Microsoft®

Windows Server 2012 Release Candidate

Product Overview

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Cloud Optimize Your IT with Windows Server 2012 RC

When it comes to IT infrastructure, the message is clear: Organizations want a more consistent, integrated approach that helps them solve fundamental business and IT challenges. They also want to take advantage of new applications and services that can be deployed on premises and in private and public cloud environments. The next release of Windows Server®, Windows Server 2012 Release Candidate (RC), is a more dynamic, available, cost-effective server platform that allows organizations of all types and sizes to cloud optimize their IT.

Converging needs and innovations

Business needs and technology innovations are converging, offering IT professionals a unique opportunity to take advantage of new innovations to meet business requirements. Consider these trending business needs:

- **Agility and flexibility.** IT professionals need to be flexible and respond rapidly to market changes, while hosting providers must develop innovative new services to attract and maintain customers.

- **Efficiency.** Whether your organization is a small company, a government agency, a hosting provider, or a large enterprise, everyone must do their job more effectively and cost-efficiently.

- **Compliance.** Businesses and hosting providers must protect customer and personal identity information, respond to changing regulations, and comply with industry and governmental policies.

- **Access.** Workers need access to data and information regardless of the infrastructure, network, device, or application used to deliver it. Businesses and hosting providers must be able to offer anytime, anywhere access to IT services to satisfy worker and customer expectations.

To support these business needs, IT professionals need an infrastructure that scales up and down quickly to meet changing business needs, minimizes downtime and failures, and maximizes and cost efficiencies. Fortunately, several key technology innovations are making that more possible:

- **Virtualization.** IT departments can respond faster to requests from business units, reducing the time it takes to deploy infrastructure and services. And as always, virtualization significantly reduces the number of physical servers required to support the business.

- **Security and identity management.** These critical technologies are evolving to provide highly secure and compliant environments that protect important assets and corporate and personal identities.

- **Cloud-based applications.** Anywhere access to critical applications helps to increase work productivity, improve communication, and increase customer touch, allowing companies to improve their regular business rhythm and respond to market changes and opportunities.

- **Multitenancy and cross-premises integration.** These innovations help IT departments and hosting service providers maximize existing infrastructure investments while exploring new services, improved management, and higher availability.

Cloud computing opportunities

Converging business needs and technology innovations have opened the door for cloud computing—the on-demand delivery of standardized IT services running on shared resources. Cloud computing transcends virtualization by treating the compute, network, and storage resources as a flexible pool that can be allocated to any workload. When a cloud data center does this it becomes more dynamic and enables full decoupling of the physical infrastructure from the logical workloads.

By providing the ability to increase and decrease usage based on demand, cloud computing gives IT greater elasticity and scale at lower cost and with greater reliability. In addition, IT can empower users to use self-service support, which frees up IT resources and gives users faster results. Your business can be more efficient because cloud computing is based on usage and driven by service level agreements (SLAs).

One important difference between private versus public clouds is distinguished by who can use the cloud services. A public cloud implements and offers services to many unrelated organizations, usually for a fee. A private cloud offers the services within an organization. A hybrid cloud offers services from private and public clouds.

IT and business professionals are beginning to see the opportunities available through the cloud. Consider these two examples:

- Technology innovations such as virtualization, multitenancy, and resource metering make it easier for IT departments to provide the business with flexibility, efficiency, and agility.

- Deep application insights along with the ability to automatically orchestrate resources are critical to enable IT departments to deliver applications as services, rapidly resolve problems, increase application uptime.

However, identifying opportunities is not enough. IT professionals from organizations of all types and sizes—a small company, a government agency, a hosting provider, or a large enterprise—recognize that they need a cloud-optimized server platform that helps them implement these innovations so they can meet business requirements. That platform is Windows Server 2012 .

Moving to cloud-optimized IT

To move toward cloud-optimized IT that can span on-premises and off-premises environments, you must have four key capabilities:

- A common virtualization platform that increases efficiency and performance across your infrastructure.

- A common identity through directory services.

- Common management through automation.

- Common developer tools and platforms.

Microsoft offers a common set of tools and services that provide these capabilities, all of which either are found in Windows Server 2012 or easily integrate with it. When combined with a set of management tools, such as System

Center 2012, Windows Server 2012 offers a complete private cloud solution. Windows Server 2012 provides the platform functionality that manages the physical servers, networking, and storage access, and enables the management layer built on top of it to expose these as a pool of compute, network, and storage resources.

For example, with Windows Server 2012 , IT professionals can make the opportunities mentioned earlier a reality:

- Network isolation and improved Microsoft Hyper-V® virtualization combined with new Resource Metering make it easier for hosting service providers and enterprises to implement private cloud services and usage-based billing for their customers and departments.

- Using new and improved features in Active Directory Doman Services (AD DS) along with claims-based authorization makes it easier for IT to grant access to information to the right people while maintaining a tighter audit trail for information governance and compliance with regulations such as the Health Insurance Portability and Accountability Act (HIPAA) and the Sarbanes-Oxley Act (SOX).

Capitalize on existing skills and investment with Windows Server 2012 RC

When you cloud optimize your IT with Windows Server 2012 RC, you capitalize on the skills and investment you have already made in constructing a familiar and consistent platform. Windows Server 2012 RC builds on that familiarity and cloud optimizes your IT infrastructure by helping you:

- Scale and protect workloads, cost-effectively build a private cloud, and more securely connect to cloud services.

- Efficiently manage infrastructure while maximizing uptime and minimizing failures and downtime.

- Build on an open and scalable web platform that supports cross-premises applications.

- Support a mobile and flexible work style that gives people access to data regardless of the infrastructure, network, device, or application they use to access it.

Windows Server 2012 RC is a great choice of operating system for running multiple servers and the devices connecting them, whether they are physical or virtual, on premises or off premises.

With Windows Server 2012 RC, you gain all the Microsoft experience behind building and operating private and public clouds, delivered as a more dynamic, available, cost-effective server platform. For example, Microsoft is the only company designing cloud computing solutions that also has deep experience in operating large cloud environments, providing a comprehensive approach to cloud services at all levels:

- Cloud-based applications and experiences through Microsoft® Office 365 and Microsoft Dynamics®.

- Public cloud-based platforms through Windows Live® Hotmail®, Windows Live Messenger, Bing™, Windows Azure®, and Xbox LIVE®.

- Private cloud services for our own organization.

Consider these statistics:

- 9.9 billion messages a day delivered via Windows Live Messenger.

- 600 million unique users every month on Windows Live and MSN.

- 500 million active Windows Live IDs.

- 5 petabytes of content served by Xbox LIVE during Christmas week.

- Over 1 petabyte of updates served every month by Windows Update to millions of servers and hundreds of millions of PCs worldwide.

- Tens of thousands of Windows Azure customers.

- 40 million paid Microsoft Online Services in 36 countries.

No other technology provider comes close to this level of experience or completeness in a cloud offering. Although other providers tend to focus on providing specific cloud components, such as virtualization or development tools, Microsoft continues to incorporate lessons learned from implementing and managing cloud services to provide a cloud-optimized operating system with Windows Server 2012 RC.

What if I'm not ready to move to the cloud?

Moving to Windows Server 2012 RC doesn't mean that you have to move to the cloud right away. It does mean that you're dedicated to staying current with a server platform that supports yesterday's technologies and today's business needs while preparing you for tomorrow's innovations.

Many of the new and improved features in Windows Server 2012 RC can help you meet demanding business requirements without ever giving thought to clouds—private or public. If you're working with virtualized environments, many of the improvements in Hyper-V and storage technologies will help you enhance your virtual environment and reduce storage costs. For example, Windows Server 2012 RC offers high-performance, continuously available file-share storage for server applications. Implementing this feature lets you store application data on inexpensive, easy-to-manage file shares and obtain nearly the same benefits you would expect from a storage area network (SAN).

Microsoft built Windows Server 2012 RC so you can capitalize on your existing investment. By choosing Windows Server 2012 RC now, you are preparing for the future. As you continue to grow and work within a heterogeneous environment, you can select the path that is best for your business. Whether implementing a private cloud is around the corner or over the horizon for you, Windows Server 2012 RC offers a great platform to prepare for and implement cloud-optimized IT now.

Getting to know Windows Server 2012 RC

Windows Server 2012 RC delivers value in four key ways:

- It takes you **beyond virtualization**. Windows Server 2012 RC offers a dynamic, multitenant infrastructure that goes beyond virtualization technology to a platform for building a private cloud. Going beyond virtualization helps you to scale and protect workloads, cost-effectively build the foundation for the cloud, and more securely connect to cloud services.

- It delivers **the power of many servers with the simplicity of one**. Windows Server 2012 RC offers you excellent economics by integrating a highly available and easy-to-manage multiserver platform.

- It opens the door to **every app on every cloud**. Windows Server 2012 RC is a broad, scalable, and elastic web and application platform, giving you the flexibility to build and deploy applications on premises, in the cloud, and in a hybrid environment by using a consistent, open set of tools and frameworks.

- It **enables the modern work style**. Windows Server 2012 RC empowers IT to provide users with flexible access to data and applications anywhere, on many devices, while simplifying management and maintaining security, control, and compliance.

These investments in Windows Server 2012 RC will help you build and deploy a scalable, dynamic, multitenant-aware cloud infrastructure that more securely connects across premises and allows IT professionals to respond to business needs faster and more efficiently.

The following sections of this paper provide an in-depth look at new and improved features in each of these areas.

Beyond Virtualization

Server virtualization has evolved over the past few years from a nascent technology into a mature IT feature. In the process, businesses of all sizes have begun taking advantage of its power to meet shifting business needs. By virtualizing their workloads, organizations can control and cut costs while improving the scalability, flexibility, and reach of IT systems.

With these advances, however, comes the realization that virtualization by itself does not allow organizations to build or take advantage of cloud services, which are assuming an ever-growing role in the execution of business tasks.

Microsoft has taken a leading position in the advancement of virtualization technology with Hyper-V. First introduced as part of Windows Server 2008, and then expanded and enhanced in Windows Server 2008 R2, Hyper-V provides organizations with a tool for optimizing server hardware investments by consolidating multiple server roles as separate virtual machines running on a single physical host machine. They can also use Hyper-V to efficiently run multiple operating systems—including operating systems other than Windows, such as Linux—together on a single server, and take advantage of the power of 64-bit computing.

Advantages of Windows Server 2012 RC

With Windows Server 2012 RC, Microsoft is going beyond virtualization, introducing new and enhanced technologies to take advantage of the enormous potential of cloud computing. This includes the creation of private clouds—that is, using cloud technology inside large organizations to extend the benefits of cloud computing across departments, geographical locations, and business processes—along with offering public cloud services and building multitenant infrastructures.

In the development of Windows Server 2012 RC, Microsoft has made major strides in advancing the features and capabilities of Hyper-V, providing organizations with a more dynamic, multitenant infrastructure.

With Hyper-V in Windows Server 2012 RC, enterprises can deploy private clouds within a flexible IT environment that can adapt dynamically to changing business needs. The new and enhanced features of Hyper-V provide high performance and scalability to meet the demands of business users and support SLAs and the ability to provide chargebacks. Administrators can access tools to automate systems through software-based policy controls and can use the Hyper-V functionality to lower the overall costs of cloud environments.

Hosting providers have specific needs, including the ability to isolate tenants, create billing solutions for these tenants, and provide additional services for new sources of revenue. Hosting providers also need tools to help transition customers from on-premises to hosted environments, and they need to continue providing high levels of service and reliability.

Hyper-V in Windows Server 2012 RC helps enterprises and hosting providers achieve these goals with:

- **A complete virtualization platform.** The new Hyper-V delivers an isolated, multitenant environment that helps in the creation of unlimited private networks by using your existing network infrastructure. You can connect virtual machines from around the world as if they were in the same server rack. To improve security, each customer's virtual machines are isolated from those of other customers running on the same Hyper-V hosts. It also includes tools that support SLAs, enable chargebacks through usage-based billing, and support self-service delivery.

- **Increased scalability and performance.** Hyper-V in Windows Server 2012 RC delivers a high-density, highly scalable environment that can be modified to perform at the optimal level based on customer needs, with features like the ability to easily migrate virtual machines and being able to take advantage of emerging high-performance hardware technology.

- **Connectivity to cloud services.** Windows Server 2012 RC uses a common identity and management framework for more secure and reliable cross-premises connectivity to help people work and collaborate more effectively regardless of whether the applications and services they need are on premises or in the cloud.

The following sections take a closer look at how the individual features in the new Hyper-V support these core capabilities in enterprise organizations and in hosting companies.

A complete virtualization platform

Hyper-V in Windows Server 2012 RC goes beyond standard virtualization technologies to deliver a more dynamic data center and cloud infrastructure with more flexible workloads, networks, and storage. It offers easier-to-administer policy-based resources, increased agility, and minimized downtime. The promise of the dynamic data center is that it allows the flexibility to place any application workload on any physical machine, and to move or assign the required resources—such as CPU, memory, and storage—according to the resource needs and requirements of the workload. This can be accomplished in an automated manner through well-defined policies and accepted practices.

New capabilities with the Hyper-V Extensible Switch

The Hyper-V Extensible Switch in Windows Server 2012 RC introduces a number of new and enhanced capabilities for tenant isolation, traffic shaping, protection against malicious virtual machines, and hassle-free troubleshooting. The Extensible Switch allows third parties to develop plug-in extensions to emulate the full capabilities of hardware-based switches and support more complex virtual environments and solutions.

The Hyper-V Extensible Switch is a layer-2 virtual network switch that provides programmatically managed and extensible capabilities to connect virtual machines to the physical network. The Extensible Switch provides policy enforcement for security, isolation, and service levels. With built-in support for Network Device Interface Specification (NDIS) filter drivers and Windows Filtering Platform (WFP) callout drivers, it also allows for third-party extensible plug-ins that can provide enhanced networking and security capabilities (Figure 1).
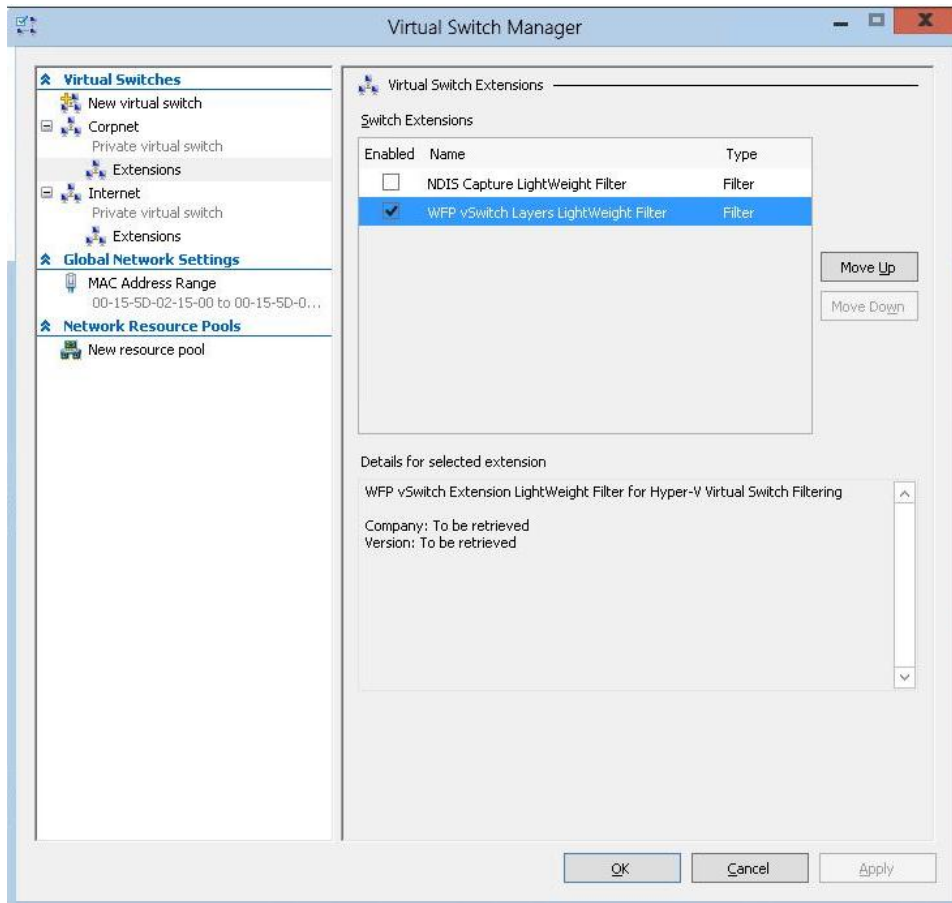
Figure 1. The Hyper-V Virtual Switch Manager displays the extensions enabled for each virtual switch.

Top benefits

With the new capabilities in the Hyper-V Extensible Switch, organizations have more options for enforcing tenant isolation, shaping and controlling network traffic, and employing protective measures against malicious virtual machines. The Extensible Switch also allows third parties to develop extensions that can emulate the full capabilities of hardware-based switches and support more complex virtual environments and solutions.

Key features

New and enhanced features and capabilities in the Hyper-V Extensible Switch include:

- An open platform that allows third parties to add or extend the capabilities provided in a virtual switch.

- A standard API based on the programming model for Windows network filters and drivers.

- A high degree of reliability and quality, stemming from the high standards used in the Windows Logo Program for Hardware.

- Management of extensions that is integrated into the Windows management environment through Windows Management Interface (WMI) calls and Windows PowerShell cmdlets. The policies used for extensions are automatically migrated with the virtual machine configuration during a live migration.

- Event logs and unified tracing that can be used for easier troubleshooting when issues occur.

Bottom line

It is now easier for organizations to connect virtual machines to physical networks, and third parties can add virtual networking features and integrate the Hyper-V Extensible Switch into their hardware.

Multi-tenant security and isolation using the Hyper-V Extensible Switch

As virtualized data centers become more popular and practical, IT organizations and hosting providers have begun offering more flexible, virtualized infrastructures to customers. This new class of service, sometimes known as "server instances on demand," is also called infrastructure as a service (IaaS). Hyper-V in Windows Server 2012 RC provides the platform capabilities needed for enterprises to create private clouds and transition to an IaaS environment. It also helps hosting providers build public clouds and offer IaaS solutions to their customers.

To enhance a more stable, safer computing environment for private clouds and IaaS environments, Windows Server 2012 RC contains new security and isolation capabilities that use the Hyper-V Extensible Switch. The Extensible Switch provides policy-based, software-controlled support for isolating multiple tenants while providing improved security.

Top benefits

The Hyper-V Extensible Switch helps organizations isolate multiple tenants and maintain security. The Extensible Switch also helps administrators to accommodate more tenants on the same infrastructure—and to provide access to this environment from their customers' data centers. It helps large enterprises and hosting providers achieve the economies of scale required to reduce their cost structure. Hosting providers can also achieve the necessary revenue per customer or service by using the Hyper-V Extensible Switch.

Key features

The Hyper-V Extensible Switch enhances a shared IaaS cloud with the following capabilities:

- **Security and Isolation.** The Extensible Switch provides the security and isolation needed for IaaS multitenancy with private virtual local area network (PVLAN) support, protection against Address Resolution Protocol (ARP) poisoning and spoofing, and protection against Dynamic Host Configuration Protocol (DHCP) snooping. It also provides virtual port access control lists (ACLs) and virtual LAN (VLAN) trunk mode support.

- **Monitoring.** With port mirroring, IT administrators can run security and diagnostics applications in virtual machines to monitor virtual machine network traffic.

- **Manageability.** Administrators can use the large number of new Windows PowerShell cmdlets for Hyper-V and the new APIs in the Virtualization WMI Provider for command-line and automated scripting support, plus full-event logging.

The Hyper-V Extensible Switch in Windows Server 2012 RC provides the open platform capabilities to enable IaaS for enterprises and hosting providers, providing better security and isolation, while supporting extensions that can be written to standard Windows API frameworks.

Dynamic, flexible virtual machine placement

The success of virtualized data centers has led large IT organizations and hosting providers to create more flexible virtualized infrastructures that make it easier to offer on-demand server instances to their customers by taking advantage of the new IaaS services.

In the IaaS scenario, multiple virtual machines from different divisions or different customers in hosted clouds require highly secure isolation. Currently, VLANs are used by most organizations to support address-space reuse and tenant isolation. However, VLANs have limitations, including the risk of unplanned outages related to reconfiguration of production switches, limited scalability, and an inability to span multiple logical sub-networks. Organizations attempting to use IaaS scenarios also face challenges with IP address assignments.

Windows Server 2012 RC Hyper-V removes the constraints of VLAN and IP address assignments for virtual machine provisioning by using policy-based, software-controlled network virtualization (Figure 2).
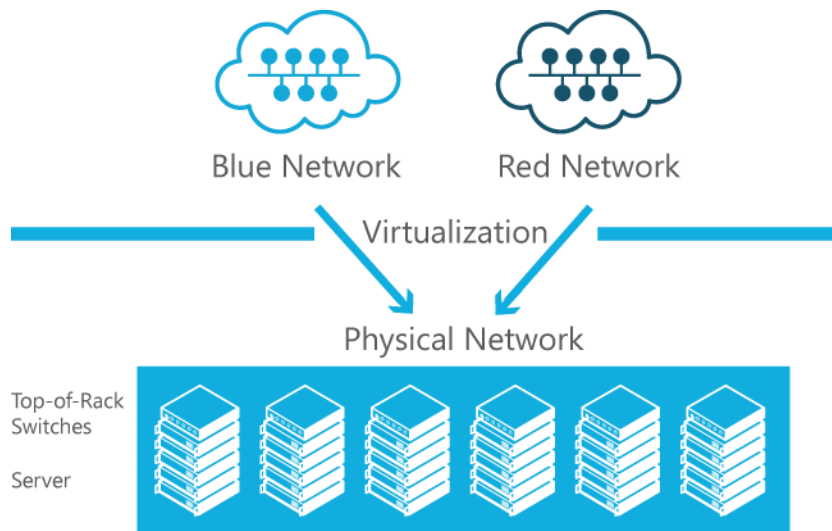
Figure 2. Hyper-V Network Virtualization lets you run multiple virtual networks on a single physical network. Each virtual network believes it is running on its own physical infrastructure.

Top benefits

Windows Server 2012 RC Hyper-V Network Virtualization reduces the impact on enterprises when they are expanding their dedicated clouds, and on hosting providers that are seeking greater efficiencies in building public clouds for their customers. Organizations can bring their own IP by transitioning workloads to the cloud with their IP addresses intact. They can also take advantage of efficient resource usage when managing virtual machines because they are no longer limited to migrating workloads within a single subnetwork.

Key features

The new Hyper-V features include:

- Ability of customers to keep internal IP addresses while moving workloads onto a shared IaaS cloud.

- Flexible placement of workloads, which keep their IP addresses while being migrated or placed anywhere in the data center.

- Simplified migration and placement of server workloads, which are no longer dependent on underlying physical network configurations.

- Tenant isolation that is enforced through software policies instead of through VLANs.

- Increased flexibility of virtual machine workload placement, which simplifies network management and improves server and network resource usage.

- Compatibility with existing infrastructure and emerging technologies, which allows Hyper-V network virtualization to be deployed in current data centers while remaining a viable option for emerging data center technologies.

- Use of Windows PowerShell command-line interface or WMI to script and automate administrative tasks.

Bottom line

Windows Server 2012 Hyper-V Network Virtualization helps large organizations reduce management overhead when moving dedicated clouds to shared IaaS environments. Hosting providers gain greater flexibility, scalability, and efficiency in managing virtual machines for their customers.

Improved live migration of virtual machines

Hyper-V in Windows Server 2012 RC dramatically increases the levels of mobility and flexibility in private clouds by increasing the speed of live migrations, allowing simultaneous migration of many virtual machines in a cluster (Figure 3). It also supports live migration outside a clustered environment (Figure 4). Hyper-V live migration moves running virtual machines from one physical host to another with minimal impact on virtual machine availability to users.
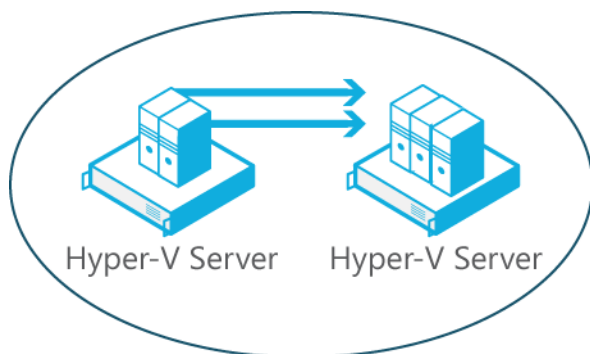
Figure 3. Simultaneous migration of multiple virtual machines in a failover cluster.

