licensing options include the System Center Management Suite, for licensing all Microsoft System Management, and the Enrollment for Core Infrastructure (ECI) which includes Windows Server, System Center Management Suite, and Forefront Endpoint Protection for antimalware protection of your virtual infrastructure. Both of these also use a per-host licensing model including all of the virtual machines, and provide simpler management and licensing cost savings. The key thing to remember is that when you license Windows, you license Hyper-V; you are getting an enterprise server virtualisation solution "for free" while reducing overall licensing costs and simplifying licensing compliance.

In times of economic uncertainty, It's all too easy to fall into the penny wise and pound wasted mentality. Some IT managers have considered the conversion to a server virtualisation infrastructure but then they make the mistake of looking only at the budget for the project. They fail to consider the longer term impact of server virtualisation on the business. Not only can the lower cost of ownership of servers have an almost immediate impact on operating expenses, but the reduced time to deploy new services to the business can actually help the business become more competitive during a time when any advantage can be the difference between success and bankruptcy. An IT decision maker needs to consider the typical cost of owning a server farm over three years, compared to a Hyper-V server virtualisation infrastructure when deciding on a strategy.



Does virtualisation impact application performance?

Reducing costs and adding new flexibility appear to be lofty goals, but they are irrelevant if achieving those objectives will harm the performance of critical business services. There was once a time, in the early days of server virtualisation, where some services would never be considered as a VM workload. Things have changed, and businesses are deploying those tier-1 services on Hyper-V without compromising on performance.

The potential impact of performance on critical business applications is minimised by several means. The architecture of Hyper-V is designed to maximise performance. It leverages virtualisation and memory management features of modern processors, and Hyper-V can take advantage of advanced networking functionality to optimise how VMs communicate on the network.

Microsoft develops its tier-1 critical server applications such as SharePoint 2010 and SQL Server 2008 R2 to run and perform well on Hyper-V. Independent testing by the Enterprise Strategy Group (ESG) [http://download.microsoft.com/download/A/D/2/AD21FD07-51A0-418E-BA8B-937FB5777A90/ESG%20Lab%20Combined%20Hyper-V%20Workload%20Summary%20Mar%2011\[4\].pdf](http://download.microsoft.com/download/A/D/2/AD21FD07-51A0-418E-BA8B-937FB5777A90/ESG%20Lab%20Combined%20Hyper-V%20Workload%20Summary%20Mar%2011[4].pdf) has shown that:

- A single Hyper-V host server hosted a SharePoint 2010 infrastructure could support up to 460,800 lightweight concurrent users
- A single Hyper-V host server could scale to meet the IO performance requirements of 20,000 Exchange 2010 mailboxes
- A virtualised SQL Server 2008 R2 infrastructure deployed within four Hyper-V virtual machines on a single host server could support up to 80,000 simulated transaction processing users

Interestingly, ESG found that there was just a 12% overhead in running a SQL workload in a virtual machine instead of an identically configured physical machine. This is quite manageable, and can be more than compensated by the greatly reduced cost of ownership and greater flexibility over the physical alternative.

Just as with physical server planning, understanding your workload is vital for achieving the required levels of performance for the services that are provided to the business. Hyper-V provides the engineering flexibility to allow administrators to tune virtualised workloads according to the needs of the business. If a workload needs greater storage throughput for databases, more flexible memory assignment according to variable pressure for resources, greater processor capacity for number crunching, or faster networking for streaming media, a Hyper-V administrator can tune the deployment to ensure that the services that IT provides will always be performing to their maximum for the business.



