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Virtualizing Microsoft Dynamics CRM using Microsoft Windows Server 2008 R2 with Hyper-V on IBM System x3650 M3

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Executive Summary

Running Microsoft® Dynamics® CRM software in a virtualized environment that uses Microsoft Windows Server® 2008 R2 with Hyper-V™ running on IBM® System x3650 M3 servers equipped with the latest Intel® Xeon® Processor 5600 series can deliver outstanding performance and virtualization reliability, plus the cost advantages of virtualization and multi-tenancy.

Workload testing by the IBM Center for Microsoft Technologies showed that this environment could be scaled to accommodate small, medium or large organizations without sacrificing performance. Following basic guidelines can help you design a robust and effective virtualized environment for Microsoft Dynamics CRM.

Microsoft Dynamics CRM Helps Drive Customer Satisfaction

Establishing strong customer relationships can mean the difference between surviving and thriving. By adopting effective customer relationship management (CRM) tools and forging links to financial management and enterprise resource planning (ERP) systems, your organization can retain satisfied customers and build their businesses.

IT professionals need to deliver CRM solutions that balance business needs with a range of other requirements, including performance, scalability and cost. Microsoft Dynamics CRM software is designed to meet these IT challenges while delivering the information your organization needs to convert customer encounters into opportunities for building stronger, more profitable relationships. Microsoft Dynamics CRM provides tools for monitoring and measuring sales, customer service, and marketing while also enabling a variety of analytic capabilities to help identify your organization's most valuable customers.

Microsoft Dynamics CRM also can be customized to meet your specific business needs. By using the flexible "xRM" (or "anything relationship management") application development platform, Microsoft Dynamics CRM enables your IT group to customize CRM while also simplifying the creation and efficient management of additional line-of-business (LOB) applications. With xRM, your organization can use familiar technologies, such as Microsoft Office, SQL Server®, Visual Studio®,.NET Framework and Windows Server, and capitalize on a common infrastructure with shared licenses and resources to accelerate results.

Microsoft Dynamics CRM also can facilitate IT consolidation and help you control costs through its built-in multitenancy capabilities. Multitenancy allows you to use a single CRM deployment to support multiple organizations. Individual business groups can have their own reports, workflows, customizations and schemas while the IT group uses just one physical server environment. With multitenancy, your business can accommodate the needs of specific groups without excessive hardware acquisition, management and support costs.

Hyper-V Helps Lower Costs and Improves Business Agility

Running Microsoft Dynamics CRM in a virtualized server environment offers an additional means of controlling costs. Virtualizing servers can help businesses make the most of hardware investments by consolidating multiple server roles onto a single physical server. By reducing the number of physical servers required, virtualization helps decrease the costs of acquiring, housing, powering, cooling, and managing hardware. Virtualization also can help enhance IT efficiency by increasing utilization of hardware and balancing workloads across different resources. Finally, virtualization can help increase business agility by facilitating the rapid and cost-effective provisioning of new servers.

For many organizations, Microsoft Windows Server® 2008 R2 with Hyper-V™ offers the most cost-effective solution for virtualization with the easiest learning curve. Organizations can run Hyper-V in 64-bit mode as a role in Windows Server 2008 R2 or as a stand-alone, console-based hypervisor in the Microsoft Hyper-V Server 2008 R2 product (available for download from the Microsoft Web site). IT administrators can provision up to four virtual processors and 64GB of memory for each virtual machine (VM), depending on the guest operating system loaded. Each VM has its own operating system instance and is completely isolated from the host operating system as well as from other VMs, ensuring strong security boundaries between the VMs. Organizations also can select a high-availability option by using Microsoft Hyper-V Server 2008 R2 with Microsoft Clustering installed. (Note that Hyper-V does not support Intel Itanium® processor-based servers.)