Hyper-V Server   Hyper-V Server
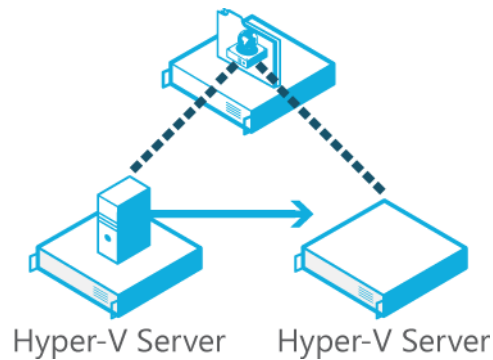
Figure 4. With Hyper-V in Windows Server 2012 RC, you can store virtual machines on file shares and perform live migration between stand-alone Hyper-V hosts.

Live migration copies the memory of the migrating virtual machine to the destination host prior to migration. This minimizes the transfer time of the virtual machine. A live migration is deterministic, meaning that the administrator or script that initiates the live migration determines which computer will be used as the destination for the live migration. There is no impact on the guest operating system, so there is no need to provide a specific configuration of the guest operating system.

Top benefits

The live migration feature in Hyper-V delivers a number of benefits that make processes easier for administrators by providing speed and flexibility in moving private clouds.

Key features

The enhancements to live migration in Hyper-V in Windows Server 2012 RC include:

- **Higher network bandwidths.** Administrators can use network bandwidths of up to 10 gigabytes to complete migrations in clustered environments faster.

- **Live migrations that can be performed outside clustered environments.** Administrators can configure a virtual machine to be stored on a server message block (SMB) file share. It is then possible to perform a live migration on the virtual machine that runs between nonclustered Hyper-V hosts while the virtual machine's storage remains on the central SMB share. Administrators can also perform a live migration of a virtual machine between two stand-alone Hyper-V hosts when using local storage for the virtual machine.

- **Simultaneous migration of virtual machines in a cluster.** This allows administrators to move entire banks of virtual machines to cluster nodes in a single action. Virtual machines can also be given priority to help ensure that higher-importance workloads are moved first and that the node has adequate resources to provide to its hosted virtual machines.

- **Automated live migration setup.** During the live migration setup stage, the source host creates a TCP connection with the destination host, transferring the virtual machine configuration data to the destination host. A skeleton virtual machine is set up on the destination host and memory is allocated to the destination virtual machine.

- **Transfer of memory pages.** This stage is a memory copy process that duplicates the remaining modified memory pages for the "test virtual machine" to the destination host. The source host transfers the CPU and device state of the virtual machine to the destination host. The number of pages transferred in this stage is determined by how actively the virtual machine accesses and modifies the memory pages.

Bottom line

Windows Server 2012 RC provides improved performance during live migration of virtual machines and is now available inside and outside clustered environments, both with and without shared storage.

Enhanced Quality of Service

As large enterprises and hosting providers rely more and more on private and public clouds to serve their customers, better performance becomes paramount to meet SLAs. To help improve performance in virtualized environments, Windows Server 2012 RC introduces new bandwidth management capabilities in the Quality of Service (QoS) feature.

Hosting companies and large enterprises often need to run multiple application servers on servers running Hyper-V. In the past, this required the use of dedicated network adapters for each type of workload. Now, with the new features in QoS, organizations can improve overall performance in virtualized environments by combining multiple kinds of network traffic onto a single network adapter, with an increased level of service to each type of traffic.

Top benefits

Organizations that converge all types of network traffic onto a single network adapter realize benefits that include lower capital and operating expenses. The new features in QoS help to meet the quality requirements of most converged network deployment scenarios. QoS provides new functionality and management interfaces in addition to what is available with Windows Server 2008 R2. To complement the software functionality, QoS also takes advantage of new network adapter hardware that works with Data Center Bridging (DCB) technology and is supported by Windows ecosystem partners.

Service	Minimum Bandwidth Reserved
Virtual Machine	30%
Storage	40%
Live Migration	20%
Cluster Shared Volume	10%

Key features

QoS in Windows Server 2012 RC now supports the capability of enforcing minimum bandwidth. In contrast to maximum bandwidth, which is a bandwidth cap, minimum bandwidth is a bandwidth floor. It results in a certain amount of bandwidth to a given type of traffic (Figure 5).

Figure 5. When the link is congested, each service uses only its minimum reserved bandwidth.

Windows Server 2012 RC offers two different mechanisms to enforce minimum bandwidth: one through the newly enhanced packet scheduler in Windows, and the other through network adapters that support DCB. Each of the two mechanisms has its own distinct advantages:

- The software solution, which is built on the new packet scheduler in Windows Server 2012 RC, provides a fine granularity of classification. It is the only viable choice if many traffic flows require minimum bandwidth enforcement.

- The hardware solution, which depends on DCB support on the network adapter, supports fewer traffic flows but can classify network traffic that does not originate from the networking stack.

Both mechanisms can be employed on the same server.

Bottom line

Windows Server 2012 RC provides rich capabilities and configuration tools to support software-controlled QoS policies for network convergence in data centers.

Resource Metering with Hyper-V

IT organizations need tools to charge back business units that they support while providing the business units with the right amount of resources to match their needs. For hosting providers, it's equally important to issue chargebacks based on the amount of usage by each customer.

To implement advanced billing strategies that measure both the assigned capacity of a resource and its actual usage, earlier versions of Hyper-V required users to develop their own chargeback solutions that polled and aggregated performance counters. These solutions could be expensive to develop and sometimes led to loss of historical data.

To assist with more accurate, streamlined chargebacks while protecting historical information, Hyper-V in Windows Server 2012 RC introduces Resource Metering, a feature that allows customers to create cost-effective, usage-based billing solutions. With this feature, service providers can choose the best billing strategy for their business model, and independent software vendors can develop more reliable, end-to-end chargeback solutions on top of Hyper-V (Figure 6).
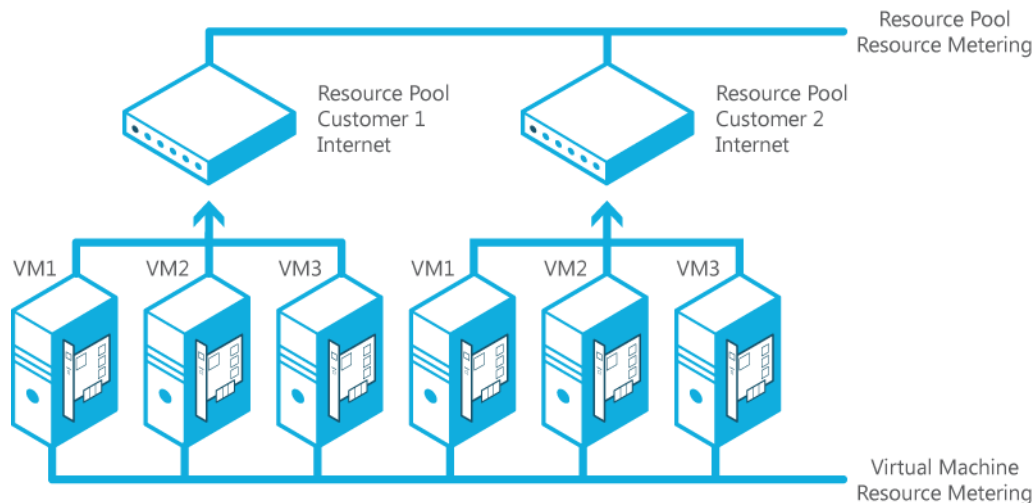
VM = virtual machine

Figure 6. Windows Server 2012 RC allows the tracking of virtual machine resource usage by resource pool.

Top benefits

The Resource Metering feature of Hyper-V in Windows Server 2012 RC allows organizations to avoid the expense and complexity associated with building in-house metering solutions to track usage within specific business units. It allows hosting providers to quickly and cost-efficiently create a more advanced, reliable, usage-based billing solution that adjusts to the provider's business model and strategy.

Key features

Windows Server 2012 RC provides two options for administrators to obtain historical data on a client's use of virtual machine resources: Hyper-V cmdlets in Windows PowerShell and the new APIs in the Virtualization WMI provider. These tools expose the metrics for the following resources used by a virtual machine during a specific period of time:

- Average CPU usage, measured in megahertz over a period of time.
- Average physical memory usage, measured in megabytes.
- Minimum memory usage (lowest amount of physical memory).
- Maximum memory usage (highest amount of physical memory).
- Maximum amount of disk space allocated to a virtual machine.
- Total incoming network traffic, measured in megabytes, for a virtual network adapter.
- Total outgoing network traffic, measured in megabytes, for a virtual network adapter.

Resource Metering works with all Hyper-V operations. Movement of virtual machines between Hyper-V hosts—for example, through live, offline, or storage migrations—does not affect the collected data.

Bottom line

Hyper-V Resource Metering provides a streamlined way to deliver a more accurate view of resource usage.

Increased scalability and performance

With the growing importance of virtualization in enterprises and at hosting providers, organizations need to be sure that system responsiveness can meet SLAs and customer expectations. Windows Server 2012 RC provides significant improvements in scalability and performance for virtualized platforms by allowing a fixed amount of resources to run more workloads faster with Hyper-V and by offloading specific processes to hardware. The result is a high-density, highly scalable environment that can be adapted to perform at optimal levels based on customer needs.

Import multiple virtual machines

Windows Server 2012 RC includes an improved wizard that makes it easier and safer to export or copy virtual machines from one host and import them to another. The wizard detects and fixes potential problems, such as hardware or file differences that might exist when a virtual machine is moved to another host. As an added safety feature, it creates a temporary copy of the virtual machine configuration file in case an unexpected restart occurs on the host, such as from a power outage.

Top benefits

IT administrators can easily migrate virtual machines from one host to another.

Key features

Administrators often think of a virtual machine as a single, stand-alone entity that they can move around to address operational needs. In reality, a virtual machine has a number of different components, including:

- Virtual hard disks, which are stored as files in the physical storage.

- Virtual machine snapshots, which are stored as a special type of virtual hard disk file.

- The saved state of the various host-specific devices.

- The memory file, or snapshot, of the virtual machine.

- The virtual machine configuration file, which organizes all of those parts and arranges them into a working virtual machine.

The Import Wizard in Hyper-V detects and fixes more than 40 different types of incompatibilities. Administrators do not have to worry ahead of time about the configuration that is associated with physical hardware, such as memory, virtual switches, and virtual processors. The Import Wizard addresses these problems by guiding administrators through the steps to resolve incompatibilities when they import a virtual machine to a new host.

Additionally, it is no longer necessary to export a virtual machine prior to importing it. Just copy a virtual machine and its associated files to the new host, and then use the Import Wizard to specify the location of the files. This "registers" the virtual machine with Hyper-V and makes it available for use. This can be done by using a USB flash drive that is formatted with the New Technology File System (NTFS). During the import process, the wizard does the following:

1. **Creates a copy of the virtual machine configuration file.** This is created as a precaution in case an unexpected restart occurs on the host, such as from a power outage.
2. **Validates hardware.** Information in the virtual machine configuration file is compared to hardware on the new host.

3. **Compiles a list of errors.** This list identifies what needs to be reconfigured and determines which pages appear next in the wizard.
4. **Displays the relevant pages, one category at a time.** The wizard identifies incompatible files to help you reconfigure the virtual machine so that it is compatible with the new host.
5. **Removes the copy of the configuration file.** After the wizard completes this step, the virtual machine is ready to start.

Bottom line

The new Hyper-V Import Wizard is a simpler, more reliable way to import or copy virtual machines.

Hyper-V Replica

With Hyper-V Replica, administrators can replicate their Hyper-V virtual machines from one Hyper-V host at a primary site to another Hyper-V host at a replica site (Figure 7). This feature lowers the total cost of ownership for an organization by providing a storage-agnostic and workload-agnostic solution that replicates efficiently, periodically, and asynchronously over IP-based networks across different storage subsystems and across sites.
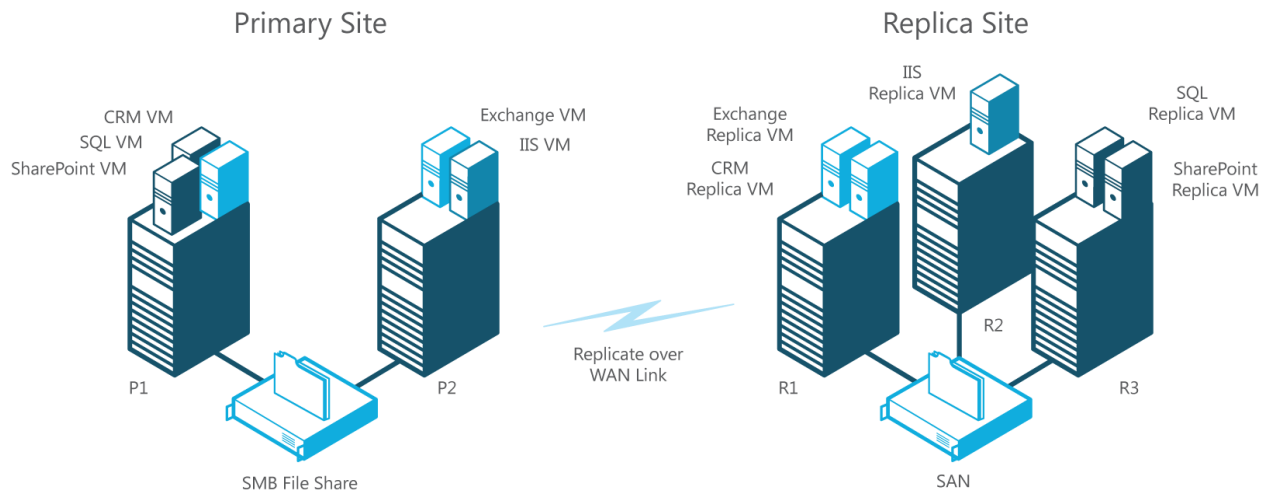
VM = virtual machine

Figure 7. Hyper-V Replica lets administrators easily replicate virtual machines to a remote site over a WAN link.

Additionally, administrators can use Hyper-V Replica to test the replica virtual machine without disrupting the ongoing replication. If a failure occurs at the primary site, administrators can quickly restore their business operations by bringing up the replicated virtual machine at the replica site.

Top benefits

Virtual machines can be easily replicated to different locations for greater protection and availability.

Key features

Hyper-V Replica tracks the write operations on the primary virtual machine and then replicates these changes to the replica server over a WAN. The network connection between the two servers uses the HTTP protocol and supports integrated and certificate-based authentication, with optional support for encryption.

Hyper-V Replica is closely integrated with Windows failover clustering and provides nearly seamless replication across different migration scenarios in the primary and replica servers. This allows virtual hard disks to be stored in a different location to enable recovery in case the data center goes down due to natural disaster or other causes.

Bottom line

Hyper-V Replica provides a virtual machine–level, affordable, reliable, manageable replication solution that is tightly integrated with Hyper-V Manager and the failover clustering feature in Windows Server 2012 RC.

Hyper-V host scale and scale-up workload support

As virtualization technology has emerged and evolved over the past few years, it has gained wide acceptance as a way to lower costs through the consolidation of server roles. If used only for consolidation tasks, virtualization does not put much demand on CPU and memory resources.

Today, however, organizations are seeing new possibilities for virtualization. More and more, IT organizations are looking to use virtualization for deploying mission-critical, tier-1 business applications with demanding workloads, such as online transaction processing and online transaction analysis. These and other kinds of enterprise applications typically run on systems with 16 or more processors and demand large amounts of memory.

Hyper-V in Windows Server 2012 RC has been enhanced to provide far greater support for performance-intensive workloads. It can run on large host systems through expanded support for host processors and memory, helping to achieve the virtualization of high-performance, scale-up workloads by supporting the configuration of large, high-performance virtual machines.

Top benefits

The enhanced support for high-performance hardware configurations in Windows Server 2012 RC Hyper-V provides more options for IT organizations for deploying a wider range of enterprise applications in virtualized environments.

Key features

Features in Hyper-V in Windows Server 2012 RC that support the virtualization of high-performance, scale-up workloads include:

- **Increased hardware support for the virtualization host.** Hyper-V in Windows Server 2012 RC supports running on a host system with up to 320 logical processors and 4 terabytes of memory, providing greater compatibility with very large server systems.

- **Support for large virtual machines.** Hyper-V in Windows Server 2012 RC supports configuration of virtual machines with up to 64 virtual processors and 1 TB of memory.

- **Use of NUMA to speed up the performance of virtual machines.** Non-Uniform Memory Access (NUMA) is a computer architecture used in multiprocessor systems in which the time required for a processor to access memory depends on the memory's location relative to the processor. NUMA provides the affinity to prefer local memory access over remote memory access. By projecting a virtual NUMA topology onto large virtual machines, Hyper-V in Windows Server 2012 RC enables the guest operating system and applications such as Microsoft SQL Server® to use their existing thread scheduler and memory allocation optimizations, which provides better performance and scalability of demanding workloads.

Bottom line

Enhancements to Hyper-V in Windows Server 2012 RC increase support for high-performance processor and memory configurations, which in turn help support the deployment and operation of mission-critical applications on virtualized systems.

Virtual Fiber Channel for Hyper-V

Many organizations have invested in Fiber Channel SANs that are used in data centers to address fast-growing storage requirements. Hyper-V in Windows Server 2012 RC has a new feature that allows virtual machines to connect directly to Fiber Channel–based storage, increasing storage capacity and allowing for growth. This feature also introduces Fiber Channel host bus adapter (HBA) ports in the guest operating system that runs the virtual machine.

Top benefits

Organizations get additional storage capacity for virtual machines by being able to use their existing SANs. Virtual Fiber Channel for Hyper-V also enables new scenarios that use shared storage, such as using Fiber Channel to run the Windows failover clustering feature inside the guest operating system of a virtual machine.

Key features

Virtual Fiber Channel for Hyper-V uses a World Wide Name (WWN) that is associated with a virtual machine to provide the guest operating system with unfiltered access to a SAN. The Virtual Fiber Channel presents an alternative hardware-based I/O path to the Windows software virtual hard disk stack, giving administrators the option to use the advanced functionality offered by their SANs directly from Hyper-V virtual machines.

Virtual Fiber Channel connects WWNs directly to virtual machines, which removes dependencies on the host WWNs and hardware configuration. This allows Hyper-V administrators to migrate virtual machines between different Hyper-V hosts while using existing SAN recommended practices with the virtual machines. The technology also supports live migration of virtual machines connected to the Fiber Channel SAN.

Bottom line

With Virtual Fiber Channel for Hyper-V, enterprises and hosting providers can use existing Fiber Channel–based SANs for virtual machines.

Hyper-V Copy Offload

To take advantage of innovations in storage hardware that provide near-instantaneous copying of large amounts of data, Hyper-V in Windows Server 2012 RC introduces Copy Offload support. With this new feature, Hyper-V workloads use the offload semantics of the host hardware, as well as the virtual storage stack, to perform certain internal operations on virtual hard disks that require large amounts of data to be copied. Hyper-V performs these operations faster than was previously possible.

Top benefits

Maintenance operations for virtual hard disks, as well as various methods of moving a virtual machine, can require moving large amounts of data frequently on the virtualized storage stack. Hyper-V Copy Offload support in Windows Server 2012 RC allows the CPU to concentrate on the processing needs of the application instead of being distracted by networking and storage overheads. This, in turn, lets IT organizations take advantage of new SAN copy offload innovations that allow for copying large amounts of data from one location to another. Copy Offload support in the Hyper-V storage stack makes it possible to complete these operations in a fraction of the time it would otherwise have taken, helping virtualized workloads to operate as efficiently as they would in a non-virtualized environment.

Key features

The new Copy Offload feature uses offload-capable hardware to host the virtual hard disk files. The hardware is connected to the virtual machine either directly or as virtual SCSI devices.

Bottom line

Hyper-V in Windows Server 2012 RC allows the virtualized workload to use the Copy Offload semantics by passing from the workload to the host hardware, which helps the virtualized workload operate as efficiently as it would in a non-virtualized environment.

Improvements in Hyper-V Dynamic Memory

In prior versions of Windows Server, it took more memory to start a virtual machine than to actually run it. IT administrators also had to take virtual machines offline temporarily to upgrade their allocated memory.

Windows Server 2012 RC addresses these issues with enhanced Dynamic Memory. Dynamic Memory, which was introduced for Hyper-V in Windows Server 2008 R2 Service Pack 1 (SP1), can now help customers dramatically increase their virtual machine consolidation ratios.

Top benefits

By using the improvements for Hyper-V Dynamic Memory in Windows Server 2012 RC, administrators can achieve higher consolidation numbers with improved reliability for restart operations. This can lead to lower costs, particularly in scenarios with many idle or low-load virtual machines, such as virtual machine pools in Virtual Desktop Infrastructure (VDI) environments.

Key features

When IT administrators configure minimum memory for their virtual machines in Windows Server 2012 RC, Hyper-V continues to assign this amount to running virtual machines. To provide a faster restart experience for the virtual machines configured with less minimum memory than startup memory, Hyper-V in Windows Server 2012 RC uses second level paging. Second level paging is a memory management technique that uses disk resources as additional, temporary memory when more memory is required to restart a virtual machine.

There are advantages and drawbacks to this approach. It provides a reliable way to keep the virtual machines running when no physical memory is available. However, it can degrade virtual machine performance because disk access speeds are much slower than memory access speeds.

To minimize the performance impact of second level paging, Hyper-V uses it only when the virtual machine is being restarted, when no physical memory is available, and when no memory can be reclaimed from other virtual machines running on the host (Figure 8).
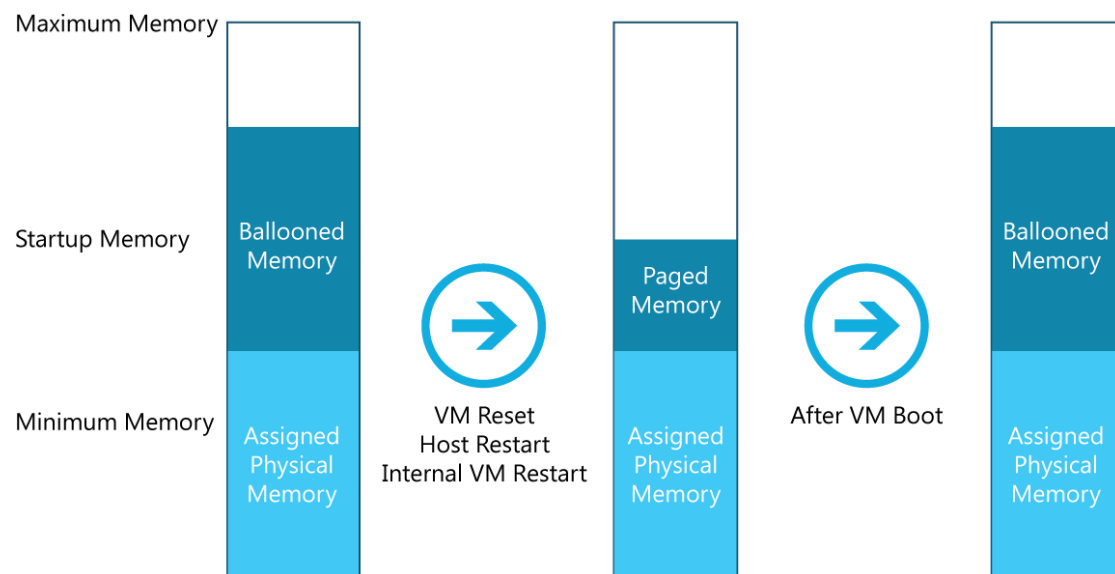
Figure 8. Second level paging is used only when restarting a virtual machine. After restart, Dynamic Memory removes the additional allocated memory.

Hyper-V continues to rely on internal guest paging when host memory is oversubscribed. Internal guest paging is the paging operation that the memory manager performs inside the virtual machines. The Windows memory manager has more information than the Hyper-V host about memory usage within the virtual machine, which means it can provide Hyper-V with better information to use when choosing the memory to be paged. Because of this, internal guest paging incurs less overhead to the system compared to second level paging.

Bottom line

Dynamic Memory improvements in Windows Server 2012 RC allow lower minimum memory configurations and increased maximum memory for virtual machines, which helps organizations achieve higher server consolidation rates and greater availability for users.

Hyper-V support for 4-KB disk sectors

One of the current standards for physical hard disk drives is 512-byte disk sectors. However, hard-drive vendors are working on innovations to enhance the capability of drives.