How Hyper-V can improve availability, backup and recovery

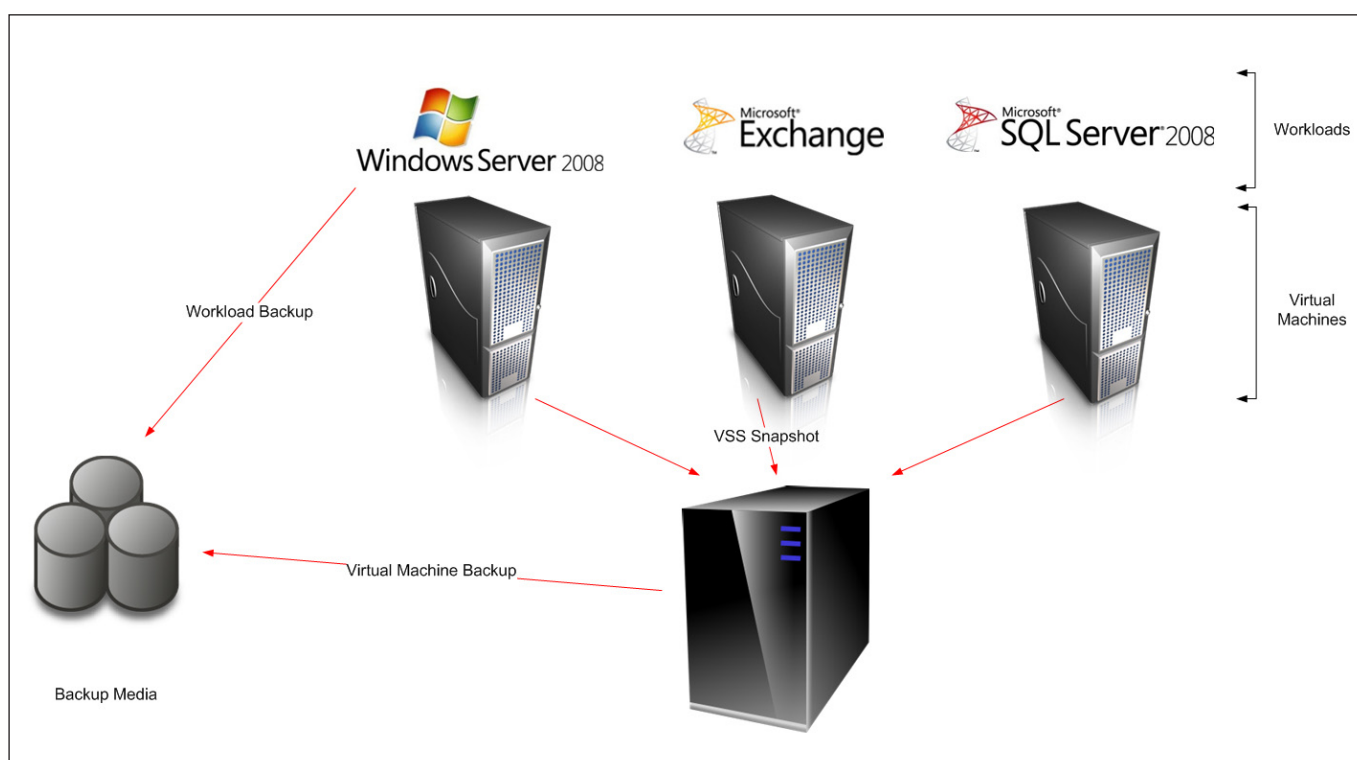
One of the most important services performed by the IT department is that of ensuring services and data will be available to the business in the event of an emergency, be it an accidental deletion, a database crash, a server failure, or the loss of a site due to a disaster. This is also one of the most difficult and error-prone aspects of IT. Server virtualisation can alleviate these issues, by simplifying the mechanisms used and the processes that must be employed, resulting in a more reliable service to the business, even during a worst-case scenario such as losing a site to a natural disaster. This can make a pretty compelling argument to virtualise your server workloads with Hyper-V.

