Windows Server® 2008 R2

## Scalability and Reliability

Disclaimer

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Scalability and Reliability

Windows Server 2008 R2 is capable of unprecedented workload size, dynamic scalability, and across-the-board availability and reliability. A host of new and updated features contribute to this, including:

Leveraging Sophisticated CPU Architectures

Server hardware has offered 64-bit processors for several years, and Windows Server 2008 R2 is 64-bit only, supporting the performance and reliability advantages of this architecture. Windows Server 2008 R2 now supports up to 256 logical processors in a single operating system instance, while Hyper-V can make use of up to 64 logical processors in the host processor pool.

Hyper-V R2 also includes a new Processor Compatibility feature. Processor compatibility allows a virtual machine to move among systems with processors of differing generations from the same vendor. When a VM is started with processor compatibility mode enabled, Hyper-V normalizes the processor feature set and only exposes the guest to processor features that are available on all Hyper-V enabled processors of the same processor architecture, i.e., AMD or Intel. This allows the VM to be migrated to any hardware platform of the same processor architecture. Processor features are "hidden" by the hypervisor by intercepting a VM's CPUID instruction and clearing the returned bits corresponding to the hidden features.
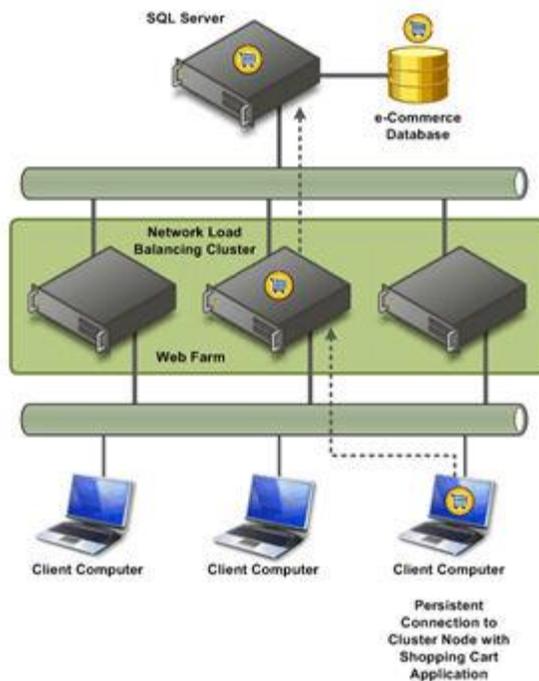
Dynamic Memory

Enables customers to better utilize the memory resources of Hyper-V hosts by balancing how memory is distributed between running virtual machines. Memory can be dynamically reallocated between different virtual machines in response to the changing workloads of these machines. Dynamic Memory thus enables more efficient use of memory while maintaining consistent workload performance and scalability. Implementing Dynamic Memory means that higher levels of

server consolidation can be achieved with minimal impact on performance. Dynamic Memory also means larger numbers of virtual desktops per Hyper-V host for VDI scenarios. The net result for both scenarios is more efficient use of expensive server hardware resources, which can translate into easier management and lower costs.

Increased operating system componentization

Microsoft introduced the concept of server roles to allow server administrators to quickly and easily configure any Windows-based server to run a specific set of tasks and remove extraneous OS code from system overhead. Windows Server 2008 R2 further extends this model with support for more roles and a broadening of current role support, like the addition of ASP.NET within IIS 7.0. Roles have been refined and feature sets redefined as customers have expressed desires for certain capabilities in popular scenarios. The Server Core installation option is an appropriate mention here with new (and much demanded) support for PowerShell scripting made possible by the addition of the .NET Framework to the list of server roles supported in the Server Core installation option.

Improved performance and scalability for applications and services

Another key design goal was to provide higher performance for Windows Server 2008 R2 running on the same system resources as previous versions of Windows Server. In addition, Windows Server 2008 R2 supports increased scaling capabilities that help support more intensive workloads than ever before.