Windows Server 2012 RC Hyper-V anticipates these innovations with support for 4,096-byte disk sectors (4-KB disk sectors) to ensure that IT organizations can keep up with—and take advantage of—emerging innovations in storage hardware. Hyper-V in Windows Server 2012 RC also improves the performance of virtual hard disks on 512-byte emulation drives (512e drives) and supports hosting virtual hard disks on native 4-KB disks.

Top benefits

IT organizations with virtualized environments can take advantage of new hard-disk technology as it comes on the market with Windows Server 2012 RC Hyper-V support for 4-KB disk sectors.

Key features

To ensure compatibility with emerging disk technology, Hyper-V in Windows Server 2012 RC makes it possible to store virtual hard disks on 4-KB disks by implementing a software-based "read-write-modify" process algorithm in the virtual hard disk layer. This algorithm converts 512-byte access and update requests to corresponding 4-KB accesses and updates.

Bottom line

Hyper-V in Windows Server 2012 RC supports 4-KB disk sectors to meet the demand for emerging innovations in storage hardware.

Hyper-V over SMB

Hyper-V in Windows Server 2012 RC introduces a new storage option—support for Server Message Block 3.0 (SMB3) remote file storage. This capability provides increased flexibility, easier storage provisioning, and reduced system costs when compared to the storage options in Windows Server 2008 R2.

Top benefits

With new Hyper-V support for SMB file storage, administrators have more storage options for virtualized environments. The feature makes it easier to provision and manage Hyper-V storage, takes advantage of existing network investments, and helps reduce acquisition and management costs for Hyper-V.

Key features

The SMB remote file storage can be set up in several different configurations (Figure 9):

- **Single-node file server,** which provides the lowest cost for shared storage. Shares are not continuously available in this configuration.

- **Dual-node file server,** which has a low cost for continuously available shared storage and provides limited scalability (several hundred disks).

- **Multi-node file server,** which provides continuous availability and the highest scalability (potentially thousands of disks). It has a higher cost than the other configurations, but it is still less expensive than connecting all Hyper-V hosts with Fiber Channel.
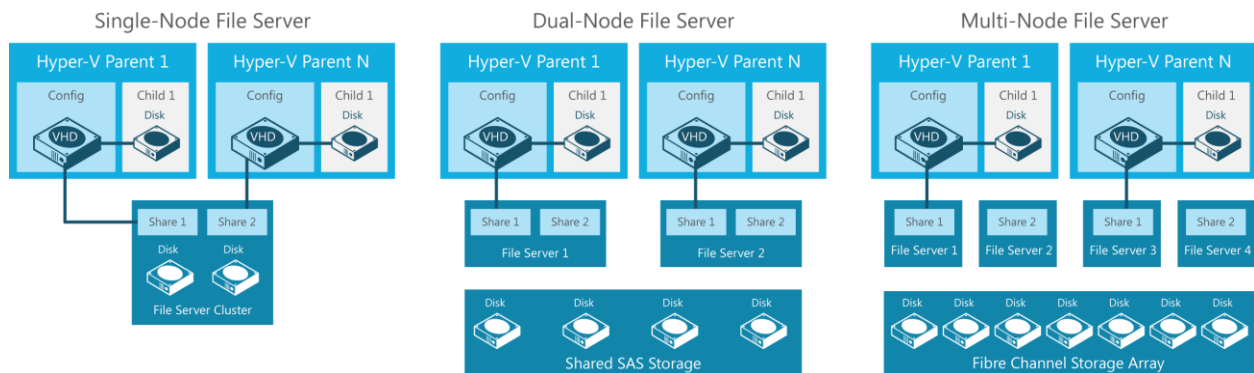
Figure 9. Three possible configurations for SMB file storage for Hyper-V.

Bottom line

Hyper-V gains flexibility, adaptability, and cost efficiency through the use of SMB remote file storage.

Hyper-V support for new virtual hard disk format

As enterprise workloads for virtual environments grow in size and in performance demands, virtual hard disk formats need to accommodate them. Hyper-V in Windows Server 2012 RC contains a new version of the VHD format, called VHDX, which is designed to handle current and future workloads.

VHDX has a much larger storage capacity than the older VHD format. It also provides data corruption protection during power failures and optimizes structural alignments of dynamic and differential disks to prevent performance degradation on new, large-sector physical disks.

Top benefits

The VHDX format introduced in Windows Server 2012 RC addresses the technological demands of evolving IT needs by increasing storage capacity, improving data protection, promoting quality performance on large-sector disks, and including additional performance-enhancing features.

Key features

The new VHDX format in Hyper-V includes the following features:

- Support for virtual hard disk storage capacity of up to 64 terabytes.
- Resistance against data corruption during power failures by logging updates to the VHDX metadata structures.
- Optimal structure alignment in a format that is well suited to large-sector disks.

The VHDX format also provides performance-enhancing features, including:

- Larger block sizes for dynamic and differential disks, which allows the disks to accommodate the needs of specific workloads.

- A 4-KB logical sector virtual disk that allows for increased performance when used by applications and workloads that are designed for 4-KB sectors.

- Metadata that is embedded by the user in the VHDX file.

Bottom line

The new VHDX format introduced in Hyper-V in Windows Server 2012 RC can handle current and future virtual workloads more effectively.

Connectivity to cloud services

Windows Server 2012 RC provides a more secure and reliable platform for connecting to cloud services by using a common identity and management framework for cross-premises connectivity, for federating identities, and for increasing data protection. The following Windows Server 2012 RC features support connectivity to cloud services.

Identity Federation with Active Directory Federation Services

Identity Federation with Active Directory Federation Services (AD FS) provides a common identity framework between on-premises and cloud environments. This feature includes the following extension of Active Directory identities:

- Easier access to cloud resources.

- Single sign-on functionality for on-premises and cloud-based activities.

- Support for open standards.

Top benefits

Identify Federation with AD FS helps users collaborate across organizational boundaries and easily access applications, whether they are on premises or in the cloud. It also helps maintain application security and provides the simplicity of single sign-on for users.

Key features

Identify Federation with AD FS provides an enterprise-scale provider for claims-based applications. Applications that use a claims-based identity model have several key features that are important to IT administrators, including:

- A single sign-on experience for users across multiple claims-aware applications.

- Access to claims-aware applications for users in other organizations.

- Reduced concerns that developers of custom applications will create processor-intensive authentication requests that could potentially—and unexpectedly—burden an organization's directory services.

You can configure AD FS in the Federation Service role so that web browser and web service applications can use federated web single sign-on across domains. This helps reduce administrative overhead, helps reduce security vulnerabilities as a result of lost or stolen passwords, and helps improve user productivity with a simplified sign-on procedure.

This feature also improves support for federation trusts, which can expedite the process of establishing the trusts. AD FS uses industry-standard metadata formats when it establishes trusts between federation partners, making it possible to add trusts quickly. It also makes certificate management easier between partners because AD FS automatically provides the appropriate certificates to the partner when it creates the trust.

Bottom line

Identify Federation with AD FS supports easier cross-organizational collaboration while helping to maintain security for applications that reside either on premises or in the cloud.

Cross-premises connectivity

Cross-premises connectivity makes it easier to connect on-premises servers with the cloud while delivering enhanced security for data. This feature is part of the Windows Server 2012 RC remote-access capabilities.

Top benefits

Cross-premises connectivity lets enterprises easily connect to private subnetworks in a hosted cloud network and provide connectivity between geographically separate enterprise locations. This, in turn, provides users with nearly seamless access to corporate resources whether they are on premises or in the cloud.

Key features

The cross-premises connectivity support in Windows Server 2012 RC includes virtual private network (VPN) site-to-site functionality, which provides cross-premises connectivity between organizations and hosting service providers. Windows 8 includes a single remote access server role that is divided into two components—DirectAccess with VPN and routing. These provide a simple way to set up remote access servers between local infrastructures and hosted services.

Enterprises can also connect to private subnetworks in a hosted cloud network and between geographically separate enterprise locations. By using a VPN site-to-site tunnel, the infrastructure is invisible. Whether the servers are local, at separate locations, or hosted in the cloud, users can access any resource as though they were on the same network.

Cross-premises functionality can be based on the industry standard Internet Key Exchange version 2–Internet Protocol security (IKEv2-IPsec) protocol, which enables organizations to use the network infrastructure they have today—such as IKEv2-IPsec-enabled routers—to create VPN site-to-site-tunnels directly from their local sites to hosted or geographic sites (Figure 10).
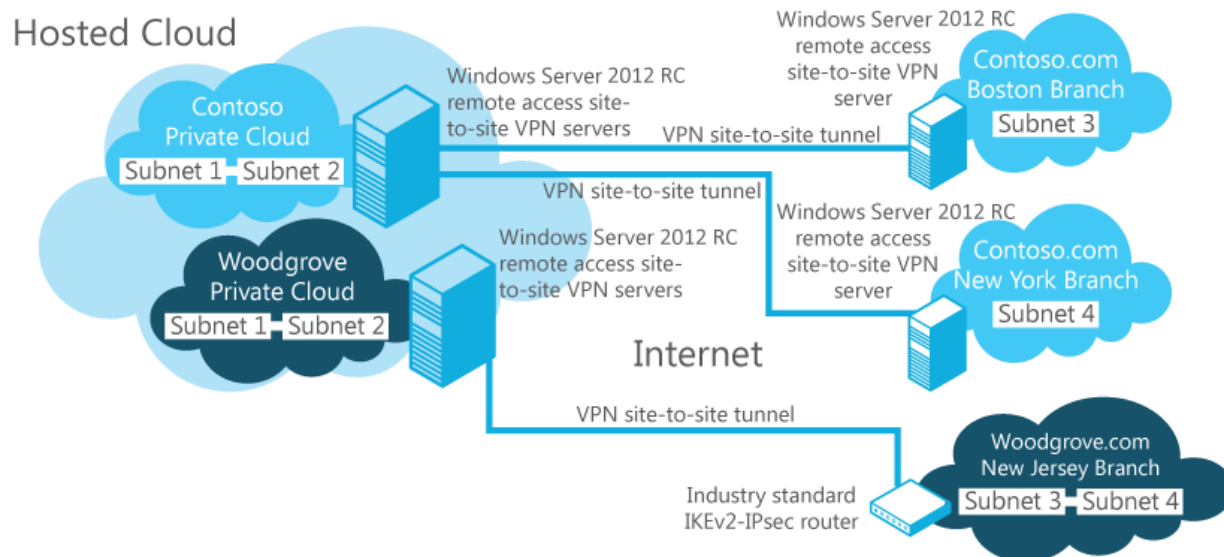
Figure 10. Cross-premises connectivity in Windows Server 2012 RC supports connections to private clouds using site-to-site VPNs.

Bottom line

Windows Server 2012 RC reduces your access costs by making traditional VPNs easier to configure, manage, and scale. You can optimize cloud deployment by using VPN site-to-site functionality to provide cross-premises connectivity. New features and tools give you greater flexibility and control over a variety of deployment scenarios while simplifying connectivity and troubleshooting.

Summary

Windows Server 2012 RC provides a rich set of new and enhanced features that help enterprise IT departments take advantage of virtualization to extend the power of cloud computing into new scenarios. Hyper-V in Windows Server 2012 RC supports a consistent, integrated approach that allows IT administrators to address core tasks. At the same time, they can explore new opportunities to benefit from applications and services that are deployed both in private and public clouds.

Windows Server 2012 RC virtualization technology supports a dynamic IT environment that adapts quickly to changing business needs and scenarios. The new and enhanced virtualization technologies provide new levels of power and scalability, putting their performance more on a par with traditional IT systems. Hyper-V provides the tools and supports processes that can increase automation and reduce the overall costs of an organization's infrastructure. It also supports the many different types of hybrid and cross-premises environments that serve business needs more effectively.

With Windows Server 2012 RC, organizations can transform core IT processes into IaaS. IaaS can, in turn, efficiently support shifting business demands through an entire spectrum of full-featured private and public cloud environments, cloud-based applications, and cloud-based productivity solutions. Through its built-in virtualization features, Windows Server 2012 RC can help shape the way IT departments serve their organizations for the foreseeable future.

The Power of Many Servers, the Simplicity of One

Companies of all sizes want to maximize IT operational and cost efficiency. Customers demand fast, reliable service that is available to them anytime from anywhere in the world. Windows Server 2012 RC is a cost-effective solution, integrating a high-availability, easy-to-manage multi-server platform with breakthrough efficiency and widespread automation. It introduces improvements that help IT professionals achieve the following high-level goals:

- **Continuous availability.** New and improved features offer cost-effective, high IT service uptime. These features are designed to endure failures without disrupting service to users.

- **Cost efficiency.** Windows Server 2012 RC uses commodity storage, networking, and server infrastructure and offers increased power efficiency for superior acquisition and operating economics.

- **Management efficiency.** Windows Server 2012 RC helps automate an even broader set of management tasks and simplifies deployment and virtualization of major workloads, which provides a path to full lights-out automation.

Most importantly, Windows Server 2012 RC helps you achieve these goals in single-server, multiserver, and multisite environments.

Advantages of Windows Server 2012 RC

Windows Server 2012 RC makes it as easy to manage many servers across multiple sites as it is to manage a single server—all while delivering the reliability and scalability of multiple servers with fewer additional costs. New advanced features and capabilities designed to improve availability, performance, and manageability give you the availability of many servers with the simplicity of one, regardless of the size of your environment.

On each server

At the individual server level, Windows Server 2012 RC helps you improve service level availability while it increases performance—all without forcing you to invest in specialized hardware or additional third-party applications.

With Windows Server 2012 RC on each server, you can:

- **Improve file system availability with online corruption repairs.** With improvements to Chkdsk, you can deploy large volumes with the confidence that they are now more available and resilient to downtime caused by potential file corruption.

- **Increase network availability, performance, and reliability with a built-in teaming solution.** Windows NIC Teaming works with network adapters from all vendors, helps spares you the problems that proprietary solutions

can cause, provides a common set of management tools for all adapter types, and is fully supported by Microsoft.

- **Be flexible when deploying servers.** You can now switch between Server Core and Full installation with no additional hardware or reinstallation.

- **Obtain greatly increased disk space availability through Features on Demand.** You can install a minimal set of features by using the Server Core installation option and then later install additional roles and features from a remote source as needed. This allows more efficient use of storage.

- **Move massive chunks of data, or even entire virtual machines, between storage devices quickly and efficiently without taxing server resources.** Offloaded Data Transfers (ODX) enables very rapid provisioning and migration of virtual machines. ODX also provides significantly faster transfers on large files, such as database or video files.

In a multiserver environment

The advanced technologies in Windows Server 2012 RC make servers more powerful and reliable than ever before, and also help maximize the functionality and efficiency of large server deployments. In a multiserver environment, you can:

- **Move virtual machine storage with no downtime.** Maintain maximized service level availability even while you are moving virtual machine storage between host servers.

- **Store server application data on inexpensive, easy-to-manage file shares.** Easily create and manage continuously available application storage for critical services such as SQL Server and Hyper-V. With new continuously available file server capabilities, you can obtain nearly the same benefits of continuous availability, optimal performance, and simple manageability that you would expect from a SAN.

- **Deploy and run VMware ESX virtual machines using Windows Server 2012 RC for NFS data stores.** Reliably store and run VMware ESX virtual infrastructures with Network File System (NFS) support on Windows Server 2012 RC while using advanced Windows continuous availability functionality.

- **Create iSCSI-based block storage easily and start virtual machines from it.** Take advantage of low-cost diskless Internet SCSI (iSCSI) boot services with on-the-fly storage provisioning capabilities that have traditionally been reserved only for high-end storage devices.

- **Provide storage solutions that allow you to choose between traditional SANs and built-in technology.** In-the-box technology uses iSCSI Target to provide scalability, performance, and reliability that are comparable to a SAN but much easier to manage.

- **Enjoy enhanced failover clustering.** Give your organization access to enhanced failover cluster services that are easy to manage yet provide faster failovers, increased scalability, and more flexibility than ever before.

- **Increase your cluster availability.** Reduce planned outages while greatly reducing management problems through new advanced technology that automatically updates cluster nodes with minimal noticeable downtime.

- **Vastly improve network availability.** Native DHCP services are continuously available, providing DHCP failover without clusters.

- **Efficiently deploy multiple servers and virtual machines faster than ever.** Deploy and manage servers locally and remotely through one single view.

- **Save time and increase efficiency by automating more management tasks than ever before.** A more robust and comprehensive Windows PowerShell offers increased consistency across cmdlets, and new cmdlets make using Windows PowerShell easier than ever.

Across multiple sites

Cutting-edge Windows Server 2012 RC features also focus on multisite management and environment recovery to make your services even more resilient to failures, not only on individual servers or clusters, but throughout your entire organization. These advancements can save your organization money by avoiding costly new hardware and additional third-party software investments. Windows Server 2012 RC gives you the power to:

- **Perform common storage management tasks from a single view** with a new unified Storage Space management console.

- **Deploy highly available and scalable storage solutions** that can help you save money by using existing investments in commodity storage.

- **Save even more money by maximizing your storage and data-access efficiency** through sophisticated deduplication functionality.

- **"Get thin and stay thin"** through new native support for thin provisioning (just-in-time [JIT] storage allocations) and trim (reclaiming storage that is no longer needed).

- **Save time by easily and quickly deploying AD DS,** which is easier to manage and more comprehensive than ever before, whether you are installing it on a single server or automatically deploying it on multiple servers in a hosted environment with new automation capabilities.

From a single server, multiple servers, and beyond, Windows Server 2012 RC delivers the availability of many servers with the simplicity of one. The following sections provide more details on these new features.

On each server

New and improved features in Windows Server 2012 RC provide cost-effective, higher IT service uptime and are designed to protect against additional failure scenarios. This helps prevent downtime and speed recovery.

Improved file system availability with online corruption repairs

If file system corruption occurs in earlier versions of Windows Server, the volume has to be taken offline. Its data is then unavailable while Chkdsk repairs the corruption. The time that Chkdsk takes to complete file system health analysis is proportional to the number of files on the volume. For very large volumes, dataset unavailability can be extensive. Unfortunately, transient errors (false positives) also lead to the same downtime because Chkdsk performs the analysis while the volume is offline.

Windows Server 2012 RC addresses this problem with a new file system "check-and-repair" approach that improves disk availability, especially for large volumes. Organizations no longer need to keep volumes small to protect data and reduce downtime (Figure 11).

CHKDSK-Runtime Improvements
Hours to Seconds

Time in minutes for CHKDSK to complete on a volume with one corruption
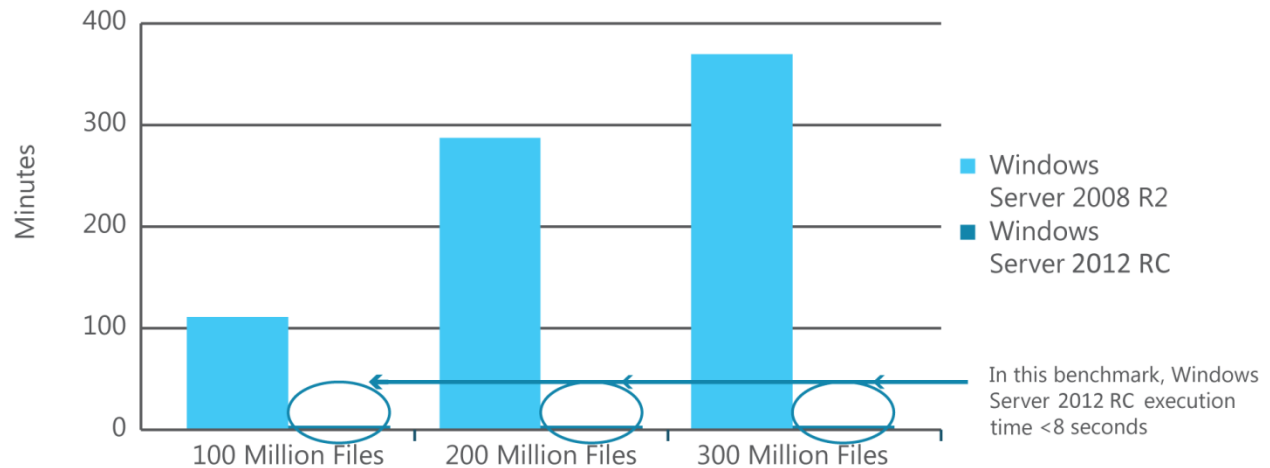
Figure 11. Chkdsk now takes only seconds to complete—even for very large volumes.

Top benefits

Windows Server 2012 RC has significantly enhanced file system scanning and repair functionality to deliver the following benefits:

- You can more confidently deploy very large volumes because corruption-related downtime is now proportional only to the number of corruptions on the volume, not the number of files in the volume.

- Windows Server 2012 RC actively monitors the health of the file system volume and provides current health information to the administrator.

- You experience minimal downtime for transient corruption events.

Key features

Windows Server 2012 RC improves file system availability and delivers a new model for managing file system corruption with the following features:

- **Improved self-healing.** NTFS quickly self-heals more issues online without requiring Chkdsk to run. This reduces Chkdsk execution frequency.

- **Online analysis.** With Windows Server 2012 RC, scanning and analyzing the volume is a background task that is performed while the volume remains online. Additional logic ensures that transient errors are eliminated. This helps prevent unnecessary subsequent downtime.

- **Corruption correction.** After the completion of an online scan, a determination is made whether the volume must be taken offline to complete the repair. If taking the volume offline becomes necessary, the administrator receives appropriate notification via events and through the management console. For system volumes, the administrator can schedule a restart when it is convenient. Because the analysis phase has already completed, no additional scanning or detection is required while the volume is offline. Chkdsk directly fixes the previously identified corruption, and the offline time is reduced to seconds. Consequently, volume unavailability is no longer proportional to the number of files on the volume, but rather to the number of corruptions on the volume.

Bottom line

Windows Server 2012 RC eliminates the need to take disks offline to run Chkdsk, because disk corruption is detected and repaired online.

Windows NIC Teaming

Providing fault tolerance on network adapters previously required third-party hardware and software. In Windows Server 2012 RC, NIC Teaming is offered as a built-in feature. Windows NIC Teaming lets multiple network interfaces work together as a team, preventing connectivity loss if one network adapter fails (Figure 12). NIC Teaming can allow a server to tolerate network adapter and port failure up to the first switch segment.

NIC = network adapter

tNIC = teamed network adapter
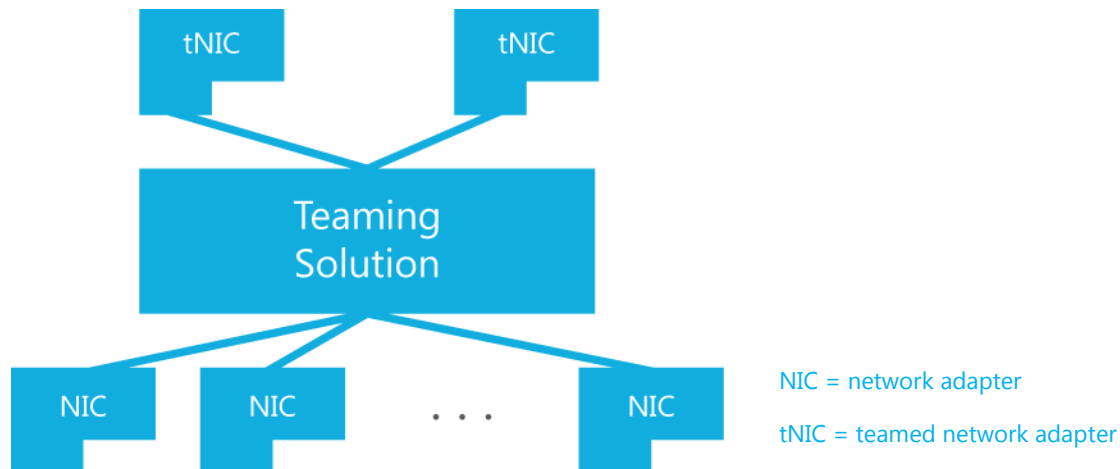
Figure 12. NIC Teaming provides fault tolerance on network adapters.

This feature is a built-in teaming solution that works with all network adapter vendors, spares an organization from most of the problems that proprietary solutions could cause, provides a common set of management tools for all adapter types, and is fully supported by Microsoft.

Top benefits

Windows Server 2012 RC provides built-in NIC Teaming, which means that organizations receive full support for their configuration from Microsoft, regardless of the network adapter vendor they use.

Key features

To team network adapters, one or more physical network adapters connect to the teaming solution's multiplexing unit and present one or more virtual adapters to the operating system. Several different algorithms distribute inbound and outbound traffic between the network adapters.