Simplifying server backup

Backing up a server workload is considered a basic operation by most organisations. However, heart rates and blood pressure can undergo unhealthy rate increases when things go wrong, and it's decided that a backup of a database or a server must be restored. Ensuring the recoverability of a wide variety of hardware is difficult. Being able to perform a bare metal restoration of a failed piece of hardware to another, newer, piece of hardware is a challenge worthy of the most experienced IT experts. It's certainly not an easy operation to complete successfully, especially during a time when the business is screaming for the restoration of a time-sensitive service. It can be so difficult that it can take days instead of hours to complete, and that is unacceptable to any business.

Virtual machines are just files, stored on a Windows volume. In a way, they are not much different to a Word document that is easily backed up and restored. The process isn't quite that simple; a running virtual machine may have services such as Microsoft Exchange or Microsoft SQL Server running in it. That's one reason why Hyper-V has been designed to allow entire volumes of virtual machines to be safely and consistently backed up by using the Volume Shadow Copy Service (VSS).

↓ **Figure 2:**
Combining Hyper-V
backup strategies





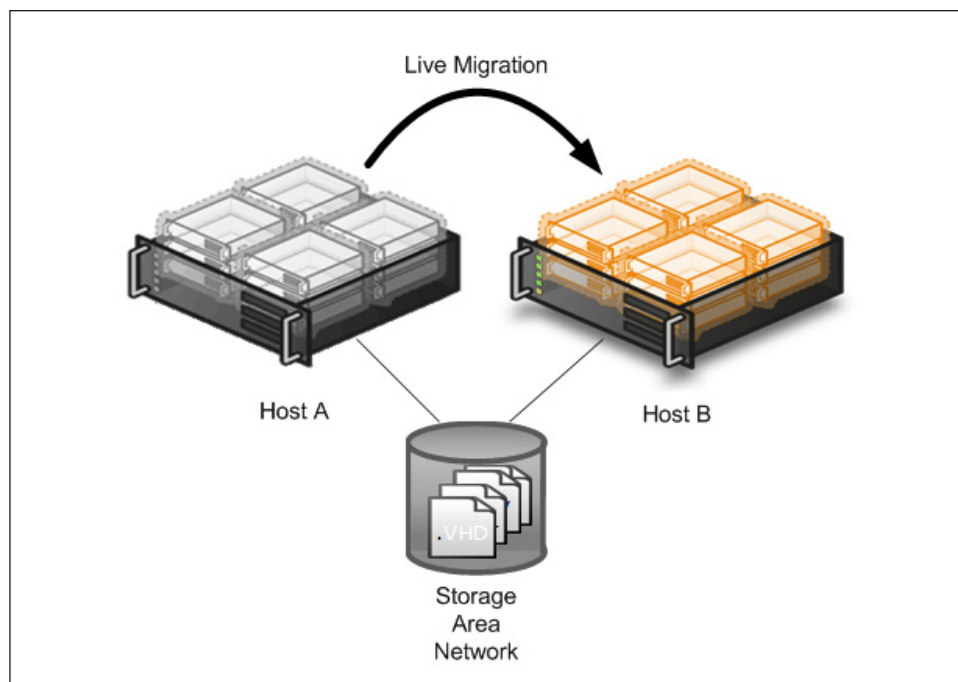
This is used to create a snapshot of a running virtual machine, and in turn, safely snapshot the running VSS-aware services within the virtual machine, as well as all of its files and settings. Each virtual machine can be restored to its original host server or to an alternative host server just as easily as restoring a Word document. There are no drivers to be concerned with, and no devices to cause complexity. A virtual machine is completely abstracted from the hardware that it's hosted on. That means an administrator can easily and quickly perform a "bare metal restoration" of a lost virtual machine in minutes instead of hours or even days.

This strategy of backing up groups of virtual machines from the physical storage level can be combined with a more granular approach of backing up the workloads within the virtual machine. A backup agent can be installed in each virtual machine, and configured to regularly back up items such as file shares or databases. This combines the best of both worlds: regularly backing up the entire virtual machine to protect it against loss, and frequent backup of the important data within the virtual machine to minimise the effect of data loss.