IBM System x Servers Provide a Robust Platform for Virtualization

IBM System x® servers can deliver the performance and reliability required for virtualizing Microsoft Dynamics CRM and other mission-critical applications on Hyper-V. To provide the performance for CRM in a virtualized environment, IBM System x3650 M3 servers, for example, can be equipped with up to two 3.33 GHz six-core processors from the Intel Xeon Processor 5600 series. With Intel Hyper-Threading enabled, the System x3650 M3 servers each offer 24 logical processors and up to 192GB of memory.

Intel Xeon Processor 5600 Series Offers High-Performance Virtualization

Selecting IBM System x servers with the Intel Xeon Processor 5600 series can help organizations build a robust, virtualized environment for running Microsoft Dynamics CRM 4.0, at a lower total cost of ownership. Intel Xeon processors have shown performance leadership in running Microsoft Dynamics CRM software in both native and virtualized environments. The Xeon 5600 series with Intel Virtualization Technology (VT) delivers exceptional performance, energy efficiency and reliability in a virtualized environment.

In virtualized settings, Intel VT provides hardware assistance to virtualization software, helping to reduce the size and complexity of the virtual machine manager and enabling less expensive, more efficient and more powerful virtualization solutions. Specifically, next-generation Intel VT enhances virtualization performance in several ways:

- Reduces the need for compute-intensive software translations between the guest and host operating systems in a virtual environment
- Decreases overhead by allowing the guest operating system to directly access CPU cycles
- Allows more virtual machines to run on a host server at near-native performance
- Provides unprecedented flexibility and control through multiplatform support and live virtual machine migration
- Enhances overall server performance

Intel VT offers hardware assistance to increase virtualization performance, including Intel Extended Page Tables (EPT), which enhance virtualization by providing hardware support for memory management of VMs. Intel EPT reduces the memory footprint and improves performance on most workloads, because Hyper-V does not need to maintain shadow page tables for processing virtual-to-physical memory translation.

With Intel VT FlexPriority, data centers can see even greater performance improvements. FlexPriority minimizes the impact of requests, or "interrupts," from other devices or applications to the processor by using a special register to monitor the priority of tasks so that only interrupts with the highest priority get immediate attention.

One of the key benefits of virtualization is the ability to migrate running applications from one physical server to another without downtime. Intel VT FlexMigration enables smooth migrations among current and future Intel processor-based servers. With this technology, hypervisors can establish a consistent set of instructions across all servers in the migration pool, creating a more flexible and unified pool of server resources that functions seamlessly across multiple hardware generations.

Servers running the Xeon 5600 series introduce a new microarchitecture that implements "Intelligent Performance," enabling the platform to adjust dynamically to meet the performance, throughput, and power needs of computing workloads:

- ***Intel Intelligent Power Technology*** introduces power management to the processor, chipset, and memory. With this technology, operating systems can move processor power and memory into the minimum states required to support current workloads without reducing performance, and individual cores can be idled independently from the others.

- ***Intel Turbo Boost Technology*** lets the processor operate above its rated frequency to speed specific workloads. For example, a **3.33GHz 6-core X5680** processor with **3-6** cores active can run the cores at **3.46GHz**. With only **one** or **two** cores active, the same processor can run those cores at **3.6GHz**. When the inactive cores are needed again, they are dynamically turned back on and the processor frequency is adjusted accordingly.

- ***Intel Hyper-Threading Technology*** allows simultaneous multithreading within each processor core to reduce computational latency. In most 5600 series processors, each core has two threads capable of running an independent process. Thus, a 6-core processor can run **12** threads concurrently. Combined with the larger caches and massive memory bandwidth of this architecture, Intel Hyper-Threading Technology can help deliver greater throughput and responsiveness for multithreaded applications.

Performance and Scalability Evaluation of Dynamics CRM on IBM Servers

The IBM Center for Microsoft Technologies in Kirkland, Washington, conducted a series of tests to evaluate the performance and scalability of Microsoft Dynamics CRM running in a Hyper-V virtualized environment on the IBM System x3650 M3 server. The goals were to determine whether this environment could meet the requirements of a demanding production environment and remain within the bounds of Microsoft best practices even as the environment was scaled to accommodate more users.