Features of NIC Teaming in Windows Server 2012 RC include:

- **Divides traffic by VLAN.** Like other commercial implementations of teaming, Windows Server 2012 RC can divide traffic by virtual LAN (VLAN) so that applications can connect to different VLANs simultaneously.

- **Works within virtual machines.** A major innovation in Windows Server 2012 RC is that the NIC Teaming feature also works within a virtual machine. This allows a virtual machine to have virtual network adapters connected to more than one Hyper-V switch and still maintain connectivity even if the network adapter under that switch becomes disconnected.

- **Is managed with Windows PowerShell and through Server Manager.** NIC Teaming is managed with Windows PowerShell and through the NIC Teaming Server Manager configuration UI for a large group of both physical and virtual servers.

Bottom line

NIC Teaming in Windows Server 2012 RC gives organizations the benefit of network fault tolerance without the need for a third-party teaming solution.

Server Core and Full installation integration

Windows Server 2012 RC allows for an easy conversion between Server Core installation and Full installation. With Windows Server 2012 RC, the Server Core and Full installations are built from a common subsystem, so you can switch between them by simply installing or uninstalling features as needed.
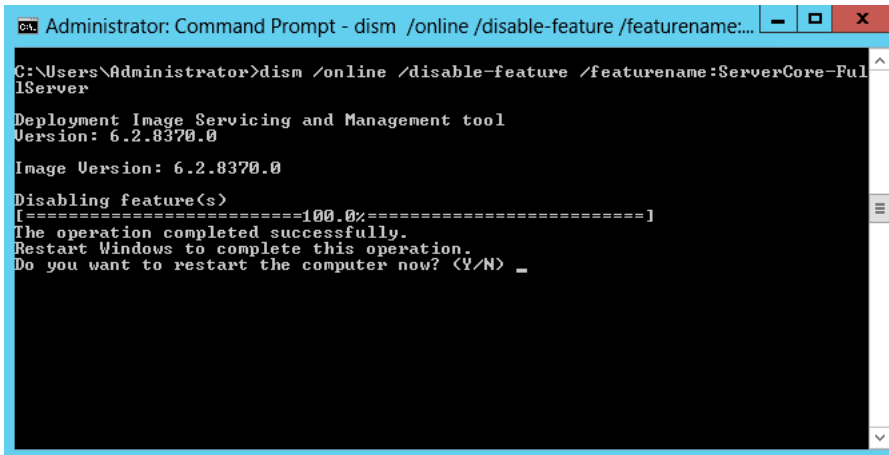
Top benefits

This capability delivers several benefits in several common IT scenarios, including:

- Reduce the server footprint without reprovisioning all servers.

- Use a Full installation to make changes or troubleshoot issues that cannot be done using the remote GUI tool in the Server Core installation, and then convert the servers back to the Server Core installation.

- Use the GUI for all initial configuration steps to make the initial configuration experience easier, while maintaining the footprint reduction and servicing advantages that a Server Core installation provides.

- Use Full installation for a business that requires a single server operating system image, and therefore cannot use a Server Core installation because it requires two images. Windows Server 2012 RC Server Core and Full installations use the same foundation, so you can have a single server operating system image, easily deploy Full installations of Windows Server 2012 RC, and then convert to a Server Core installation to gain the footprint reduction and servicing advantages that it offers.

Key features

The ability to switch between the Server Core and a Full installation is now available in Windows Server 2012 RC because the Deployment Image Servicing and Management (DISM) utility treats Server Core, ServerCore-FullServer, and Server-Gui-Shell as sets of features that can be enabled or disabled as needed (Figure 13).

Figure 13. The DISM command line tool can change from a Full installation to a Server Core installation.

Bottom line

With Windows Server 2012 RC, you can switch between Server Core installation and Full installation, or uninstall just the shell to run local GUI tools on the minimal server interface.

Features on Demand

When you use the Server Core installation option, you can install a small set of features and then later install more roles and features from a remote source as needed. This greatly increases available disk space by storing the binaries associated with optional features on a remote repository instead of your local disk, dedicated operating system partition, or virtual machine image.

Top benefits

Features on Demand allows you to get the most out of your existing disk space, whether it is physical storage or virtual machine images, by installing only the roles and features that you need.

Key features

The Features on Demand functionality is used for the following two installation options offered during Windows Server 2012 RC setup:

- **Windows Server Developer Preview (Features on Demand).** This is a full installation of Windows Server 2012 RC, but with the binaries removed for all server roles and features that are not installed by default.

- **Windows Server Developer Preview (Server Core).** This is the equivalent of a Windows Server 2008 R2 Server Core installation, with all Server Core roles and features available for installation from the local disk. However, the

binaries for the server roles and features have been removed to maintain a smaller Server Core footprint on the disk.

There is a third installation option—the Windows Server Developer Preview (Full installation)—that is the equivalent of a Windows Server 2008 R2 Full installation, in which all server role and feature binaries are stored on the local disk.

Bottom line

With Features on Demand, you can reduce system disk usage by installing just the features you want just when you need them.

Rapid and efficient data movement using intelligent storage arrays

Windows Server 2012 RC maximizes an enterprise's investment in intelligent storage arrays by making it easier to move data within and between storage devices. This is done with ODX, which promotes rapid provisioning and migration of virtual machines. ODX also provides significantly faster transfers on large files, such as database or video files.

Top benefits

With ODX, the performance of data transfers is limited only by the capacity of the ODX-capable intelligent storage array or fabric instead of the availability network throughput or server usage. Host-based data transfer loads are removed from the data center's servers and network, which improves the data center's overall capacity and scale. Additionally, enabling ODX does not require special work by administrators or users. Transfers are automatically offloaded when files are moved as part of normal operations, assuming that the storage array supports this capability (Figure 14).
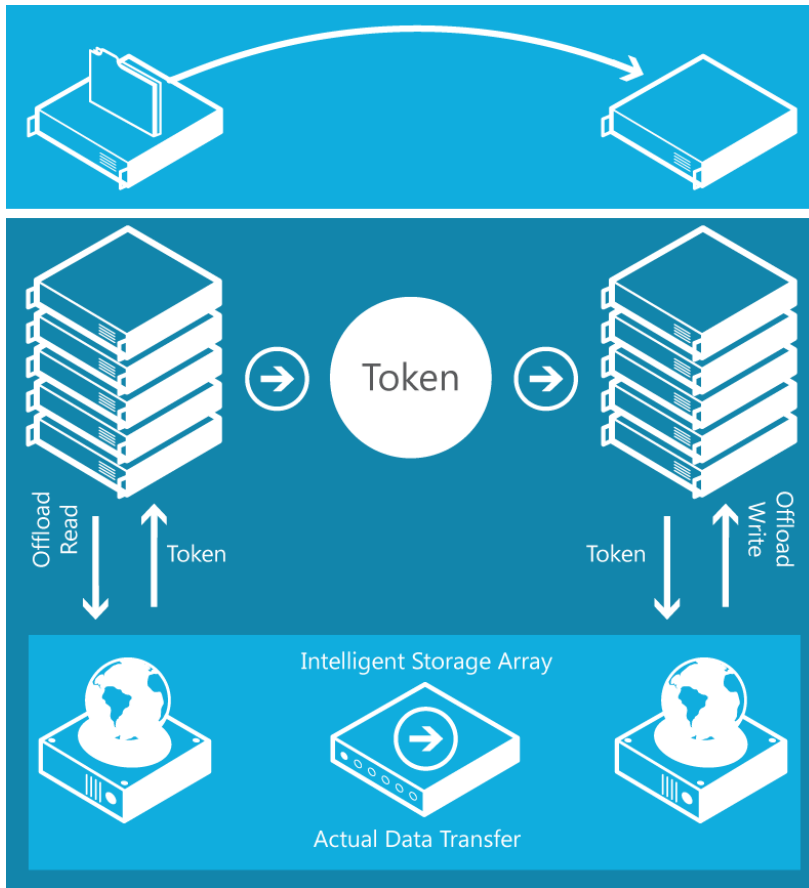
Figure 14. Windows Server automatically translates a file copy transfer request into an ODX if this capability is supported by the storage array.

Key features

By offloading the file transfer to the storage array, ODX reduces latencies, optimizes throughput, and reduces the drain on host resources, such as CPU and network consumption. File transfers offload transparently and automatically when you move or copy files, regardless of whether you simply perform drag-and-drop through Windows Explorer or use command-line file copy commands. No administrator setup or intervention is needed.

Bottom line

ODX gets more speed and efficiency out of existing hardware by giving you the ability to rapidly move large files and virtual machines directly between storage arrays while eliminating host CPU and network resource consumption.

In a multiserver environment

Move virtual machine storage with no downtime

Updating the physical storage available to Hyper-V is the most common reason for moving a virtual machine's storage. In Windows Server 2008 R2, administrators could move a running instance of a virtual machine by using live migration, but could not move the virtual machine's storage while the virtual machine was running.

Hyper-V in Windows Server 2012 RC addresses this issue with new support for moving virtual machine storage while the virtual machine is running, with no downtime. Administrators can also add physical storage, either as a stand-alone system or to a Hyper-V cluster, and then move the virtual machine's virtual hard disks to the new physical storage while the virtual machine continues to run.

Top benefits

This new feature in Hyper-V allows administrators to move the virtual hard disks of a virtual machine while those virtual hard disks remain available for use by the running virtual machine.

Key features

With Hyper-V in Windows Server 2012 RC, you now have the ability to move a virtual machine's storage while the virtual machine is running, with no downtime. The process works like this:

1. Disk reads and writes go to the source virtual hard disk at the beginning of the move operation (Figure 15).

2. While reads and writes occur on the source virtual hard disk, the disk contents are copied to the new destination virtual hard disk.

3. After the initial disk copy is complete, disk writes are mirrored to both the source and destination virtual hard disks while outstanding disk changes are replicated.

4. After the source and destination virtual hard disks are fully synchronized, the virtual machine switches over to using the destination virtual hard disk.

5. Finally, the source virtual hard disk is deleted.

Computer Running Hyper-V

Virtual Machine

1

3 VHD Stack

2

Source Device

Destination Device

5

4

VHD

VHD
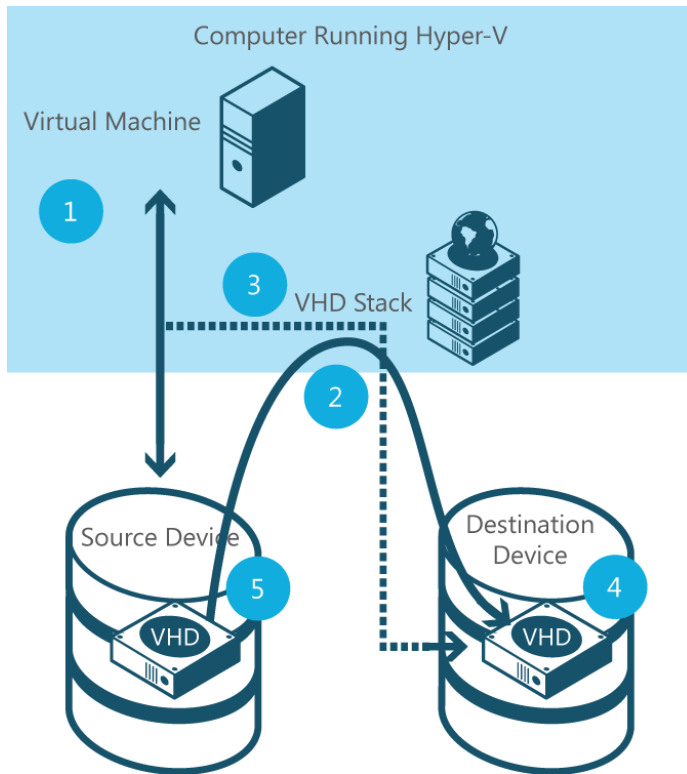
VHD = virtual hard disk

Figure 15. Moving a virtual hard disk attached to a running virtual machine.

Bottom line

Hyper-V in Windows Server 2012 RC supports the movement of a virtual machine's storage while the virtual machine is running.

High-performance, continuously available file share storage for server applications

SANs provide excellent storage performance and make continuous availability possible for your server applications—but they can be expensive to acquire and difficult to operate. Windows Server 2012 RC introduces new file server features that let you store server application data on file shares and obtain a level of reliability, availability, manageability, and high performance that is similar to what you would expect from a SAN.

Top benefits

Windows Server 2012 RC provides new features that greatly enhance the reliability, availability, manageability, and performance of file servers. The new features are easy to use, and no specialized storage network infrastructure is needed.

Key features

These new file server features are part of the improvements to SMB in Windows Server 2012 RC. They include transparent failover, networking improvements for greater bandwidth and resiliency, support for network adapters with Remote Direct Memory Access (RDMA) capability, specific performance optimizations, and support for Windows PowerShell commands.

Bottom line

With Windows Server 2012 RC, you can store application data on inexpensive, easy-to-manage file shares and obtain nearly the same benefits of continuous availability, high performance, and manageability that you would expect from a SAN.

Deploy and run VMware ESX virtual machines with Server for NFS data stores

File-based storage can be a viable alternative to more expensive SAN storage because it is less complicated to provision and manage. Examples of this trend include scenarios in which VMware ESX/ESXi virtual machines are deployed and run from file-based storage accessed over the NFS protocol. Server for NFS in Windows Server 2012 RC has been updated to support continuous availability, making it possible to more reliably store and run VMware ESX virtual machines on a server running Windows Server 2012 RC by using the NFS file-sharing protocol (Figure 16).

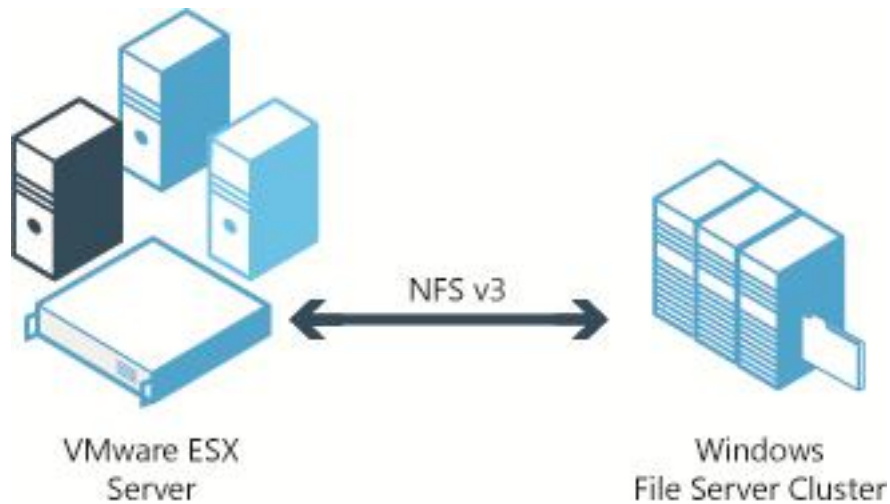Figure 16. More reliably store and run VMware ESX virtual machines on a server running Windows Server 2012 RC with NFS data stores.

Top benefits

On a failover cluster, Server for NFS fails over quickly and reduces the chance for the running virtual machine workload to experience outages, which makes it easier to deploy NFS shares as a more reliable file-based storage system for VMware ESX hypervisor hosts.

Key features

Improvements in Windows Server 2012 RC to both Server for NFS and failover clustering make it possible to run continuously available VMware ESX virtual machines on NFS shares. The failover clustering infrastructure has been enhanced to support faster failovers of the disk and network resources. In Windows Server 2012 RC, both Server for NFS and Client for NFS have been ported to run on top of a new, high-performance runtime infrastructure. Additionally, the failover cluster resource dynamic-link library (DLL) has been rewritten in Windows Server 2012 RC, with the result that Server for NFS can now fail over much faster than in earlier versions of Windows Server.

Bottom line

With Server for NFS in Windows Server 2012 RC, you can now create NFS shares for VMware ESX virtual machines with the option of clustering.

Diskless network startup with iSCSI Target

Windows Server 2012 RC now includes an iSCSI Target as part of the File Server role. With iSCSI, a local initiator (sometimes called a client) takes commands or requests that the operating system would make to a local hard disk, and sends them over the network to a storage array or other target. This feature allows block-based access to storage from an iSCSI initiator over the network. In Windows Server 2012 RC, you can start a server from storage located over the network on the iSCSI Target.

Top benefits

With iSCSI Target in Windows Server 2012 RC, you can create a SAN storage device without purchasing additional hardware or software. This feature also supports diskless network startup for Windows Server 2012 RC, with the operating system stored over the network on the iSCSI Target. This centralized storage of boot disks can improve storage efficiency, manageability, and availability.

Key features

iSCSI Target in Windows Server 2012 RC supports diskless network startup without the need for special hardware or additional software. A key component of this feature is that it supports differencing virtual hard disks. This is critical in the startup scenario because multiple servers running Windows Server 2012 RC can start by using one base image. Each server reads from the same base image, but writes to a differencing virtual hard disk.

In Windows Server 2012 RC, the scale of iSCSI boot has increased to 256. Therefore, the clustered target can support 256 startup clients and experience fewer operating system errors with iSCSI Target service failover from one clustered node to another.

Bottom line

You can now create iSCSI-based block storage easily with iSCSI Target and then use this storage to start virtual machines.

Continuously available block storage with iSCSI Target

iSCSI Target functionality in Windows Server 2012 RC goes beyond the usual initiator and target installation. You can install and configure the iSCSI Target on two or more physical machines or virtual machines and then create a failover cluster. The combination of the iSCSI Target functionality and failover clustering helps deliver continuous availability.

Top benefits

iSCSI Target can provide SAN storage for any server, and is a built-in service to the File Server role in Windows Server 2012 RC, supporting IT tasks such as enabling virtual machine guest clustering.

Key features

iSCSI Target is a feature under the File Server role in Windows Server 2012 RC. The iSCSI initiator, which has been part of Windows Server for several releases, provides a way to enable an iSCSI initiator and to connect to the target. In Windows Server 2012 RC, iSCSI Target has changed the cluster resource model in the clustering configuration, which improves the scalability so that more initiators can connect to the targets and to support workloads with less than 60 seconds of reduced performance during failover.

Bottom line

The use of block storage and failover clustering provide continuous availability and reduced application errors during planned—and unplanned—failover of the iSCSI Target, all without SAN hardware.

Failover clustering

Failover clustering provides high availability and scalability that can be applied to many different workloads. The enhanced failover clustering capability in Windows Server 2012 RC now supports up to 4,000 virtual machines and up to 64 nodes. Also, improvements in the Failover Cluster Manager snap-in make it easier to manage high availability services in a large network.

Top benefits

The improvements to failover clustering in Windows Server 2012 RC support more integrated features for Hyper-V virtual machines. There is higher performance and support for more workload scenarios, such as using File Server for scale-out application data, with failover clusters providing a core infrastructure for private clouds.

Key features

Enhancements to failover clustering include:

- Support for up to 4,000 virtual machines, which can be managed more easily with an improved Failover Cluster Manager snap-in (Figure 17).

- Support for up to 64 nodes in a single failover cluster. There are also improvements in the validation and migration wizards that make it easier to set up failover clustering.

- Improved failover clustering for file servers that support database applications such as SQL Server.

- Multisite failover clusters that can be used for data recovery. Multisite clusters can now use more flexible quorum options.
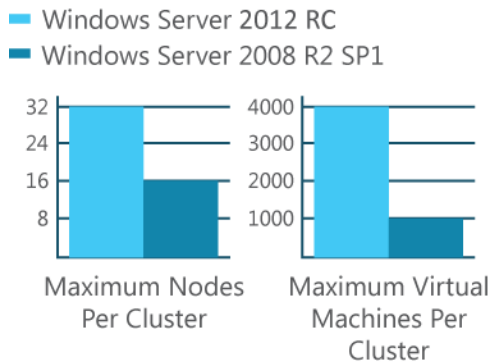
Figure 17. Enhanced failover clustering support for Hyper-V in Windows Server 2012 RC.

Bottom line

The enhanced failover clustering in Windows Server 2012 RC provides increased scalability, easier management, faster failover, and more flexible architectures.

Cluster-Aware Updating

Cluster-Aware Updating (CAU) supports the automatic updating of clustered servers with little or no loss in availability during the update process. CAU works as follows:

1. Transparently takes one node of the cluster offline.

2. Installs the updates.

3. Performs a restart if needed.

4. Brings the node back online.

5. Moves on to the next node.

This feature, which is part of the Windows update management infrastructure, can be further extended and automated with Windows PowerShell for integration into larger IT automation initiatives.

Top benefits

With CAU, administrators can update a failover cluster in an automated way (with the Cluster-Aware Updating Wizard; Figure 18) that maintains high levels of service availability with fewer interruptions to users.
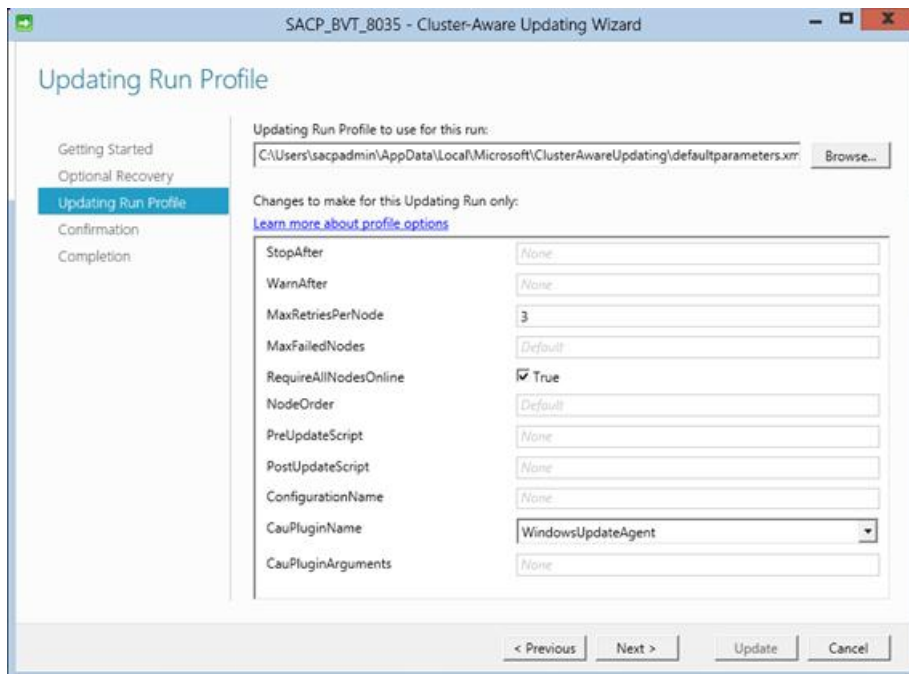
Figure 18. The Cluster-Aware Updating Wizard guides you through the process of applying updates to your cluster.

Key features

The automated CAU process works nearly seamlessly with existing Windows Update Agent (WUA) and Windows Server Update Services (WSUS) functions. CAU also comes with an extensible architecture that supports new plug-in development to orchestrate many node-updating tools—such as custom software installers, BIOS updating tools, and network adapter/HBA firmware updating tools—across cluster nodes in a cluster-aware manner.

Bottom line

Cluster-Aware Updating makes it easy to install updates to cluster nodes while maintaining high availability.

DHCP Server Failover

Windows Server 2012 RC supports the DHCP Failover protocol, which can be used by the DHCP Server Failover feature to allow two DHCP servers to synchronize lease information almost instantaneously and provide continuous availability of DHCP service. If one of the servers becomes unavailable, the other server assumes responsibility for servicing clients for the same subnetwork. You can also now configure failover with load balancing, which distributes client requests between the two DHCP servers.