Reducing downtime

Downtime for a server means that a business-enabling service is offline, and business operations are affected. The usual approach has been to deploy clusters of physical servers. Each cluster is made up of two or more physical servers with shared storage such as a storage area network (SAN). One service, such as SQL Server, runs on each server. This service can be moved from one server to another, either manually for scheduled maintenance or if a server suffers a failure, with just a few seconds of downtime. The cost of increased service uptime is greater complexity and expenditure.

Server virtualisation allows each VM to be treated as a highly available service. Hyper-V accomplished this by creating clusters of hosts. A virtual machine can be moved from one physical host server to another with no downtime using Live Migration. This can allow administrators to perform host maintenance without impacting the provision of business services.



← Figure 3: Live migration of a virtual machine between clustered hosts



A cluster will respond to a sudden host failure by moving that host's VMs to other hosts in the cluster. This minimises the amount of downtime caused by unforeseeable circumstances. This technology also can make every business service highly available with less complexity, offering something that can't be matched using physical servers.

Disaster recovery

Events such as 9/11 and the New Orleans floods remind us of the need to deploy disaster recovery (DR) sites and business continuity plans. For some organisations this is a legal requirement. Making physical server workloads highly available between production and secondary sites is a huge engineering challenge.

Each workload has unique requirements. Some server applications such as SQL Server 2008 R2 and Exchange 2010 have replication and high availability mechanisms built in. But others may not, and some other server applications may have dependencies on services such as SQL Server that prevent the usage of mechanisms such as database replication.

Most organisations have a huge variety of solutions including application-native replication, hardware replication, and third-party software replication in place to meet their business and regulatory requirements. However, few organisations get to test these plans fully.

The complexity of these plans raises doubts over their possible success during a day that will be every employee's worst nightmare. Much automation will be in place, but many pieces of the puzzle will require manual intervention. Will the employees make it to the secondary site? Will they have the safety of friends and family on their minds? Will the pressure of the situation prevent them from successfully invoking the business continuity plan in the required time if it's too complex?

The hardware abstraction of server virtualisation brings simplicity and flexibility to the design of a DR infrastructure. Disaster recovery sites can be deployed using a number of mechanisms, depending on the size and requirements of the business:

- VMs can be replicated to a secondary site using backup software
- Replication software can duplicate VMs to a DR site
- Multi-site Hyper-V host clusters that leverage storage replication can be built between the primary and secondary site

Added advantages of implemented DR sites using server virtualisation include:

- Different numbers, models, and manufacturers of servers can be used in the secondary site
- An entire VM server farm can be replicated from the primary site to the secondary site using a single replication system
- The DR site can be invoked automatically by failing over VMs in the secondary site
- The investment for the implementation of a virtualised DR site will be much lower than possible with physical servers



How Hyper-V will improve management

Why does a business have physical or virtual servers? The answer to this should be that the business requires applications and information to perform business operations. The business doesn't care about firewalls, servers or disks. And management doesn't start and end with server virtualisation.

Microsoft recognises the importance of services such as applications and information sharing to the business. This is why Microsoft has focused so much effort on developing the System Center family of systems management solutions for managing the entire IT stack, from the physical layer to the application layer. It's this family of products and their integration with Hyper-V that differentiates Microsoft's virtualisation from the competition.

Virtualisation and the private cloud

System Center Virtual Machine Manager (SCVMM) is Microsoft's solution for centrally managing many Hyper-V hosts and clusters, as well as other virtualisation platforms. It provides easier management for administrators by providing scripting and automation of complex tasks. SCVMM also allows an organisation to build an on-site private cloud, where non-administrators can use a self-service portal to deploy virtual machines and services in a controlled and measured manner from a centrally managed library of resources.

Health and performance monitoring

System Center Operations Manager (SCOM) has the ability to monitor the health and performance of all aspects of the IT infrastructure, including the physical layer, the virtualisation layer, the operating system and the application. Using management packs provided by Microsoft and partners such as software publishers and server/storage manufacturers, a business can have complete insight into the stability, performance, and scalability of the IT infrastructure and the services it provides. Monitoring has the ability to model services, monitor them from the end user's perspective, and provide service level agreement (SLA) monitoring, with dashboards that can be presented to the business using SharePoint.