- **Increased Scale-Out Workload Support**
  - o The Network Load Balancing feature in Windows Server 2008 R2 allows you to combine two or more computers in to a cluster. Use NLB to distribute workloads across the cluster nodes in order to support a larger number of simultaneous users. Network Load Balancing feature improvements in Windows Server 2008 R2 include:
  - o Improved support for applications and services that require persistent connections.
  - o Improved health monitoring and awareness for applications and services running on Network Load Balancing clusters.
- **Increased Scale-Up Workload Support**
  - o Windows Server 2008 R2 includes features that support larger workloads on individual servers. Scaling up can help reduce the number of servers in your data center and can help improve power efficiency. Features that support scaling up include:
  - o Increased number of logical processors supported – Windows Server 2008 R2 scales to 256 logical processors, for business-critical servers supporting large databases, line of business, and custom applications which sometimes require highly reliable, scalable servers. Hyper-V supports up to 64 logical processors.
  - o Reduced operating system overhead for graphical user interface.
  - o Improved performance for storage devices.

Improved Reliability

Windows Server 2008 R2 offers a variety of features which can help improve solution reliability, particularly when paired with today's most robust server hardware.

- Windows Hardware Error Architecture (WHEA) has been enhanced to support Machine Check Architecture (MCA) error recovery, offering the ability to contain and recover from several types of multi-bit ECC errors in memory and cache without operating system or application interruption.
- Dynamic Hardware Partitioning works with dynamically partitionable server hardware to enable partition units containing processors, RAM, or IO resources can be added or replaced without restarting the operating system. Windows Server 2008 R2 supports hot-add of processors, memory, and I/O host bridges, and hot-replace of processors and memory on x64-based and Itanium-based systems which support DHP.
- Windows Server 2008 R2 includes support for fault tolerate memory synchronization. Fault-tolerant servers contain redundant hardware – from fans and power supplies, to processors and RAM, which run in lockstep with each other. If a primary component fails, the secondary component takes over in a process that is seamless to the application running on the server.

Improved Storage Solutions

The ability to quickly access information is more critical today than ever before. The foundation for this high-speed access is based on file services and network attached storage (NAS). Microsoft storage solutions are at the core of providing high-performance and highly available file services and NAS. The release version of Windows Server 2008 introduced many improvements in storage technologies. Windows Server 2008 R2 includes additional improvements that enhance the performance, availability, and manageability of storage solutions.

Improved Storage Solution Performance

Windows Server 2008 R2 includes a number of performance improvements in storage solutions, including:
- Reduced processor utilization to achieve "wire speed" storage performance.
- Improved storage input/output process performance.
- Improved performance when multiple paths exist between servers and storage.
- Improved connection performance for iSCSI attached storage.
- Improved support for optimization of the storage subsystem.
- Reduced length of time for operating system start.

Improved Storage Solution Availability

Availability of storage is essential to all mission-critical applications in your organization. Windows Server 2008 R2 includes the following improvements to storage solution availability:
- Improved fault tolerance between servers and storage.
- Improved recovery from configuration errors.

Improved Storage Solution Manageability

Management of the storage subsystem is another design goal for Windows Server 2008 R2. Some of the manageability improvements in Windows Server 2008 R2 include:

- o   Automated deployment of storage subsystem configuration settings.

- o   Improved monitoring of the storage subsystem.

- o   Improved version control of storage system configuration settings.

Improved Protection of Intranet Resources

The Network Policy Server (NPS) is a Remote Authentication Dial-In User Service (RADIUS) server and proxy and Network Access Protection (NAP) health policy server. NPS evaluates system health for NAP clients, provides RADIUS authentication, authorization, and accounting (AAA), and provides RADIUS proxy functionality.

NAP is a platform that includes both client and server components to enable fully extensible system health evaluation and authorization for a number of network access and communication technologies, including:

- Internet Protocol security (IPsec)-protected communication

- 802.1X-authenticated access for wireless and wired connections

- Remote access virtual private network (VPN) connections

- Dynamic Host Configuration Protocol (DHCP) address allocation

- Terminal Service (TS) Gateway access

The improvements to NPS in Windows Server 2008 R2 include:

- Automated NPS SQL logging setup

- NPS logging improvements

- NAP multiple configurations of a system health validator (SHV)

- NPS templates

- Migration of Windows Server 2003 Internet Authentication Service (IAS) servers