Top benefits

For IT administrators seeking to ensure round-the-clock availability of core network services, the DHCP Server Failover feature allows easy deployment of a highly available DHCP service with minimal capital expenditure and low maintenance overhead (Figure 19).
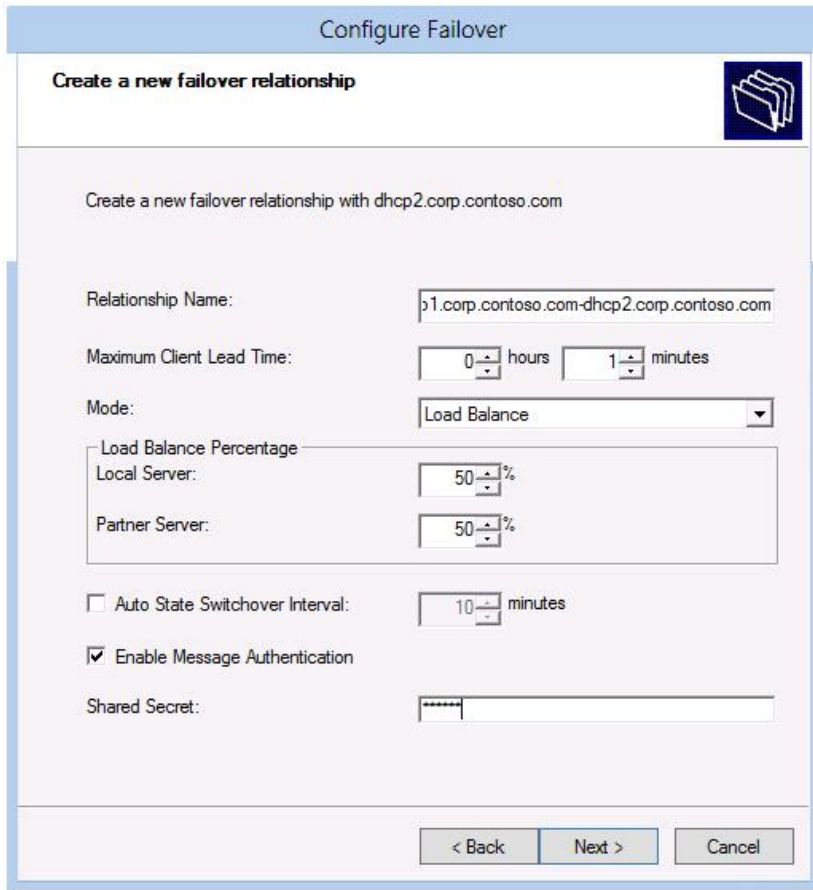
Figure 19. Use Configure Failover to create a new failover relationship with a DHCP server.

Key features

Administrators can deploy DHCP servers running Windows Server 2012 RC as failover partners in either load-sharing mode or hot standby mode. In load-sharing mode, which is the default mode, the two servers simultaneously serve IP addresses and options to clients on a particular subnet. In the hot standby mode, two servers operate in a failover relationship in which an active server leases IP addresses and configuration information to all clients in a scope or subnet.

Bottom line

With DHCP Server Failover, you can deploy continuously available DHCP services without clusters.

Multiserver management and feature deployment with Server Manager

Managing all the servers on a network is difficult without a central, integrated tool. Windows Server 2012 RC provides an enhanced Server Manager for managing multiple servers and performing tasks such as deploying roles and features remotely to both physical and virtual servers, provisioning servers and offline virtual hard disks, and creating custom server groups (Figure 20). You can also use Server Manager in Windows Server 2012 RC to provision servers and offline virtual hard disks from your desktop without requiring either physical access to the system or Remote

Desktop Protocol (RDP) connections to each server. Additionally, you can deploy roles and features to virtual hard disks even when they are offline.
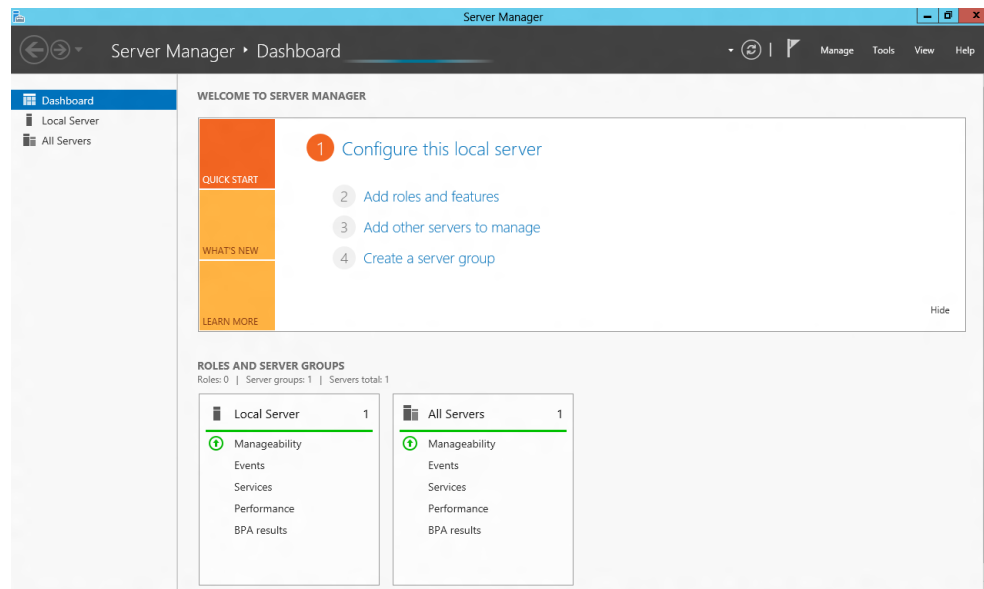
Figure 20. The enhanced Server Manager Dashboard makes deploying and managing multiple servers and virtual machines easier.

Top benefits

The new and enhanced features in Server Manager help administrators simplify the processes of configuring new servers, deploying roles and features to Windows Server and offline virtual hard disks, and managing multiple-server environments.

Key features

New and enhanced capabilities of Windows Server 2012 RC Server Manager include:

- **Resilient remote deployment.** The Add Roles and Features Wizard in Server Manager is implemented by using new WMI providers that allow remote deployment and configuration.

- **Streamlined server configuration and deployment.** Server Manager includes configuration functionality previously provided by the Initial Configuration Tasks window.

- **Server Manager multiserver experience.** Server Manager uses Windows PowerShell remote management and workflow capabilities to provide resilient multicomputer management, generating status views for multiple servers after polling servers for operational statistics.

- **Integration with other management tools.** New, modern, role-specific tools—such as File Storage Management, Remote Desktop Services (RDS), and IP Address Management—are integrated into the Server Manager console, which is the launch point for server management tools.

- **File storage management.** Management of files moves from a single-server, single-service management model to one in which multiple, individual file servers or multiple failover clusters that are running the File Services role can be managed remotely through a single management application.

- **Remote Desktop Services.** RDS provides session virtualization and VDI technologies so that users can access session and virtual desktop collections. New management features of Server Manager simplify how RDS is deployed and managed in multiserver configurations.

- **IP address management.** The IP Address Manager (IPAM), which is used for managing IP address space and associated infrastructure roles, supports automated discovery of addressing and naming servers. This feature also provides a unified experience for tracking use trends and managing dynamic, static, and virtual IPv4 and IPv6 address space.

Bottom line

Windows Server 2012 RC includes a modern Server Manager with a clean, role-centric dashboard that helps you understand, at a glance, the state of your servers.

Windows PowerShell 3.0 in Windows Server 2012 RC

Windows PowerShell 3.0 provides a comprehensive management platform for all aspects of the data center: servers, network, and storage. In this newest version of Windows PowerShell, sessions to remote servers are more resilient and can withstand various types of interruptions. Learning Windows PowerShell is easier because of simplified, consistent syntax that resembles natural language. Windows PowerShell 3.0 offers hundreds of improvements, including:

- New SMB modules that make it easy for organizations to manage network shares.

- Cmdlets to help organizations manage the new NIC Teaming feature from the command line.

- More than 140 built-in Hyper-V cmdlets.

These Windows PowerShell commands are comprehensive, support the tasks required at a data center, and are easier for IT pros to learn. IT pros can use the new features to automate basic and complex data center tasks with ease.

Top benefits

Windows Server 2012 RC includes enhancements to Windows PowerShell that increase both its ease of use and its power in managing a data center. Windows Server 2012 RC also provides Windows PowerShell cmdlets and WMI objects to manage shares and set share permissions, and includes cmdlets to help you manage NIC Teaming and automate Hyper-V tasks.

Key features

Windows PowerShell 3.0 includes many new features and capabilities:

- **Resilient, simple automation.** Windows PowerShell 3.0 provides a platform for robust, multimachine automation for all elements of a data center, including servers, Windows operating systems, storage, and networking. New features introduced to Windows PowerShell in Windows Server 2012 RC make automation simpler and more resilient than previous versions.

- **Workflow writing.** Windows PowerShell 3.0 lets you write workflows—long-running task sequences. Workflows can run activities (in sequence or in parallel) to perform complex, larger management tasks, such as multimachine application provisioning. The use of Windows Workflow Foundation at the command line helps ensure that Windows PowerShell workflows are repeatable, parallelizable, interruptible, and recoverable.

- **Robust sessions and handling failures.** With the new release of Windows PowerShell, sessions can automatically recover from network failures and interruptions. The Robust Sessions feature stores Windows PowerShell sessions on the remote (server-side) computer, so that users can search and reconnect to sessions at a later time, even from another computer.

- **Job scheduling.** Windows PowerShell lets you schedule jobs that run regularly or according to a particular schedule. The Windows Task Scheduler is used to schedule and start the job, and a per-user job repository is used to store job output so that it is available later in any Windows PowerShell session on the computer.

- **RunAs capability.** Windows PowerShell includes commands that can be executed with delegated credentials, so that users with limited permissions can run critical jobs. Credentials are stored in the WS-Management provider.

- **Syntax simplification.** Windows PowerShell now uses a simplified language syntax that makes commands and scripts look less like code and more like natural language. You can construct commands without using script block, braces, the current object automatic variable ($), or dot operators to get properties and methods—the "punctuation" that frequently challenged beginning users is no longer required.

- **Cmdlet discovery: Get-Command and module auto-loading.** Windows PowerShell features improved cmdlet discovery and automatic module loading that make it easier to find and run any of the more than two thousand new high-level-task-oriented cmdlets that manage all elements of a data center. The Get-Command has been updated to find all cmdlets that are installed on the system. You can use the cmdlets immediately because modules are imported automatically on first use.

- **New Windows PowerShell ISE features.** Windows PowerShell Integrated Scripting Environment (ISE) 3.0 includes many new features to ease beginning users into Windows PowerShell and provide advanced editing support for scripters. For example, Show-Command helps you find the right cmdlet, view its parameter options in a dialog box, and run it.

- **Updatable help.** New Update-Help and Save-Help cmdlets download and install the newest help files for each module. The cmdlets find the help files on the Internet, determine whether they are newer than local files, unpack them, and install them in the correct location. The updated files are ready for immediate use in Get-Help—there is no need to restart Windows PowerShell. For large enterprises and users behind Internet firewalls, the Save-Help cmdlet downloads help files to a file system location, such as a file share. The Update-Help cmdlet can download help files from the file share, just as it does for Internet locations.

- **New SMB modules for Windows PowerShell.** New SMB modules for Windows PowerShell in Windows Server 2012 RC make it simple to manage network shares. Organizations must load a specific module to obtain the SMB cmdlets, which include SmbShare cmdlets and SmbShareAccess cmdlets.

- **Commands to manage NIC Teaming.** Windows Server 2012 RC includes Windows PowerShell cmdlets to help you manage the new NIC Teaming feature right from the command line. These include NetLbfoTeam cmdlets, NetLbfoTeamMember cmdlets, and NetLbfoTeamNic cmdlets.

- **Automation support for Hyper-V.** Windows Server 2012 RC introduces over 140 Windows PowerShell cmdlets to manage Hyper-V. These cmdlets can help simplify and automate the management of virtual machines in the

data center. IT pros can use the cmdlets to perform all the available tasks in the GUI of Hyper-V Manager. You can also perform several tasks exclusively through the cmdlets in Windows PowerShell. Features of the new cmdlets include:

- **Task-oriented interface.** Hyper-V cmdlets are designed so that it is easy for IT pros to go from thinking about a task to actually performing it. For example, to get a list of all virtual machines, the PowerShell command is simply Get-VM.

- **Use of standard cmdlet verbs.** Hyper-V cmdlets make it easier for IT pros to extend their existing knowledge of Windows PowerShell because they use the same verbs as other Windows cmdlets. For example, the cmdlet for performing the "get" task on a service is Get-Service, and the Hyper-V cmdlet for performing the same task on a virtual machine is Get-VM.

- **Consistent cmdlet nouns to simplify discoverability.** All cmdlets in the Hyper-V module use one of three noun prefixes: VM, VHD, and VFD. This makes it easy for IT pros to discover the cmdlets they need.

Bottom line

With Windows PowerShell 3.0, you can establish resilient command-line sessions to remote servers and use simple, easy-to-learn syntax to manage many aspects of the data center. In addition, you can use Windows PowerShell cmdlets to automate Hyper-V tasks and to manage network shares and NIC Teaming.

Across multiple sites

Windows Server 2012 RC delivers significant management efficiency with broader automation of common management tasks and a path toward full lights-out automation.

Storage Spaces

Windows Server 2012 RC provides Storage Spaces, an enhanced feature set that offers sophisticated storage capabilities that allow customers to use industry-standard storage technologies for both single-node and scalable multinode deployments.

Top benefits

Storage Spaces addresses a long-standing need for more cost-effective, continuously available, reliable, and scalable storage. Customers who deploy Storage Spaces benefit not only from a rich set of features that support a breadth of scenarios, but also from a substantial reduction in costs associated with purchasing and operating more flexible, simply managed, and fully capable storage solutions.

Key features

Storage Spaces includes the following features:

- **Storage pools.** These are the fundamental building blocks for Storage Spaces. IT administrators have the flexibility to create storage pools based on the needs of a deployment. For example, given a set of physical disks,

an administrator can create either one pool (by using all available physical disks) or multiple pools (by dividing the physical disks as required).

- **Multitenancy.** Administration of storage pools can be controlled through access control lists (ACLs) and delegated on a per-pool basis, thereby supporting hosting scenarios that require tenant isolation.

- **Resilient storage.** Storage Spaces supports two optional resiliency modes: mirroring and parity. This resiliency enables lights-out high service availability in the event of storage component failures.

- **Continuous availability.** Storage Spaces is fully integrated with failover clustering to deliver continuously available service deployments.

- **Optimal storage use.** Storage Spaces supports thin provisioning to allow businesses to easily share storage capacity among multiple unrelated datasets and thereby maximize capacity use.

Bottom line

You can deploy highly available and scalable storage infrastructure at a significantly lower cost by using Storage Spaces.

Data deduplication

The amount of file-based data in almost every enterprise is increasing at a tremendous rate. Although storage costs have been steadily dropping, this drop has not been fast enough to offset the growth in the amount of data, making storage efficiency a critical requirement for most enterprise IT departments.

Data deduplication, a technique that involves finding and removing duplication within data without compromising its fidelity or integrity, can lead to significant efficiencies in the use of storage capacity. Windows Server 2012 RC includes data deduplication as a standard feature at no extra cost.

Top benefits

Windows Server 2012 RC data deduplication lets an enterprise store more data in less physical space. It is highly scalable, resource efficient, and nonintrusive, and it can run on many large volumes of primary data at the same time without affecting other server workloads. With the constant growth in data and its impact on storage and infrastructure budgets, data deduplication in Windows Server 2012 RC can provide a clear, measurable return on investment.

Key features

Windows Server 2012 RC delivers enhanced data deduplication with the following capabilities:

- **Capacity optimization.** Deduplication lets Windows Server 2012 RC store more data in less physical space and achieve significantly higher storage efficiency than was possible with single-instance storage or NTFS compression. Deduplication uses variable-size chunking and compression, which delivers optimization at a ratio of 2:1 for general file servers and up to 20:1 for certain virtualization data.

- **Scale and performance.** Windows Server 2012 RC deduplication is highly scalable, resource efficient, and nonintrusive. It can run on dozens of volumes of primary data at once without affecting other workloads on the

server. This low impact on the server workloads is maintained by Internet Information Services (IIS) CPU Throttling, which reduces memory resources consumed. In addition, power users have flexibility—they can set times when deduplication should run, define the resources available for deduplication, or set policies to deduplicate only older files.

- **Reliability and data integrity.** When deduplication is applied on data, the copy of the data that is retained must not be corrupted. Windows Server 2012 RC uses checksum, consistency, and identity validation to improve data integrity. In addition, for all metadata and for the most frequently referenced data, Windows Server 2012 RC deduplication maintains redundancy to aid recoverability in case of corruption.

- **Bandwidth efficiency in conjunction with BranchCache**. Through integration with BranchCache, the same optimization techniques are applied to data transferred over the WAN to a branch office, resulting in faster file download times and reduced bandwidth consumption.

Bottom line

Data deduplication lets you store and access data more efficiently.

Optimal storage use: support for thin provisioning and trim

Sophisticated storage solutions offer both JIT allocations (thin provisioning) and the ability to reclaim storage that is no longer needed (trim). Windows Server 2012 RC integrates with these sophisticated storage solutions and lets an enterprise get the most out of their storage infrastructure.

Top benefits

To confidently deploy sophisticated storage solutions that support JIT allocation, an enterprise needs to know that it can provision the additional capacity. Windows Server 2012 RC identifies thinly provisioned virtual disks, provides standardized notifications when use thresholds are crossed, and provides platform-enabling applications that give up storage when it is no longer needed, promoting optimal use of storage capacity.

Key features

Windows Server 2012 RC includes the following capabilities to support thin provisioning and trim:

- **Identification.** Windows Server 2012 RC uses a standardized method to detect and identify thinly provisioned virtual disks, enabling additional capabilities delivered by both the Windows storage stack and storage management applications.

- **Notification.** When configured physical storage use thresholds are reached, Windows Server 2012 RC notifies the administrator via events, which lets the administrator take appropriate action as soon as possible. These events can also be consumed (for automated actions) by sophisticated management applications such as Microsoft System Center.

- **Optimization.** Windows Server 2012 RC provides a new API that lets applications return storage when it is no longer needed. NTFS issues trim notifications when appropriate in real time. Additionally, trim notifications are issued as part of storage consolidation (optimization), which is performed on a regularly scheduled basis.

Bottom line

Windows Server 2012 RC helps you maximize the benefits of sophisticated storage infrastructure through support of thin provisioning and trim.

Active Directory Domain Services

AD DS has been at the center of IT infrastructure for more than 10 years, and its features, adoption, and business value have continued to grow with each release. Today, most Active Directory infrastructure resides on premises, but the emerging trend toward cloud computing is an ever more realistic and compelling proposition.

The adoption of the cloud, however, will not occur overnight, and migrating suitable on-premises workloads or applications is an incremental, long-term exercise. New hybrid infrastructures are sure to emerge, and it is essential that AD DS support the needs of these new and unique deployment models, including services hosted entirely in the cloud, services that comprise both cloud and on-premises components, and services that remain exclusively on premises. These new hybrid models will further increase the importance of security and compliance, and will compound the already complex and time-consuming process of ensuring that access to corporate data and services is appropriately audited and accurately expresses business intent.

AD DS in Windows Server 2012 RC addresses these emerging needs because it is easier to virtualize and simpler to deploy, manage, and automate, both locally and remotely.

Top benefits

AD DS in Windows Server 2012 RC reduces the time requirements and complexities associated with deploying domain controllers with a new streamlined domain controller promotion wizard (the Active Directory Domain Services Configuration Wizard) that is integrated with Server Manager and built on Windows PowerShell (Figure 21). Organizations can more rapidly and easily deploy domain controllers (both on premises and in the cloud), can increase flexibility when auditing and authorizing access to files, and can more easily perform administrative tasks at scale, either locally or remotely, through consistent graphical and scripted management. AD DS in Windows Server 2012 RC also introduces support for the capabilities of public and private clouds through virtualization-friendly technologies and the rapid deployment of virtual domain controllers through cloning.
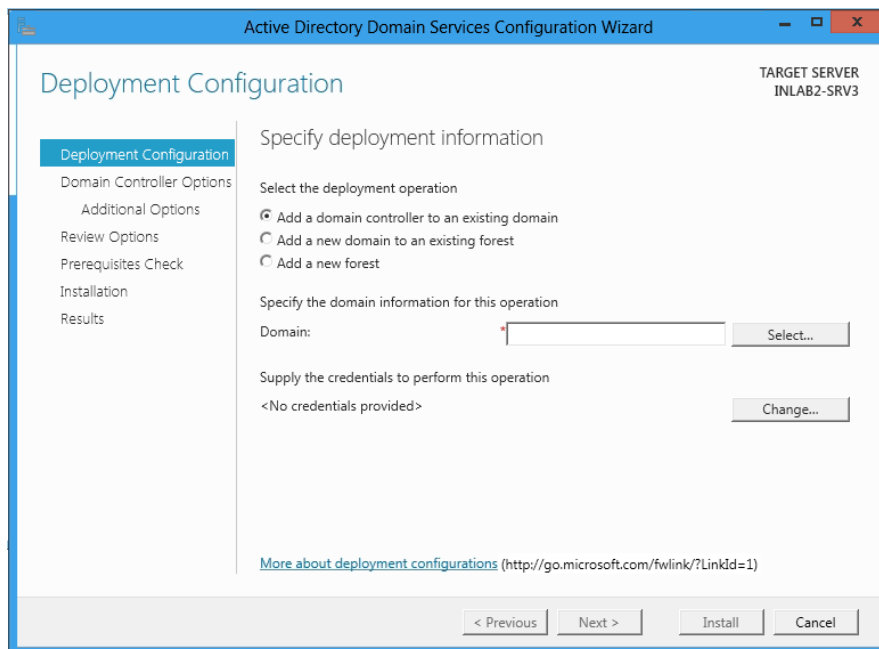
Figure 21. New, streamlined Active Directory Domain Services Configuration Wizard.

Key features

AD DS in Windows Server 2012 RC includes the following features:

- **Simplified deployment.** AD DS deployment in Windows Server 2012 RC integrates all the required steps to deploy new domain controllers into a single graphical interface. It requires only one enterprise-level credential and can prepare the forest or domain by remotely targeting the appropriate Flexible Single Master Operation (FSMO) role holders. The new deployment process conducts extensive prerequisite validation tests that minimize the opportunity for errors that might otherwise have blocked or slowed the installation. The wizard is built on Windows PowerShell, integrated with Server Manager, able to target multiple servers, and able to remotely deploy domain controllers, which results in a deployment experience that is simpler, more consistent, and less time consuming.

- **Deployment with cloning.** AD DS in Windows Server 2012 RC makes it possible to deploy replica virtual domain controllers by cloning existing virtual domain controllers. An organization can promote a single virtual domain controller by using the new domain controller promotion interface in Server Manager to rapidly deploy all additional virtual domain controllers, within the same domain, through cloning.

  The process of cloning involves creating a copy of an existing virtual domain controller, authorizing the source domain controller to be cloned in AD DS, and creating a configuration file that either contains detailed promotion instructions (name, IP address, Domain Name System [DNS] servers, and so on) or can be left empty, allowing the system to automatically fill in the blanks. This dramatically reduces the number of steps and amount of time involved by eliminating repetitive deployment tasks.

- **Safer virtualization of domain controllers.** AD DS has been successfully virtualized for several years, but features in most hypervisors can invalidate strong assumptions made by the Active Directory replication algorithms—primarily, that the logical clocks used by domain controllers to determine relative levels of

convergence only go forward in time. In Windows Server 2012 RC, a virtual domain controller uses a unique identifier exposed by the hypervisor called the virtual machine GenerationID. The virtual machine GenerationID changes whenever the virtual machine experiences an event that affects its position in time. The virtual machine GenerationID is exposed to the virtual machine's address space within its BIOS and made available to its operating system and applications through a Windows Server 2012 RC driver.

When starting and before completing any transaction, a Windows Server 2012 RC virtual domain controller compares the current value of the virtual machine GenerationID against the value that it stored in the directory. A mismatch is interpreted as a "rollback" event, and the domain controller employs AD DS safeguards that are new in Windows Server 2012 RC. The safeguards allow the virtual domain controller to converge with other domain controllers and also prevent it from creating duplicate security principles. Note that for Windows Server 2012 RC virtual domain controllers to gain this extra level of protection, the virtual domain controller must be hosted on a virtual machine GenerationID–aware hypervisor, such as Windows Server 2012 RC Hyper-V.

- **Windows PowerShell script generation.** The Windows PowerShell cmdlets for AD DS are a set of tools that lets an organization manipulate and query AD DS by using Windows PowerShell commands and create scripts that automate common administrative tasks. Active Directory Administrative Center uses these cmdlets to query and modify AD DS according to the actions performed within the Active Directory Administrative Center GUI.

  In Windows Server 2012 RC, the Windows PowerShell History viewer in Active Directory Administrative Center lets the organization view the Windows PowerShell commands as they execute in real time. For example, when a new fine-grained password policy is created, Active Directory Administrative Center displays the equivalent Windows PowerShell commands in the Windows PowerShell History viewer task pane. Those commands can then be used to automate the process by creating a Windows PowerShell script.