The monitoring of SCOM can be integrated with the virtualisation management of SCVMM using Performance and Resource Optimization (PRO). This can allow SCOM to detect a fault, such as a VM needing more resources than are available on the current host, or a minor host hardware fault. SCVMM can automatically (or manually if required) react to this fault by relocating VMs to more suitable hosts with no downtime.

Backup and recovery

System Center Data Protection Manager (DPM) provides reliable backup and recovery services for VMs and their workloads. DPM features simple backup licensing. It gives a business best of breed backup for a Microsoft-centric network, by backing up data to disk and optionally to tape.

An added benefit of DPM is the ability to replicate backup data to a DPM server in a secondary site. This provides automated off-site storage of backup data and can be used to recover entire VMs and their workloads in a secondary site during the invocation of a business continuity plan.



Configuration and policy management

System Center Configuration Manager (SCCM) gives an organisation the ability to centrally manage desktops and servers throughout their entire configuration life cycle. It can deploy operating systems, software, services packs, hot fixes and security patches. It can be used to audit hardware, software and configuration policies.

Service and compliance management

System Center Service Manager (SCSM) is more than just a helpdesk solution. It provides a way for an organisation to comply with regulatory or industry standards, and build an automation service spanning the entire IT infrastructure.

Run book automation

System Center Opalis (soon to be renamed System Center Orchestrator) gives a business the tools to build automated processes that span the entire Hyper-V and System Center family, as well as other Microsoft and third-party applications and services. This can improve the timeliness and consistency of often repeated processes, freeing up IT staff to focus on engineering tasks to better enable the business to survive and thrive.

Success story: Endeavour International Corporation

Endeavour International Corporation is an oil and gas company that has operations in the United States and the UK. IT provides critical business-enabling services with just one IT professional based in London.

The company underwent significant growth in the period between its founding in 2004 and 2008. An office in Aberdeen, Scotland, was a focal point in that growth. This created a challenge for the systems administrator; how would he continue to manage existing systems from London while deploying new systems hundreds of miles away in Aberdeen?

Windows Server 2008 R2 Hyper-V was deployed to provide a server virtualisation platform, while System Center Virtual Machine Manager (SCVMM) 2008 R2 was deployed to enable the systems administrator to remotely and quickly provision new services. This combination meant the IT professional could work from London and respond to the changing needs and growth of the company. Other business issues caused by the growth in requirements for additional IT services were also resolved.

Physical servers take time to deploy, especially when dealing with a remote office. This couldn't be allowed to restrict growth of the business. Hyper-V combined with SCVMM removed the need to provision physical hardware when new services were required by the business. Instead, a new virtual machine could be deployed from a template, and be operational in a matter of minutes instead of weeks.

The Aberdeen office had a small amount of space for IT systems. The growing need for servers could have forced the operation to undergo a costly transformation to add otherwise necessary rack space if not for Hyper-V. The consolidation provided by server virtualisation meant that less space was required, and business operations wouldn't be disrupted by a move that could have been caused by an IT need, saving an estimated £10,000.

Critical business data was stored in the Aberdeen office. Backing this up in a remote branch office proved to be a challenge for Endeavour International Corporation. Using Hyper-V enabled a solution by simplifying the problem of backup and recovery.

Additional benefits this solution brought to Endeavour International Corporation included:


- Simpler and more economic software licensing
- The ability to make every virtual machine highly available using Windows Failover Clustering and Live Migration, thus making business services more resilient to hardware faults
- Centralised and easier management that allows reduced IT costs and increased IT responsiveness
- Reduced cost of ownership for IT infrastructure including hardware purchase and support, office space, and electricity
- Server virtualisation with Hyper-V not only gave Endeavour International Corporation an IT solution, but, more importantly, a solution to a business problem.