Bottom line

AD DS in Windows Server 2012 RC is easier to virtualize and simpler to deploy, manage, and automate, both locally and remotely.

Comprehensive Windows storage management

Organizations typically must contend with a variety of different interfaces and tools to manage storage infrastructures that are frequently disparate and heterogeneous. Windows Server 2012 RC introduces a new WMI-based interface to manage all of an organization's storage, including third-party intelligent storage subsystems and virtualized local storage (Storage Spaces). This comprehensive interface provides administrators, independent software vendors (ISVs), and storage manufacturers with a powerful and consistent mechanism for managing storage, thereby reducing complexity and operational costs.

Top benefits

The design of the storage interface offers specific benefits for distinct groups of users:

- **Enterprise system administrators** experience uniform, scriptable management with Windows PowerShell and a comprehensive set of cmdlets used for discovery, thin-provisioning support, snapshot management, replication, masking and unmasking, enumerating HBA port, and creating pools, logical units, and volumes. For example, an organization can use a single script to both configure host resources and to configure and present the storage.

- **Independent software vendors** experience the flexibility to administer any type of storage connected to a Windows system.

- **Storage manufacturers** experience nearly seamless integration of devices with any storage management client, which promotes a consistent experience for customers.

Key features

The unified interface for storage management provides a core set of defined WMI and Windows PowerShell interfaces, as well as features for more advanced management. Management applications can use a single Windows API to manage different storage types by using standards-based protocols such as the Storage Management Initiative Specification (SMI-S).

Bottom line

You can reduce complexity and cost by using the Windows Server 2012 RC comprehensive storage management interface.

Unified remote management for File Services

In the past, managing file servers on a network required you to connect to each file server individually. Windows Server 2012 RC Server Manager has new File Services management functionality that allows you to use a single interface to remotely manage multiple file servers or clustered file server instances.

Top benefits

The new File Services functionality in Server Manager saves you time by allowing you to remotely manage multiple servers, including single file servers and server clusters, from a single interface.

Key features

The new functionality for the File Services role facilitates a number of different administrative tasks, including managing file shares, volumes, and storage. With the enhanced functionality of this role, you can create pools of volumes on the network and then manage those storage pools as a unit (Figure 22). You can also use File Services to add and share volumes anywhere on the network.
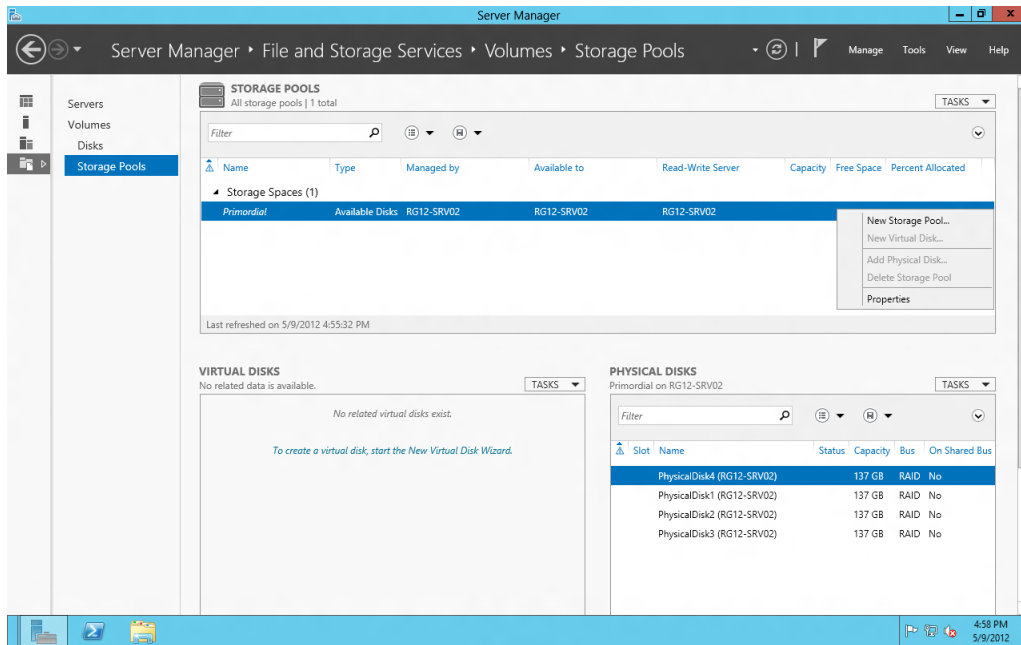
Figure 22. Creating a new storage pool by using Server Manager.

Bottom line

Server Manager can help you manage multiple file servers, including clusters, as easily as one server. Storage pools allow you to group many physical disks into easily managed volumes.

Summary

Windows Server 2012 RC delivers several new and enhanced features that help administrators manage an entire network as easily as a single server. These features help improve manageability, performance, and reliability starting at the individual server level and going all the way up to managing large data centers.

At the individual server level, the new management features help deliver greater efficiency when deploying large volumes, maximize network performance, and provide flexibility when deploying servers. Availability of disk space has been greatly improved, and administrators can move very large chunks of data or even entire virtual machines quickly and easily between storage devices.

In multiserver environments, it is now easier than ever to maintain maximum service level availability when moving virtual machines and when providing file services. It is also easier to reliably store and run VMware ESX virtual infrastructures.

Windows Server 2012 RC features also deliver more support for multisite management and environment recovery to make services even more resilient to failures throughout your entire organization. These advancements can save your organization money by avoiding costly new hardware and additional third-party software investments.

Every App, Any Cloud

As the interest in cloud computing and providing web-based IT services grows, customers are saying they need a scalable web platform and the ability to build, deploy, and support cloud applications that can run on premises, in the cloud, or both. At the same time, servers remain vital to businesses because of the applications running on them, from email and accounting to line-of-business applications. For the foreseeable future, more and more organizations will conduct business in hybrid IT environments that mix on-premises and cloud-based technologies.

Advantages of Windows Server 2012 RC

Windows Server 2012 RC provides an optimal platform for bridging these two environments. It builds on the tradition of the Windows Server family as a proven application platform, with thousands of applications already built and deployed and a community of millions of knowledgeable and skilled developers already in place. Windows Server 2012 RC extends this rich history with new features and enhancements that offer even greater application flexibility. Now organizations can build and deploy applications either on premises or in the cloud—or both at once, with hybrid solutions that can straddle both environments. It also introduces IIS 8.0 and ASP.NET 4.5 to help provide the most flexible, scalable, secure web application hosting platform possible today.

Windows Server 2012 RC is designed to meet the needs of developers, hosting providers, and large enterprises. Enterprises benefit from a server platform that delivers high performance and application availability while supporting strategies for current and future cloud-based solutions. For hosting providers, there are features that support the cost-effective deployment and management of very large numbers of websites. This includes multitenant scenarios in which providers can host dense populations of customer sites while continuing to provide the robust performance and availability that is vital to meeting SLAs. For developers, Windows Server 2012 RC offers a platform and associated tools for creating and deploying rich applications that will address customer needs for both on-premises and cloud-based solutions.

This section examines the features and benefits of Windows Server 2012 RC as it supports four key tenets of the Every App, Any Cloud vision:

- Providing flexibility to build on premises and in the cloud.

- Delivering a scalable and flexible application platform.

- Providing a scalable and elastic web platform.

- Offering an open web platform to support open-source and mission-critical applications.

Flexibility to build on premises and in the cloud

In today's business environment, people access applications and data through many different channels, including traditional operating systems, powerful web applications running in browsers, and small computers such as cell phones, netbooks, and other smart devices. Windows Server 2012 RC provides the frameworks, services, and tools

that give organizations and developers the flexibility to build applications that meet the demand for this rich and varied access to information, whether it resides on premises, in the cloud, or both.

Windows Server 2012 RC offers common programming languages and tools, including Visual Studio and the .NET Framework, which span both on-premises and cloud-based environments. With this programming symmetry, developers can work in a single, unified environment to build solutions that can be targeted to either Windows Server or the Windows Azure cloud platform. These programming tools can be used across web, application, and data center tiers for locally deployed applications and for private and public cloud solutions.

This programming symmetry is complemented by the rich and comprehensive Visual Studio experience. Whether working in house or as third-party solution providers, developers can create on-premises, cloud-based, or hybrid applications from within a unified Windows development environment when writing code and using common workflows and rules.

Windows Server 2012 RC also enables hybrid applications that cross the boundary between physical IT infrastructures and the cloud. It supports existing and emerging cloud technologies, including those that are helping to make Windows Azure one of the world's leading cloud platforms. These include secure messages to and from web services (regardless of their point of origin), controls for establishing federated authentication and authorization solutions, and caching services for enhancing application performance.

Scalable and flexible application platform

With Windows Server 2012 RC, Microsoft continues the tradition of delivering a rich, innovative application platform. It provides technologies such as publish/subscribe (pub/sub) messaging, framework components, and support for high-density, multitenant scenarios. It also supports the messaging, caching, and workflow technologies that enable the use of loosely coupled applications that are easy to scale on premises or in the cloud.

Scalable and elastic web platform

Windows Server 2012 RC offers new and enhanced features that provide extensive support for web applications and cloud-based strategies. It helps to improve website density so that enterprises and hosting providers can increase the number of sites supported with the same amount of computer hardware. It delivers features such as sandboxing and CPU Metering, so that organizations can isolate and secure multitenant environments while keeping close track of resource usage. It also provides features to improve performance and security in environments.
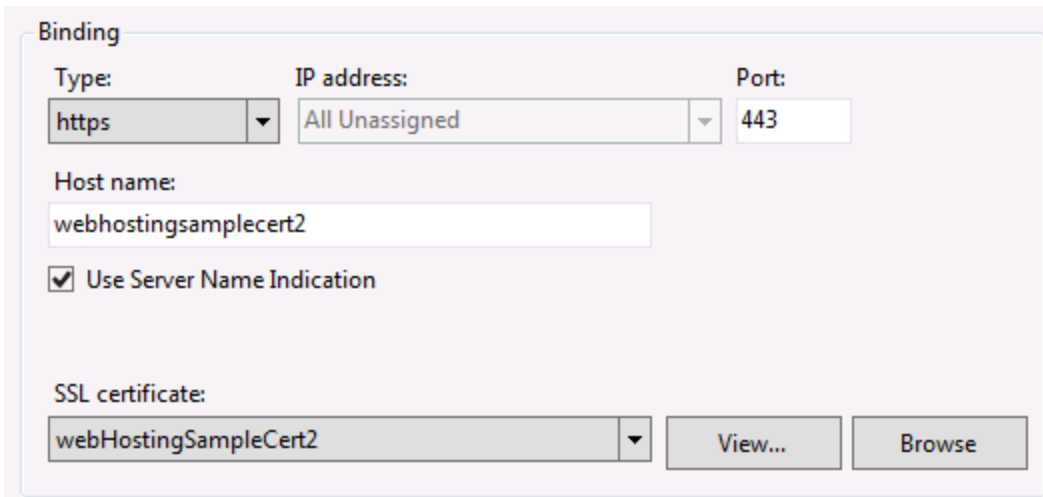
The following features support this newly scalable and elastic platform.

Server Name Indication

Server Name Indication (SNI) uses a virtual domain name to identify a network endpoint, eliminating the need to have a dedicated IP address for each secure site. It does this by extending the Transport Layer Security (TLS) protocol to include the virtual domain name during Secure Sockets Layer (SSL) negotiation. SNI allows the client to request the domain name before the certificate is committed to the server.

With SNI, a host name can be used along with IP address and port to identify the network endpoint, eliminating the need to have a dedicated IP address for each secure site. In the past, if you had 10,000 tenants, you would need

10,000 unique IP addresses. With SNI, you need only one. SNI also supports thousands of SSL certificates and uses the local certificate store (Figure 23).

Figure 23. The Web Hosting certificate store can contain thousands of SSL certificates.

Top benefits

This feature allows SSL to scale massively, which is needed in the cloud and in hosting. It also allows the use of fewer IPv4 addresses per server.

Key features

In previous versions of Windows Server, binding a secure site requires a unique network endpoint using an IP address and a port. Because the site owners want their secure sites to be running on a standard SSL port, this means having a dedicated IP address per each secure site. This issue has been addressed with SNI, which uses the host name to identify the network endpoint. In addition, a new Web Hosting certificate store included in Windows Server 2012 RC will scale to thousands of certificates.

Bottom line

The new SNI feature in Windows Server 2012 RC helps to support increased density of secure sites, which in turn enables greater site scalability.

NUMA-Aware Scalability

Computer hardware continues to make great advances, and within the next several years server hardware with 64 cores or more will be commonplace. In the past, scaling up to such powerful hardware could be problematic due to the challenges and cost of synchronizing memory between CPUs.

Windows Server 2012 RC introduces NUMA-Aware Scalability, a component of IIS 8.0 that addresses this issue by taking advantage of pending advances in hardware, including NUMA (Non-Uniform Memory Access) architecture, in which a processor can access its own local memory faster than nonlocal memory. This new feature allows IIS 8.0 to

divide workloads into multiple processes and uses NUMA nodes to minimize the need for the CPU to synchronize memory across the servers.

Top benefits

The following are the benefits of NUMA-Aware Scalability:

- **Efficiency.** Customers get a high return on their hardware investments. The NUMA-Aware Scalability feature can take advantage of an increased number of processor cores so that it can use server hardware—both current and upcoming hardware technology. Customers can get more from their hardware, and web applications can run more efficiently on the same resources (Figure 24).

- **Scalability.** The NUMA-Aware Scalability feature divides the workload into multiple processes and uses NUMA nodes to minimize the need for the CPU to synchronize memory across the servers.

- **Manageability.** The NUMA-Aware Scalability feature minimizes complexity so that users do not need a detailed understanding of how NUMA works.
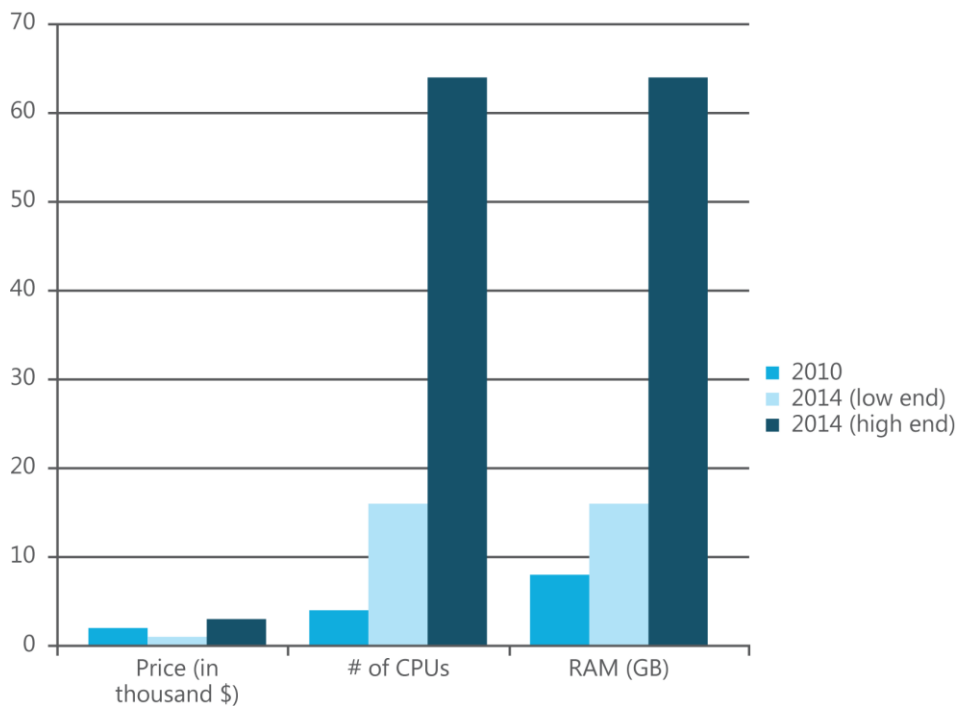
Figure 24. NUMA-Aware Scalability will allow you to benefit from the dramatic advances in server hardware resources expected over the next several years.

New features

System designers use NUMA to enhance system performance while avoiding increased loads on the processor bus. In a NUMA system, CPUs are arranged in smaller systems called nodes, with each node having its own processors and memory. Each node is connected to the larger system through a cache-coherent interconnect bus.

Bottom line

With NUMA-Aware Scalability, Windows Server 2012 RC can help you take advantage of emerging, high-performance server hardware systems.

IIS CPU Throttling

Windows Server 2012 RC introduces IIS CPU throttling, which can be used to set the maximum allowable CPU consumption for each application pool. Because the recommended practice is to create a separate application pool—or "sandbox"—in a multitenant hosting environment, administrators can use CPU Throttling to prevent one tenant's application from monopolizing the CPU resources needed by other tenants' applications running on the same IIS server.

Top benefits

Resource management is greatly enhanced in Windows Server 2012 RC with the new IIS CPU Throttling feature. The sandboxing process controls resource consumption per site. In multitenant environments, such as shared-hosting scenarios, this feature can be used for monitoring—and potentially billing—users who require higher amounts of CPU resources.

Key features

In Windows Server 2012 RC, IIS CPU Throttling is used to establish the maximum CPU consumption allowed per application pool. Because it is recommended to create a separate application pool per tenant, the feature can be used to create individual sandboxes for each tenant.

Bottom line

With IIS CPU Throttling, you can now achieve a specific level of CPU resources for business applications running on IIS 8.0 in Windows Server 2012 RC.

Centralized SSL Certificate Support

In the past, if you had 20 servers in a server farm, you would have to copy and import SSL certificates on all 20 computers, one by one. The problem increases exponentially if you have 10,000 tenants that all want a secure site. The result is 10,000 SSL certificates that have to be copied to all 20 computers and imported individually.

The Centralized SSL Certificate Support feature in Windows Server 2012 RC is used to store all SSL certificates centrally in a file server, where they are shared by all servers in the server farm. In the preceding example, the 20 computers get the SSL certificates from a central location so the administrator has just one location to update the certificate. Additionally, there is no need for any special "importing" procedure—you simply copy the certificate file to the file server.

Top benefits

With the Centralized SSL Certificate Support feature in Windows Server 2012 RC, SSL certificate management is greatly simplified, in turn lowering the time and cost involved in running a server farm. With this feature, adding a server running Windows Server 2012 RC takes minutes because there are no certificates to import. To configure a new server, you simply point to the file server with SSL certificates (Figure 25).
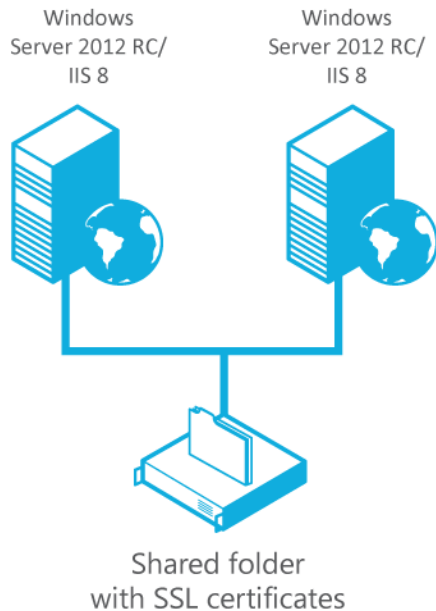
Figure 25. Multiple IIS servers can use SSL certificates from a single shared folder.

Key features

In previous versions of Windows, there are as many SSL bindings as there are SSL sites because the 1:1 mapping must be deliberately and explicitly managed. With the Centralized SSL Certificate Support feature in Windows Server 2012 RC, there is just one binding because the web server uses the SSL certificate that has the same file name as the domain name.

Bottom line

SSL certificate management is much simplified with Centralized SSL Certificate Support, which lowers the total cost of ownership.

Application Initialization

With the new Application Initialization feature in IIS 8.0, website administrators can configure IIS 8.0 to proactively perform initialization tasks for one or more web applications. IIS 8.0 can also be configured to return static content as a placeholder or splash page until an application has completed its initialization tasks.

Top benefits

Application Initialization helps improve the performance of first requests. A first web request takes more time because the corresponding IIS worker process needs to start. In IIS 8.0, the process is initialized in advance so that the first request performance is improved. In addition, the feature can be used to initialize the process while serving a splash page, resulting in an improved user experience. Instead of enduring an extended wait without seeing anything on the browser, the user can look at the splash page displayed on the browser while the process is being initialized.

Key features

IIS 8.0 initializes the process in advance so that the first request performance is improved.

Bottom line

Application Initialization in IIS 8.0 helps to speed up the initialization of websites.

Dynamic IP Restrictions

Dynamic IP Restrictions is a feature of IIS 8.0 in Windows Server 2012 RC that lets you easily set up filters to selectively deny access to IP addresses from potentially malicious users who might pose a threat to your servers. This includes parties that launch denial-of-service (DoS) attacks.

Top benefits

This feature's primary benefit is to protect servers from DoS attacks by automatically blocking potentially harmful IP addresses.

Key features

Before IIS 8.0, administrators used a manual process to allow or deny access for individual IP addresses or ranges of IP addresses. With IIS 8.0, you can use dynamic IP address filtering to do the following:

- Block access for IP addresses that exceed the specified number of requests.

- Block access based on the number of connection attempts from an IP address during a specified time period.

- Specify the behavior when IIS blocks an IP address. Requests from malicious clients can then be aborted by the server instead of returning HTTP 403.6 responses to the client.

Administrators can configure this feature in two ways: The first way is by setting a static rule based on a client IP address, such as "block requests from this IP address." The other way is to set a dynamic rule that is based on heuristics, such as "block requests from IP if the IP has more than a configured number of concurrent connections or if it sends X requests in X timeframe," with X representing parameters set by the administrator.

There is also a "logging only" feature in which the server administrator can enable the feature without actually blocking the IPs. In this mode, the feature only logs what would have happened. This is useful for server administrators to try out the feature and tune the settings before actually affecting the clients.

Bottom line

IIS 8.0 for Windows Server 2012 RC allows you to easily set up filters to automatically deny access based on criteria that you can determine based on your security needs.

FTP Logon Attempt Restriction

Servers have long been vulnerable to brute-force attacks by malicious clients who determine the FTP server type and guess a common user name, such as "administrator" or "root." Windows Server 2012 RC and IIS 8.0 reduce that vulnerability through a feature named FTP Logon Attempt Restriction, which you can use to deny access to clients who are attempting brute-force attacks on your server. This feature limits the number of logon attempts in a specified time period, so that malicious tools or individuals will not be able to try millions of combinations in a short period of time because they would violate the number of logon attempts (Figure 26).
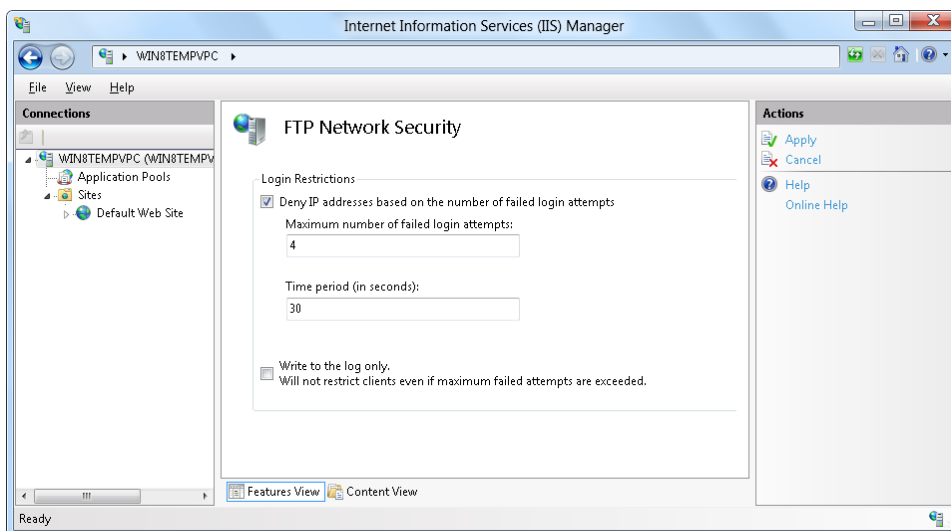
Figure 26. FTP Network Security can be easily configured to help reduce the impact of a DoS attack.

Top benefits

This feature provides the security of a custom authentication provider without the need for an administrator to set up and manage individual custom accounts.

Key features

The FTP Logon Attempt Restriction feature in IIS 8.0 provides built-in functionality that used to require custom authentication. The FTP service can be configured to deny access to the FTP service based on the number of times that an FTP client fails to authenticate within a specified time period. After the number of failed logon attempts has been reached, the FTP connection to the client is forcibly closed by the server, and the FTP client's IP address is blocked from accessing the FTP service until the FTP service has been restarted.

The FTP Logon Attempt Restriction feature is a server-level setting—you can't set separate logon restrictions on a per-site basis. This is because attackers are attempting to gain access to your entire server, not just a single site. Therefore, the FTP service blocks access for malicious users at the server level.

Bottom line

IIS 8.0 in Windows Server 2012 RC now includes FTP Logon Attempt Restriction, a feature that helps protect your server from brute-force incursions by malicious users.

An open web platform

Windows Server 2012 RC and IIS 8.0 provide a solid platform for both open-source software and ASP.NET, so developers can choose freely from programming stacks like PHP and ASP.NET. Windows Server 2012 RC provides enhanced support for PHP and MySQL through IIS 8.0 extensions, delivering more flexibility and agility to development efforts. IIS 8.0 also includes ASP.NET 4.5 integration, support for the latest HTML 5 standards, and support for writing managed WebSocket Protocol applications.

With its support of ASP.NET applications and PHP-based applications, Windows Server 2012 RC can help reduce operating costs by providing a single server platform on which to run a heterogeneous mix of applications. IT personnel can also reuse their existing knowledge in IIS 8.0 and Windows Server 2012 RC to maintain PHP and ASP.NET applications.

The key features that support this open web platform are discussed in the following section.

WebSocket Protocol

WebSocket Protocol is a new standards-based protocol in Windows Server 2012 RC that provides real-time bidirectional communications between a client—that is, a browser or client application—and a server. The WebSocket Protocol feature in Windows Server 2012 RC is supported in IIS ASP.NET 4.5 and Windows Communication Foundation (WCF), using either native or managed programming APIs for writing server-side WebSocket Protocol applications.

Top benefits

WebSocket Protocol provides additional ways to write web applications. This feature also has the ability to push messages from the server to the client and to run other protocols.

Key features

WebSocket Protocol is a bidirectional, full-duplex TCP socket that is initiated by HTTP. It is designed to be implemented in web browsers and web servers, but it can be used by any client or server application. It provides a programming model in which data is pushed from the server to the client, instead of the client pulling data from the server. In addition, you can run different protocols over WebSocket Protocol. And, because the initiation of the socket is done via HTTP, it is easy to tunnel through proxies.

Bottom line

WebSocket Protocol in Windows Server 2012 RC provides more secure real-time bidirectional communications between a client and a server, which provides more support for interactive, data-intensive HTML and Asynchronous JavaScript And XML (AJAX) applications.

ASP.NET 3.5 and 4.5 on IIS 8.0

IIS 8.0 in Windows Server 2012 RC enables ASP.NET applications to run using either .NET Framework 3.5 or .NET Framework 4.5. This is done by IIS 8.0 hosting versions of the .NET Framework in different application pools, which enables multiple ASP.NET applications with different .NET Framework versions to run simultaneously on Windows Server 2012 RC.

Top benefits

Multiple ASP.NET applications created with different versions of the .NET Framework can run simultaneously on Windows Server 2012 RC.

Key features

Both .NET Framework 3.5 and .NET Framework 4.5 are natively recognized by the operating system. This backward compatibility means that both UI-based and command-line driven setups can be used to turn on both versions of the .NET Framework, as well as to enable integration of both versions of ASP.NET with IIS 8.0.

IIS 8.0 also supports managing both ASP.NET 3.5 and ASP.NET 4.5 applications by using both the graphical IIS Server Manager tool and the IIS command-line management tools.

Bottom line

IIS 8.0 in Windows Server 2012 RC gives you greater flexibility in running an array of applications created with different versions of the .NET Framework.

ASP.NET 4.5 and 3.5 applications management

In addition to IIS 8.0 in Windows Server 2012 RC running both ASP.NET 3.5 and ASP.NET 4.5 applications, the management infrastructure of IIS 8.0 supports managing both ASP.NET 3.5 and ASP.NET 4.5 applications.

Top benefits

This management feature allows server administrators and developers to effectively manage both ASP.NET 3.5 and ASP.NET 4.5 applications.

New features

Both graphical and command-line IIS 8.0 management tools operate in a version-specific manner when reading or writing configuration information for ASP.NET applications. For example, ASP.NET administration modules running in the IIS Server Manager display configuration options applicable for the specific ASP.NET version used by an application. The following are two new options in the IIS Administration modules:

- **Enable JIT profiling.** By default, ASP.NET 4.5 works with the common language runtime (CLR) and JIT compilation to enable background compilation of speculative JIT execution paths using additional CPU cores.
- **Enable Prefetch.** This option integrates the ASP.NET 4.5 compilation system with the Windows Server 2012 RC Superfetch service. When both the Superfetch service and ASP.NET Prefetch option are enabled, Windows Server

2012 RC profiles ASP.NET compilation during the start of web applications to dynamically optimize disk performance when loading managed assemblies.

Bottom line

IIS 8.0 provides an infrastructure for managing both ASP.NET 3.5 and ASP.NET 4.5 applications.

Summary

Most organizations today are using—or are planning for—a combination of on-premises and off-premises IT resources and tools, resulting in hybrid environments of both on-premises and cloud resources. Windows Server 2012 RC provides enormous flexibility for hosting web-based applications on premises and in the cloud, giving organizations an advanced server platform that can provide flexibility, scalability, and compatibility for running vital applications.

Windows Server 2012 RC takes advantage of symmetry in application development efforts for both the data center and the cloud. It provides the frameworks, services, and tools to increase scale and elasticity for multitenant-enabled applications that can be deployed both on premises and in the cloud. As a web platform, it improves website density and efficiency while enabling service providers to better build, provision, and manage a hosting environment. And as an open web platform, it supports mission-critical applications and enhanced support for open standards such as HTML 5 and open source applications.

Modern Work Style, Enabled

Anyone in business today is familiar with the computing demands of the modern work environment. Modern employees and executives simply expect their IT resources to work together easily, and to do so despite an ever more complex set of technical and regulatory challenges. Furthermore, if you are a technical decision maker or IT administrator, you know that users often feel that they should be able to use their personal computers or mobile devices at any time and from any location to access their corporate data and applications. This trend, referred to as the consumerization of IT, means that even small businesses quickly require complex IT infrastructure, and the worldwide economic picture means that cost-effective solutions are more essential now than ever before. All this puts new pressures on IT departments and IT pros, who must understand and respond to demands driven by user preferences and business requirements. In short, computing resources are increasingly treated as centralized commodities—rather than being focused on particular hardware, they are seen as a way of providing users with a certain level of functionality and accessibility. This change in thinking has led to the many advantages of cloud infrastructure, but has also introduced significant challenges for IT pros.

For instance, system security is increasingly difficult to maintain. As organizations expand, administrators are often overwhelmed by the need to implement and maintain custom security solutions based on individual user privileges, device configurations, and data types. The pressures of data security and compliance are driving the trend toward consolidation, where large amounts of data from users' desktops and departmental file shares are moved into centrally managed file servers. However, consolidation introduces its own security challenges, because business users still want to access their data and applications from different locations, and to use any convenient device to do so. Furthermore, as companies go global, an ever-larger set of regulatory requirements overshadows every computing decision.

In short, the modern corporate IT environment has the challenge of enabling a modern work style that is mobile, collaborative, device independent, and cost conscious.

Advantages of Windows Server 2012 RC

Windows Server 2012 RC is designed to support the demands of the modern work style by helping administrators intelligently and effectively achieve user productivity in enterprise deployments, especially those that involve centralized desktops. Windows Server 2012 RC advances the trend established by previous versions of Windows Server of supporting centralized desktop solutions (sometimes called remote desktops). Previous versions of Windows Server introduced support for four different types of centralized desktops and applications: first session-based applications (RemoteApp) and desktops, and then both pooled and personal VDIs. Windows Server 8

Developer Preview adds new features and significant improvements to the implementation and management of all four kinds of centralized resources. The advanced features in Windows Server 2012 RC are designed to support three key goals of the modern work style:

- Giving users access to data and applications from virtually anywhere, on whatever device they choose.

- Enabling users to experience the full Windows experience from wherever they are.

- Keeping the entire experience as secure as possible while aiding compliance with applicable regulations.

Access virtually anywhere, any device

Windows Server 2012 RC enables easy, always-on access to a virtualized work environment from virtually anywhere, including branch offices and public places. Business users are demanding that they be allowed to bring their consumer devices to work, and IT pros are looking for ways to provide information access on a whole new set of devices they didn't need to support previously.

With Windows Server 2012 RC, centralized desktops and simple-to-deploy remote access and branch location solutions provide an easy way to give users access to corporate infrastructure while helping to maintain security and regulatory compliance. In addition, Windows Server 2012 RC enables users to employ more types of devices than ever before, including laptops and PCs running Windows 7 or 8; Windows-based tablet devices; Microsoft RemoteFX®, Windows Embedded, and Linux-based thin clients; non-corporate PCs using remote access gateway and web access; USB flash drive-based flexible workspaces; and session-based or VDI environments (Figure 28). In all cases, the user's experience of Windows is kept as consistent as possible given the physical constraints of the device form.

PCs and laptops

Mobile tablets

Thin clients

Non-corporate PCs

USB flash drive-based flexible workspaces

Session or virtual desktop environments
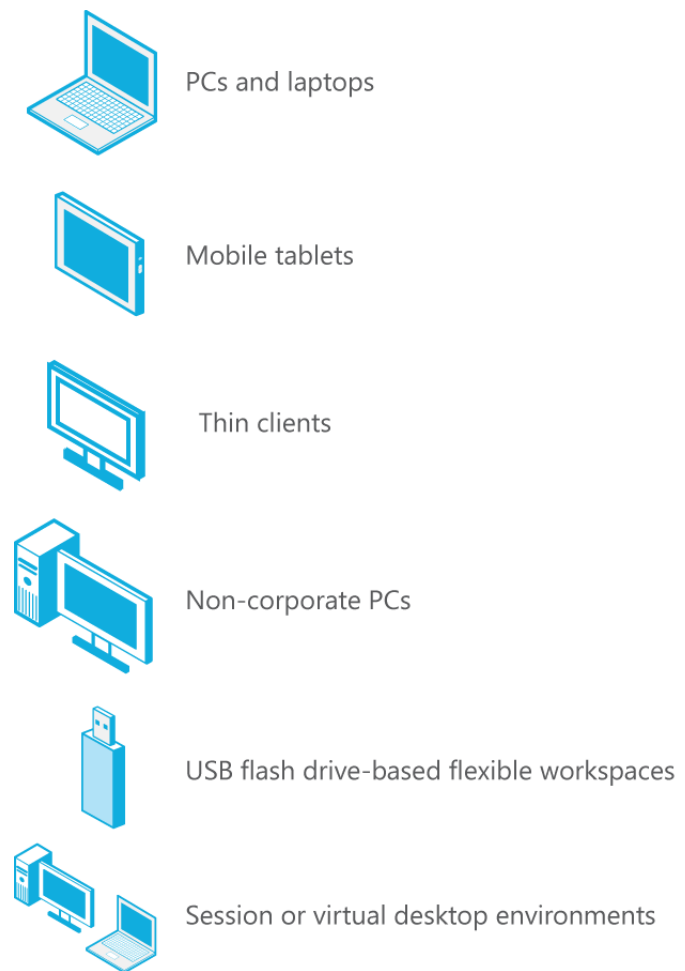
Figure 27. Device options.

Full Windows experience anywhere

For business users to be able to roam and stay productive on different devices in different locations, their experience must imitate as closely as possible the in-office solution of using a laptop or PC. Windows Server 2012 RC offers a number of improvements that enable a personalized, rich user experience from many more devices while adapting to different network conditions quickly and responsively.

Enhanced data security and compliance

Compliance with regulatory standards and the need to secure business-critical and personal data from leakage continue to be a priority for businesses and corporate IT. One of the key requirements for compliance and leakage prevention is controlling who has access to information and having the ability to report on who actually accessed specific information.

Windows Server 2012 RC helps provide enhanced data security and compliance by offering granular access to data and corporate resources based on strong identity and device security status, as well as simplified configuration and administration for remote access. Windows Server 2012 RC puts IT pros in an even better position to control access to company-sensitive and customer-sensitive data by making authorization and information-auditing management more central, flexible, and natural.

Summary of Windows Server 2012 RC advantages

The modern work style presents IT pros with a set of unique challenges and inspires three goals:

- Giving users access to data and applications from virtually anywhere, on whatever device they choose.

- Enabling users to experience the full Windows experience from wherever they are.

- Keeping the entire experience as secure as possible while aiding compliance with security regulations.

Windows Server 2012 RC gives IT pros and their enterprises a key competitive advantage, because it has been designed with those three goals in mind. The remainder of this chapter describes the features that help administrators enable the modern work style for users in their business. Features may address more than one goal, which are discussed under one of the following headings:

- Support for centralized desktop deployments.

- DirectAccess improvements.

- Branch office support.

- Easier security and compliance.

Support for centralized desktop deployments

Centralized desktops are becoming a key component of corporate IT environments in the modern work style. Windows Server 2012 RC includes a number of features aimed at making deployments of centralized desktops more flexible, more user friendly, more cost effective, and easier to manage.

Centralized management console

Centralized desktop deployments can offer significant advantages to users in many situations, but the cost, complexity, and expertise required to set up and manage them is a barrier for many potential users and a burden on the rest. Until now, the management and configuration of such systems have involved considerable manual work, placing high demands on IT administrators' time and introducing the possibility of errors. Windows Server 2012 RC changes that with a centralized management console, which gives a single, powerful point of access to all the management features of a VDI or session-based centralized desktop deployment.

Top benefits

- Faster rollout of centralized desktop deployments (session based or VDI).

- More efficient life-cycle management and patching for desktops and applications.

- Greater number of servers per administrator.

- Better user experience when accessing a centralized desktop.

Key features

The centralized management console in Windows Server 2012 RC gives you a single point of control for your remote desktops, so that one administrator can easily configure and manage multiple virtual desktops and sessions. From a single console wizard, the administrator can deploy groups of multiple machines (called collections) and configure them with a single command.

By launching the Create Collection Wizard from Server Manager, you can now easily deploy collections of session-based desktops, shared virtual desktops, or personal virtual desktops (Figure 28).
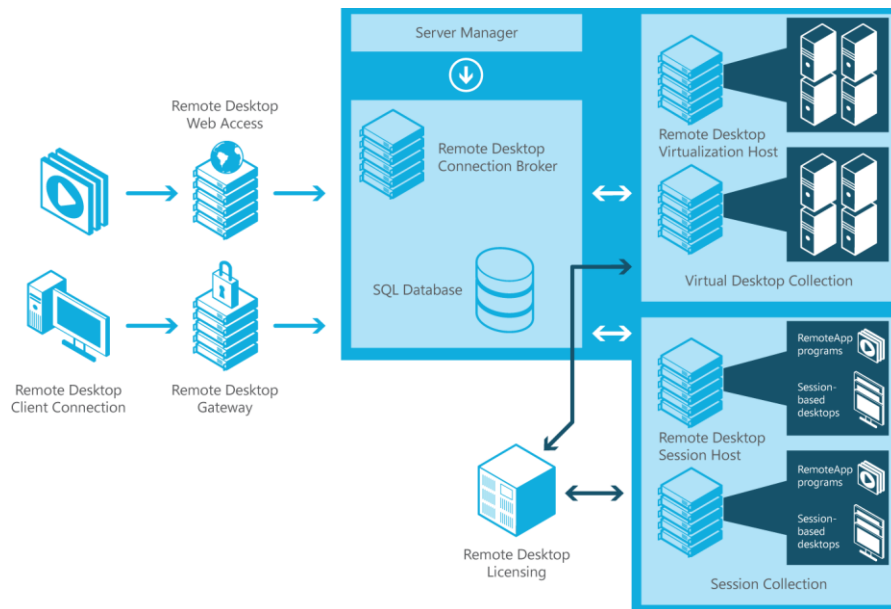

Figure 28. Deploying collections using a wizard launched from Server Manager.

Bottom line

The centralized management console has been improved to give you greater flexibility and ease when managing large deployments of servers or virtual desktops.

Simplified VDI deployment and patching for virtual machine pools and personal virtual machines

In Windows Server 2012 RC, VDI in RDS introduces new ways to configure and manage your virtual desktops to help increase flexibility and decrease maintenance-related downtime. VDI is a powerful technology, and one feature with particular significance to the modern work style is the ability to deploy and patch virtual machines—whether in pools or individually—through a central command tool. Windows Server 2012 RC offers that functionality and eases the implementation of virtual machines in any size enterprise.

Top benefits

- **Unified central experience.** In Windows Server 2012 RC, you can deploy Session Virtualization in a few hours or less and manage your session-based desktops and Windows Server 2008 R2 RemoteApp programs through a new unified central experience.

- **Simplified and centralized deployment.** Simple, scenario-based installations allow you to create an entire session collection at one time.

- **Centralized and unified management.** You can manage all the Remote Desktop Session Host (RD Session Host) or Remote Desktop Virtualization Host (RD Virtualization Host) servers in your collection from a single location.

- **Improved single sign-on administration.** Single sign-on administration is simpler to manage, easier to deploy, and now available in all areas of RDS deployments across multiple types of user logons.

- **Fair Share experience.** For a predictable user experience in Windows Server 2012 RC, and to ensure that one user doesn't negatively impact the performance of another user's session, the following features are enabled by default on RD Session Host servers:

  - **Network Fair Share.** Dynamically distributes available bandwidth across sessions based on the number of active sessions to enable equal bandwidth usage.

  - **Disk Fair Share.** Prevents sessions from excessive disk usage by equal distribution of disk I/O among sessions.

  - **CPU Fair Share.** Dynamically distributes processor time across sessions based on the number of active sessions and load on these sessions. This was introduced in Windows Server 2008 R2 and has been improved for heavier loads in Windows Server 2012 RC.

Key features

Windows Server 2012 RC makes it easier to deploy virtual desktops by providing administrators with the flexibility to choose from the two common options for virtual machine deployments:

- **Pooled virtual machine collections.** Customers can choose to deploy VDI through virtual machine pools. In this model, a single master image is shared by all users in the virtual machine pool. The changes made by users during each session are stored in a transient virtual hard disk that is discarded at logoff. The main advantage of this model is that there is a single image to manage, which reduces storage requirements and simplifies management, thereby reducing deployment costs. In Windows Server 2012 RC, the entire model of deploying pooled virtual machine collection is transparent to the administrator. The single image management and administration is natively supported and the whole process is simplified for ease of deployment.

- **Personal virtual machine collections.** Personal virtual machines are based on a master virtual machine. Windows Server 2012 RC automates the rollout process by copying the master image for each instance of the personal virtual machine. After the initial rollout is completed, virtual machines are maintained as if they are physical machines, and they can be managed by using WSUS and System Center Configuration Manager add-ons.

Bottom line

New features in Windows Server 2012 RC make VDI deployment and patching easier, faster, and more reliable.

Hyper-V over SMB

Hyper-V over SMB is a feature that adds support for SMB on the Hyper-V-based virtualization platform. The ability to use SMB storage over Hyper-V drastically cuts the complexity and cost of deploying virtualized environments.

Top benefits

Rather than requiring expensive SAN-based storage hardware, Windows Server 2012 RC enables the use of SMB-based hardware, both in the primary data center and in virtualized platforms over Hyper-V.

Key features

Hyper-V over SMB is applicable to pooled virtual machines only. The lowest cost of deployment for any virtualized environment is to use a local disk. This becomes especially important in VDI deployments in which a potentially large amount of storage is required.

The basic sequence for Hyper-V over SMB is as follows:

1. A virtual hard disk image with no service packs installed is placed on an SMB share.

2. When a new pooled virtual machine is created by using the virtual hard disk image that is in the SMB share, a copy of the virtual hard disk starts on the local disk, the virtual machine starts, and the copying continues in the background.

3. This is almost spoofed as if it is live migration, but in reality, the virtual machine is moved from one location to another and the virtual hard disk is copied from one machine to another before the new virtual machine is started.

Note: You can't use the Hyper-V UI to perform this migration—you must use the VDI UI. Because this is a pooled virtual hard disk, there is no issue with moving the data from one location to another.

Bottom line

SMB storage over Hyper-V drastically cuts the complexity and cost of deploying virtualized environments.

IP Address Manager

The modern work style is device independent, which means that enterprise IP addresses are proliferating rapidly as administrators and users introduce more and more devices to the corporate workspace. However, previous versions of Windows Server do not support a native solution for automated IP tracking and management. As a result, complex manual workarounds have often been required, which increase administrator workload and introduce the possibility for errors. To address these needs, Windows Server 2012 RC introduces IPAM, a framework for discovering, monitoring, auditing, and managing the IP address infrastructure on a corporate network.

Top benefits

- Quicker, more reliable, more cost-effective management of your IP address space.
- A powerful set of IP address management capabilities, including:
  - Server discovery and data collection.
  - DHCP and DNS server management and monitoring.
  - IP address usage monitoring.
  - Configuration auditing and user tracking.

Key features

IPAM gives you a choice of two main architectures:

- **Distributed.** An IPAM server deployed at every site in an enterprise.
- **Centralized.** One IPAM server in an enterprise.

In either configuration, IPAM periodically attempts to locate the Network Policy Server (NPS), domain controller, DNS, and DHCP servers on the network that are within the scope of discovery that you specify. You must choose whether these servers are managed by IPAM or unmanaged. The IPAM server communicates with managed servers by using a remote procedure call (RPC) or WMI interface. This automatic polling enables IPAM to achieve work-saving functionality, including:

- Automatic IP address infrastructure discovery.
- Migration of IP address data from spreadsheets or other tools.
- Custom IP address space display, reporting, and management.
- Auditing server configuration changes and tracking IP address usage.
- Monitoring and managing DHCP and DNS services.

Bottom line

IPAM lets you manage your IP address space by using tools integrated with AD DS.

RemoteFX for WAN optimization

The reality of the modern work style is that not every user will be on an ideal broadband connection at all times when attempting to work remotely. As a key aspect of Microsoft RemoteFX, RDP in Windows Server 2012 RC has been optimized to work better over low-bandwidth, high-latency connections.

Top benefits

- Increased deployment flexibility by adding WAN connections.
- Reduced network/bandwidth costs.
- Support for virtual and session-based desktops.
- Support for full or thin clients.
- Support for Windows Server 2008 R2 RemoteApp programs.
- Rich user experience over WAN.

Key features

The improvements to RemoteFX for WAN in Windows Server 2012 RC include:

- **User Datagram Protocol (UDP) transport.** RDP in Windows Server 2012 RC intelligently chooses between the TCP and UDP transports, depending on the content type and the quality of the connection. For instance, in some applications, such as streaming video, packets that are lost or delayed are no longer needed by the application. In cases like these, Windows Server 2012 RC chooses UDP transport to help eliminate resending irrelevant packets. When Remote Desktop is enabled on a computer, UDP for port 3389 is automatically enabled in the Windows Firewall. For enhanced performance, enable this port on your network.

- **RemoteFX Network Auto Detect.** RemoteFX Network Auto Detect determines the amount of available bandwidth between the client and server and uses this information to optimize the user experience.

RemoteFX Network Auto Detect is automatically enabled by using Remote Desktop Connection (RDC), resulting in:

- Superior WAN performance with RemoteFX for WAN.
- Full 3D and Aero Glass remoting experience with Software GPU.
- Rich desktop remoting experience for all content types with RemoteFX adaptive graphics.
- Smooth Media playback experience with RemoteFX media streaming.

Bottom line

RemoteFX for WAN optimization improves remote desktop performance over WANs.

User Profile Disk support in VDI deployments

User Profile Disk is a feature in Windows Server 2012 RC that helps provide user state virtualization, resulting in a better and more consistent user experience of centralized desktop access. Virtual hard disk use also drastically reduces the storage requirements for a given number of virtual machines.

Top benefits

User state virtualization with User Profile Disk reduces storage and maintenance costs for a given number of virtual machines.

Key features

This feature is applicable only to pooled virtual machines.

From an IT administrator's standpoint, pooled virtual machines are better than personal virtual machines because of the reduced storage costs required to manage and maintain them. The same virtual hard disks can be used for multiple pooled virtual machines, whereas with personal virtual machines, the storage requirements are too high to allow that. However, users often like the ability to customize their desktop environment, and users with different workflow requirements may need access to different tools from within the same pooled virtual machine.