You can read more of this success story at http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000006533.

Hyper-V licensing

Hyper-V can be licensed in a number of ways, as shown in the table below.

	Standard	Enterprise	Datacenter	Hyper-V Server
Licensing model	Per host	Per host	Per Host CPU	Free
Free licences for VMs	1	4	Unlimited	None
Failover clustering	No	Yes	Yes	Yes
Live migration	No	Yes	Yes	Yes
Maximum host memory	32GB	1TB	1TB	1TB

 **Table 1:**
Comparing the licensing of Hyper-V

Windows Server allows one to license the Hyper-V host server. This means you can license Windows Server for the host and for a number of virtual machines that are placed on that host. For example, Windows Server Enterprise edition provides licensing for the parent partition and for four VMs that are placed on that host. Windows Server Datacenter edition provides licensing for the host, and it also includes Windows Server licensing for an unlimited number of VMs on that host. This is seen as a huge cost saving by organisations that want to place more than a few VMs on a host server.

Microsoft has also released a free version of Hyper-V called Hyper-V Server, with the current version being Hyper-V Server 2008 R2. This includes all of the scalability and features of a purchased version of Windows Server with Hyper-V, but it doesn't provide free Windows Server licensing for virtual machines.



Suggested Hyper-V Hardware

There are a wide variety of hardware solutions for building a Hyper-V infrastructure, depending on the requirements of the business. You should work with a Microsoft partner to identify an appropriate solution from the Windows Server Catalog at <http://www.windowsservercatalog.com/>.

Your Next Steps

Evaluate your environment for Hyper-V server virtualisation using the Microsoft Assessment and Planning (MAP) Toolkit. The MAP toolkit's free to download and use from <http://technet.microsoft.com/en-us/solutionaccelerators/dd537566>. Using the MAP toolkit, you can discover your infrastructure, measure the actual resource utilisation of your workloads, and accurately size a Hyper-V infrastructure that your converted servers can be hosted on.

The data gathered by the MAP toolkit can be entered into Microsoft Integrated Virtualisation Return on Investment (ROI) Calculator, found at <https://roianalyst.alinean.com/msft/AutoLogin.do?d=307025591178580657>. You can enter the costs of maintaining your physical IT infrastructure and this tool will calculate the savings your business will achieve by converting it to a Hyper-V server virtualisation infrastructure.

You should contact a Microsoft partner with the virtualisation competency at <https://solutionfinder.microsoft.com/> once you have evaluated how virtualisation with Hyper-V can bring cost savings and increased agility to your business.

Glossary

Host: A physical server that one or more virtual machines are placed onto and consume resources from.

Virtual Machine (VM): An insulated partition of a host server that has its own operating system, disk space, memory, identity and security boundary.

Hypervisor: A form of virtualisation that uses a small piece of software to partition a physical host server into many virtual machines.

Live Migration: A method of moving virtual machines with no downtime from one physical host to another within a cluster of hosts.

Dynamic Memory: A technique used by Hyper-V to allocate host memory to virtual machines on an on-demand basis.

Cluster Shared Volume (CSV): A file system that is shared by many hosts in a cluster to store one or more virtual machines.

Cluster: A group of up to 16 physical that provide fault tolerance and high availability by allowing virtual machines to move between hosts.

Hyper-V Server: A free edition of Windows Server that provides all of the scalability and technology features of Hyper-V on Windows Server 2008 R2, but can only be used for virtualisation.

Further Reading

Virtualization with Hyper-V: <http://www.microsoft.com/windowsserver2008/en/us/hyperv-main.aspx>

Hyper-V on Microsoft TechNet: <http://technet.microsoft.com/en-us/dd448604>

Microsoft Virtualization Case Studies: <http://www.microsoft.com/virtualization/en/us/case-studies-featured.aspx>

Microsoft System Center: <http://www.microsoft.com/systemcenter/>