Prior to Windows Server 2012 RC, users' state and customizations would be lost every time they logged on. To overcome this issue, Windows Server 2012 RC introduces the concept of a User Profile Disk. All user-state changes are stored in the User Profile Disk and they are persistent, which means that user-directed changes are applied after the next logon, and the process is easy.

Bottom line

A User Profile Disk gives VDI deployments an efficient storage footprint while still allowing users to customize their desktop environment.

USB support in session desktops

Session desktops based on Windows Server 2012 RC allow users to connect USB-based devices, including USB flash drives, to their client device and see these devices within their session-based desktop on the server. This functionality was introduced for virtual desktops in Windows Server 2008 R2 and is now available on session desktops as well.

Top benefits

- Provides greater convenience for users.
- Facilitates adoption of session desktops by removing one functional difference between session desktops and other types of desktops.

Key features

Remote Desktop in Windows Server 2012 RC now supports RemoteFX USB redirection for RD Session Host. RemoteFX USB redirection is designed to work with the following devices:

- All-in-one printer
- Scanner
- Biometric authorization device
- Webcam
- VoIP telephone/headset

RemoteFX USB Redirection is configured by using Group Policy.

Bottom line

USB redirection offers a nearly seamless added functionality to session-based desktops in your Remote Desktop deployment.

DirectAccess improvements

DirectAccess is a powerful tool for administrators who want to enable remote users to access important corporate resources, whether or not they also want to deploy centralized desktops. In Windows Server 2012 RC, we've made DirectAccess even better: more powerful, easier to deploy, and with broader functionality.

DirectAccess improvements: Unified Remote Access

DirectAccess allows remote users to access internal resources more securely without VPN connectivity. It establishes transparent connectivity to the corporate network every time a DirectAccess client computer connects to the Internet, even before the user logs on.

In Windows Server 2012 RC, DirectAccess and Routing and Remote Access service (RRAS) are integrated into a single remote access server role. The role is divided into two components: DirectAccess with VPN and Routing. DirectAccess and VPN can be configured together in the remote access management console by using a single set of wizards. Other RRAS features can be configured by using the legacy Routing and Remote management console. The new role allows easy migration of Windows 7 RRAS and DirectAccess deployments and provides a number of new features and improvements.

Top benefits

- DirectAccess allows administrators to easily monitor connections, and remotely manage DirectAccess client computers located on the Internet.
- DirectAccess is now easier to deploy and configure.
- The administrator has the option of omitting a Secure Sockets Layer (SSL) certificate during DirectAccess implementation.

Key features

DirectAccess improvements in Windows Server 2012 RC include simplified deployment steps, support for new deployment scenarios, a streamlined management experience, and improved scalability and performance. The details of these improvements include:

- **Improved management experience.** DirectAccess and VPN for multiple remote access servers can be configured, managed, and monitored in a single location by using the new Remote Access management console. The console provides comprehensive monitoring information on specific server components and allows you to log detailed accounting data and statistics to a local database or RADIUS (Remote Authentication Dial-In User Service) server. You can also see detailed views of connected users and computers, and even monitor which resources clients are accessing.

  Administrators also have access to Windows PowerShell command-line tools and automated scripts for Remote Access setup, configuration, management, monitoring, and troubleshooting.

  On client computers, users can access the Network Connectivity Assistant to see a concise view of the DirectAccess connection status along with links to corporate help resources, diagnostics tools, and troubleshooting information.

- **Ease of deployment.** The enhanced installation and configuration design in Windows Server 2012 RC allows you to set up a working deployment quickly and easily. For example, in simple deployments, DirectAccess can be configured without setting up a certificate infrastructure.

  Traditionally, DirectAccess required the deployment of two IPsec tunnels, one to authenticate and manage clients and a second to provide client access to corporate resources after authentication. In Windows Server 2012 RC, you can deploy DirectAccess with a single IPsec tunnel.

- **New and improved deployment scenarios.** Remote access in Windows Server 2012 RC includes a number of additional enhancements, including better support for forced tunneling, simpler configuration of Network Access Protection (NAP) compliance, multiple-domain and multiple-site deployment support, additional authentication options, and the ability for client computers to join a domain remotely over the Internet.

- **Scalability improvements.** Remote access offers a number of scalability improvements, including support for more users with better performance and lower costs. Remote access servers can be clustered for load balancing, high availability, and failover.

  Remote access server role takes advantage of Single Root I/O Virtualization (SR-IOV) for improved I/O performance when running on a virtual machine. In addition, Remote access improves the overall scalability of the server host with support for IPsec hardware offload capabilities (available on many server interface cards that perform packet encryption and decryption in hardware).

  Optimization improvements in IP-HTTPS take advantage of the encryption provided by IPsec. This optimization, combined with the SSL encryption requirement being removed, produces an increase in scalability and performance.

Bottom line

The enhanced features and simple management tools available with the Unified Remote Access server role provide clients with simple, highly secure connectivity to corporate resources.

Branch office support

Modern businesses often find themselves in a branch office situation, whether because they establish a main office with satellite workers or simply because of moving key servers off site to a data center. Windows Server 2012 RC includes features that improve the Branch Office computing experience.

BranchCache improvements

BranchCache is a WAN bandwidth optimization technology that was included in Windows Server 2008 R2 and has been considerably improved for Windows Server 2012 RC. To optimize WAN bandwidth, BranchCache downloads content from your content servers and caches it at office locations, allowing local client computers to access it.

After a client has downloaded content one time, other client computers that request the same content don't download it from the content servers over the WAN connection; instead, they retrieve small identifiers, called *content information*, from the remote content servers. Clients use the content information to find the content in the local office, cached on either a server running Windows Server or on other client computers, depending on the mode in which BranchCache has been deployed.

Top benefits

- Reduced bandwidth use
- Improved data access time

Key features

BranchCache can be deployed in larger branch offices due to the following improvements:

- **Deployment of multiple hosted cache servers.** Windows Server 2012 RC provides the ability to scale hosted cache mode deployments for offices of any size by allowing you to deploy as many hosted cache servers as are needed at a location (Figure 29).
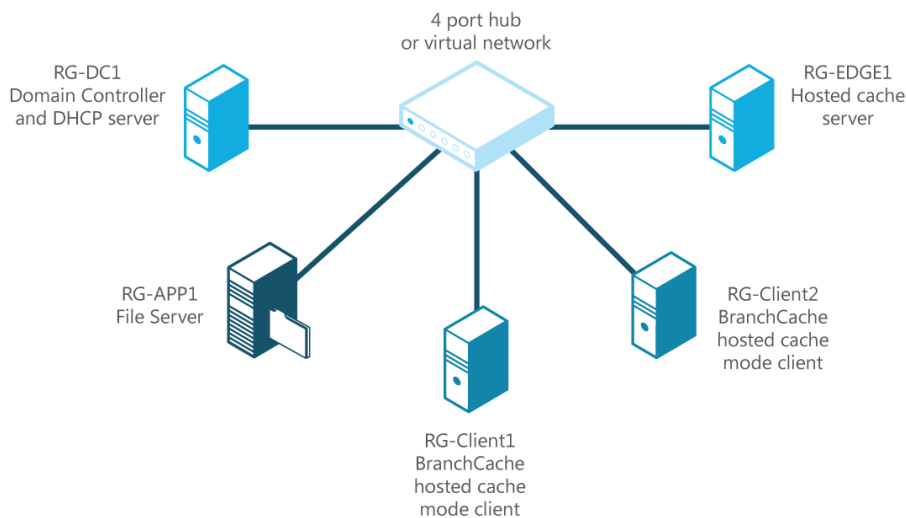

Figure 29. BranchCache now supports multiple hosted cache servers.

- **Improved database performance.** BranchCache now uses the Extensible Storage Engine (ESE) that powers Microsoft Exchange Server. This allows a single hosted cache server to meet the demands of more people while using the same hardware. It also allows a hosted cache server to store significantly more data (on the order of terabytes), which is necessary to provide high optimization for many people.

- **New tools and simplified deployment model.** BranchCache is more effective, easier to implement, and less expensive to operate due to new tools and a simplified deployment model:

  o BranchCache no longer requires office-by-office configuration. There is no requirement for a Group Policy object (GPO) for each location, streamlining deployment. A single GPO that contains a small group of settings is all that is required to deploy BranchCache in any size organization, from a small business to a large enterprise.

  o Client computer configuration is automatic. Clients can be configured through Group Policy as distributed cache mode clients by default, but they will search for a hosted cache server—and if one is discovered, clients automatically self-configure as hosted cache mode clients.

  o Cache data is kept encrypted and hosted cache servers don't require server certificates. Previously, hosted cache servers were required to have a server certificate that was issued by a certification authority (CA) that client computers at the office location trusted. Deploying a public key infrastructure with one or more CAs is complex and expensive; however, this requirement is now removed because BranchCache security has been improved through data encryption and other technologies. Additional drive encryption technologies are no longer needed to protect cached data.

  o BranchCache can now be managed with Windows PowerShell and WMI, which enable scripting and remote management of BranchCache content servers, hosted cache servers, and client computers.

  o BranchCache provides tools to manipulate data and preload the content at remote locations ahead of time.

  o BranchCache is deeply integrated with Windows File Server, and borrows the state-of-the-art technology used to divide files into small pieces and eliminate duplicates. This greatly increases the chance of finding duplicate pieces in independent files, resulting in greater bandwidth savings. BranchCache is also more tolerant of small changes in large files.

  o File division calculations are performed only one time and may be done offline. When a client computer running Windows 8 downloads content from a file server or web server that is running Windows Server 2012 RC and is using new disk deduplication technology, there is no need for BranchCache to spend CPU cycles calculating how to divide the content—because the file server and web server have already made these calculations. Content information is calculated offline, well before a BranchCache client requests a file. This provides faster performance and more bandwidth savings, because content is ready for the first client who requests it.

Bottom line

BranchCache offers a simpler, more secure, more robust way of optimizing content delivery and application performance over WAN connections. In Windows Server 2012 RC, BranchCache features significant improvements in performance, security, and ease of use.

Branch Office Direct Printing

Branch Office Direct Printing allows print jobs from a branch office to be redirected to local printers without going to a print server in a data center. With this feature, users don't need to deploy costly WAN optimizing appliances specifically for printing purposes.

The printer driver deployment and other configuration data are still accessed from the data center. When a print job is started from the branch office, the printer configuration and drivers are accessed through the data center if needed, but the print job is sent to the local printer for fulfillment.

Top benefits

- Reduction in overall bandwidth use from the branch office.

- Reduction in printing time, which improves user experience.

Key features

If for some reason the WAN link is inactive, print jobs continue to work by using the last known configuration. This improvement resolves an issue with previous versions of Branch Office Direct Printing and helps to ensure that the branch office still has print ability even if the WAN isn't available.

Bottom line

Branch Office Direct Printing reduces WAN usage and enables quicker printing at branch offices.

Easier security and compliance

Secure data access in the modern work style requires more than just file access control and encryption, although these are both important. Administrators increasingly also need the ability to analyze how files are being accessed. Windows Server 2012 RC addresses all these needs through intelligent and auditable security capabilities.

Security, audit, and compliance

Windows Server 2012 RC helps administrators set up centralized access rules and policies by taking advantage of file claims. Claims are assertions about attributes of the object with which they are associated. Policy-based file classification can use these claims to establish security rules, usually related to compliance and business requirements. These are often targeted at protecting the right access to managed information—for example, preventing modification or deletion of files that are under retention or eDiscovery. These policies are defined and hosted in AD DS.

A central policy rule has the following logical parts:

- **Applicability.** A condition that defines which data the policy applies to. (Example: Resource.BusinessImpact=High)

- **Access conditions.** A list of one or more access control entries (ACEs) that define who can access the data. (Example: Allow | Full Control | User.EmployeeType=FTE)

- **Exception.** An additional list of one or more ACEs that define an exception for the policy. (Example: MemberOf[HBIExceptionGroup])

Combining the functionality of claims and policies allows administrators to establish powerful and flexible rules—for example, an administrator can specify that to access files classed as (HBI) data, a user must be a full-time employee, access from a managed device, and log on with a smart card.

In addition to these rules, Windows Server 2012 RC includes functionality that empowers administrators to perform audits on the file servers to verify that they comply with the various regulations or internal policies defined by the company.

Auditability allows IT administrators to monitor file access and generate reports. These reports allow them to verify compliance or take corrective action as needed to prevent file access to specific roles or individuals.

Top benefits

- Standardization of access rights to particular files based on the type of data they contain.

- Ability to establish policies restricting access to groups of files.

- Powerful, flexible tools that administrators can use to author customized audit policies.

Key features

The administrator can set up a central audit policy across file servers, allowing them to do targeted access-auditing of files on the file servers.

The administrator can also set up audit-access events that are based on metadata in the files, such as whether it has financial information or is HBI, so events can later be correlated by systems that collect and report on events across multiple servers. For example, they can audit:

- All successful access of files that contain financial information.

- All failed access to HBI files.

This feature set is based on infrastructure investments that can be further used by partners and line-of-business applications, providing great value for organizations using AD DS and Windows. This infrastructure includes:

- New Windows authorization and audit engine that can process conditional expressions and central policies.

- New Kerberos authentication support for user claims and device claims.

- Improvements to the File Classification Infrastructure (FCI).

- Rights Management Services (RMS) extensibility support so that partners can provide solutions that encrypt non-Microsoft Office files.

As a result, with Windows Server 2012 RC, administrators can author audit policies by using claims and resource properties, which facilitates scenarios that until now were either impossible or too difficult to implement. Figure 30 shows a sample audit policy.
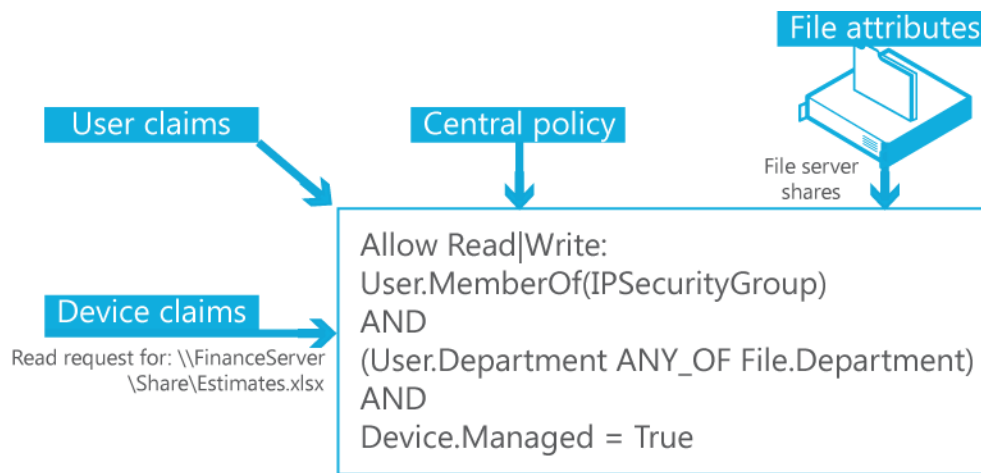

Figure 30. Parts of a sample audit policy.

Powerful audit tools in Windows Server 2012 RC help administrators track access to secure data and comply with applicable regulations.

User Device Affinity

Today, enterprises are deploying centralized desktop systems that take advantage of user state technologies such as Roaming User Profiles (RUP) and Folder Redirection. With past operating systems, it was very difficult to limit these user state technologies to a specific set of computers.

Windows Server 2012 RC supports mapping a user to a limited set of computers where Folder Redirection and/or RUP are to be used (Figure 31). This functionality, User Device Affinity, replaces complicated workarounds that involved custom scripts and WMI filters on GPOs and provides a simpler and more powerful method for associating users with particular computers or devices. On a computer mapped to the user, the roaming user profile or redirected folders are immediately available at logon. On a computer not mapped to the user, the user instead receives a local profile with no personal settings or data.
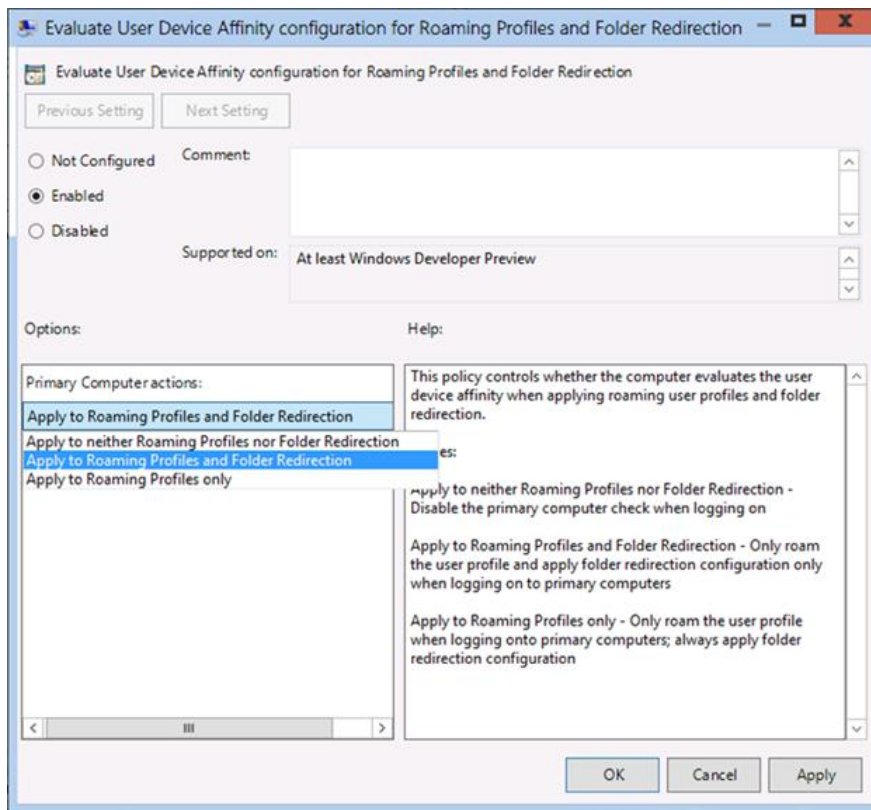
Figure 31. Configuring User Device Affinity by using GPOs.

Top benefits

- The administrator can specify which computers a user can use to access redirected data and settings. For example, the administrator can choose to roam user data and settings between a user's desktop and laptop, but not to roam when that user logs on to a conference room computer.

- The security and privacy risk of leaving residual personal or corporate data on computers where the user has logged on is reduced. For example, a general manager who logs on to an employee's computer for temporary access won't leave behind personal or corporate data.

- Administrators can mitigate the risk of an improperly configured or otherwise corrupt profile. Corruption could result from roaming between differently configured systems, such as an x86 system and an x64 system. User Device Affinity helps avoid this by letting administrators specify the systems onto which a profile can roam.

Key features

The AD DS schema has been extended to support the concept of "primary computers" associated with a user. An administrator can populate the primary computer attribute with a list of machine names for a user or group object, using the Active Directory Service Interfaces (ADSI) Edit tool or Lightweight Directory Access Protocol (LDAP).

To make User Device Affinity possible, Folder Redirection and RUP components incorporate additional logic checks when a user logs on to a machine. Specifically, there are two additional checks:

- Windows checks the new Group Policy setting to determine if the PrimaryComputer attribute in AD DS should influence the decision to roam the user's profile or apply Folder Redirection.

- If the policy setting enables PrimaryComputer support, Windows verifies whether the AD DS schema supports the PrimaryComputer attribute. If it does, Windows checks to see whether the computer the user is logging on to is designated as one of the user's primary computers.

    o If the computer is one of the user's primary computers:

        – Windows applies the roaming user profile and redirected folders.

    o If the computer is not one of the user's primary computers:

        – Windows loads a cached local profile for the user, if present, or creates a new local profile.

        – Windows removes any existing redirected folders according to the removal action specified by the previously applied policy setting, which is retained in the local Folder Redirection configuration.

Bottom line

User Device Affinity lets administrators easily control which computers roaming profiles and offline files are stored on.

DNSSEC

Domain Name System Security Extensions (DNSSEC) is an important data security feature that can help prevent man-in-the-middle attacks, and with Windows Server 2012 RC, it's easier than ever to set up and manage.

Windows Server 2012 RC simplifies configuration and management of DNSSEC by adding support for online signing and automated key management. The added features allow enterprise customers to protect both their internal DNS infrastructure and external DNS communication while reducing management overhead and lowering total cost of ownership.

Top benefits

- Support for the latest standards.

- Integration with AD DS.

- Simple deployment.

- A "sign and forget" operation experience.

Key features

DNSSEC is a suite of additions to DNS that helps protect DNS traffic from attack. By validating a digital signature attached to each DNS response, the resolver can verify the authenticity of DNS data, even from an untrusted DNS server. Specifically, DNSSEC provides origin authority, data integrity, and authenticated denial of existence.

Windows Server 2012 RC adds several new features to the management and implementation of DNSSEC.

- Support for the latest DNSSEC standards, including:

    o NSEC3 signing per RFC 5155, including support for authenticated denial of existence.

    o RSA/SHA-2 per RFC 5702.

    o Automated Trust Anchor Rollover per RFC 5011.

- Simplified deployment and management via DNS Manager and Windows PowerShell.

- One-step "sign the zone" wizard within DNS Manager.

- AD DS integration, including:

    o Key generation and replication.

    o DNS dynamic updates in DNSSEC signed zones.

    o Automated trust anchor distribution through AD DS.

- Automatic updating of trust anchors within a zone.

- Automated zone signing functionality with Dynamic Zone Signing, including:

    o Automatic signing of zone data.

    o Background zone signing.

    o Dynamic updates.

    o Scavenging.

- Automated key rollover management.

- Key master functionality that can be assigned to a server of choice on a per-zone basis.

Bottom line

Windows Server 2012 RC enables simpler deployment and management of DNSSEC, adds support for the latest standards, and integrates DNSSEC with AD DS.

Encrypted Hard Drive BitLocker

Encryption offers significant benefits for enterprise data security, but can be cumbersome and resource draining to implement. Windows Server 2012 RC Encrypted Hard Drive uses rapid BitLocker Drive Encryption to enhance data security and management. Because Encrypted Hard Drive encrypts data quickly, enterprise clients can expand BitLocker deployment with minimal impact on productivity.

Top benefits

Encrypted Hard Drive BitLocker provides higher-performance encryption that uses fewer system resources.

Key features

In earlier versions of Windows, BitLocker required a two-step process to complete read/write requests, but in Windows Server 2012 RC, Encrypted Hard Drive offloads the cryptographic operations to the drive controller for much greater efficiency. By offloading the cryptographic operations to hardware, Encrypted Hard Drive increases BitLocker performance and reduces CPU usage and power consumption.

When Windows Server 2012 RC initializes Encrypted Hard Drive, it activates the security mode. This activation enables the drive controller to generate a media key for each volume that the host creates. This media key, which is never exposed outside the drive, is used to rapidly encrypt or decrypt every byte of data that goes to the media.

Bottom line

Encrypted Hard Drive helps you quickly and easily improve drive security with minimal loss of performance or productivity.

Summary

If you are involved in IT management or operation, you know that the modern work style places great demands on IT systems and the administrators who establish and maintain them. Fortunately, Windows Server 2012 RC is full of features to help you, including:

- Intelligent, unified management of centralized desktops through a dedicated portal.

- Lower storage costs via Server Message Block (SMB).

- A better user experience, with rich performance over networks and features that help maintain personalization.

- More secure and better managed access to sensitive data.

- Improvements to DirectAccess.

- Expanded functionality and scalability for BranchCache.

The new features and tools in Windows Server 2012 RC give you greater flexibility and control over a variety of deployment scenarios, while simplifying connectivity and troubleshooting. The modern work style is certain to keep evolving, but with Windows Server 2012 RC, you have the tools to support your users while improving efficiency, security, and cost.

Conclusion

Microsoft built Windows Server 2012 RC so you can capitalize on your existing investment while cloud optimizing your IT. With Windows Server 2012 RC, you can:

- Go **beyond virtualization** by scaling and securing workloads, cost-effectively building a private cloud, and securely connecting to cloud services.

- Enjoy the **power of many servers with the simplicity of one** by efficiently managing infrastructure while maximizing uptime and minimizing failures and downtime.

- Enable **every app on any cloud** by building on an open and scalable web platform that supports cross-premises applications.

- **Enable the modern work style** by giving people access to information and data regardless of the infrastructure, network, device, or application they use to access it.

By choosing Windows Server 2012 RC now, you are preparing for the future. As you continue to grow and work within a heterogeneous environment, you can select the path that's best for your business. Whether implementing a private cloud is around the corner or over the horizon, Windows Server 2012 RC offers the best platform to prepare for and implement cloud-optimized IT.