The testing of Microsoft Dynamics CRM 4.0 on an IBM Server x3650 M3 using Hyper-V was conducted using scenarios created from the Microsoft Dynamics CRM 4.0 Performance Toolkit. The testing included the standard tests in the testing toolkit, plus tests that included running reports, syncing to Microsoft Outlook and running workflows. This toolkit is available as a free download and is designed to help test the performance of Microsoft Dynamics CRM in customer environments.

The IBM team created three reference configurations that could accommodate 100, 500 and 1,000 users, respectively. There were two virtual servers for each configuration—one running Microsoft Dynamics CRM 4.0 and the other running Microsoft SQL Server 2008. Moving from the basic (100-user) configuration to the standard (500-user) and advanced (1,000-user) configurations, the IBM team increased the amount of system memory and hard disk drive (HDD) capacity, as well as the number of virtual processors and amount of memory assigned to virtual servers.

	Basic	Standard	Advanced
Number of users	100	500	1,000
Database size	5GB	25GB	50GB
x3650 M3 memory configuration	**12GB** memory	**24GB** memory	**48GB** memory
Storage	**8** internal SAS HDDs	**12** internal SAS HDDs	IBM System Storage® EXP3000 expansion unit with **20** SAS HDDs
Operating system	Windows Server 2008 R2 with Hyper-V		
Virtual server 1	Microsoft Dynamics CRM 4.0		
	2 virtual processors, **4GB** of memory	**2** virtual processors, **4GB** of memory	**4** virtual processors, **8GB** of memory
Virtual server 2	Microsoft SQL Server 2008		
	4 virtual processors, **8GB** of memory	4 virtual processors, **16GB** of memory	4 virtual processors, **32GB** of memory

Table 1. Server configurations by workload

Microsoft Dynamics CRM 4.0 Reference Configurations

As shown in *Figure 1*, response times remained low as systems scaled to accommodate more users.
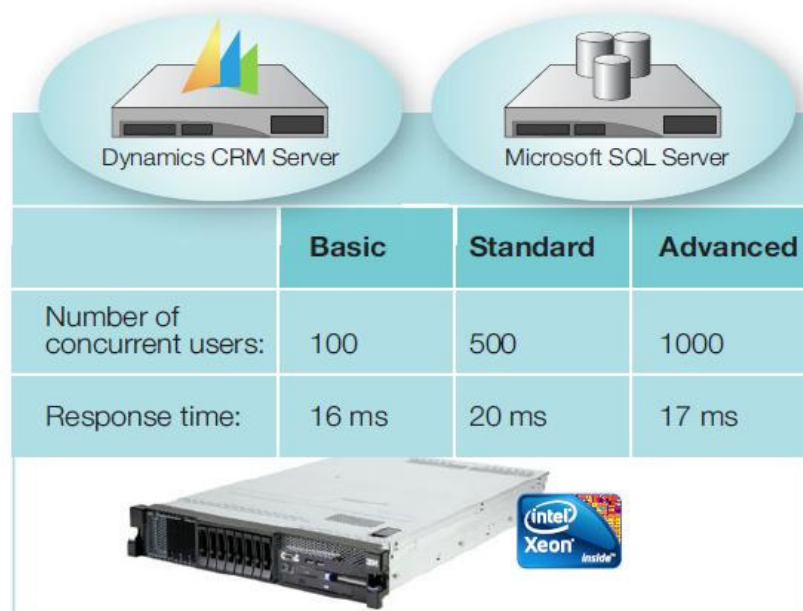
Figure 1. Response times by workload

The tests showed that running Microsoft Dynamics CRM 4.0 in a Hyper-V virtualized environment on an IBM System x3650 M3 server can deliver outstanding performance and scalability. The measured response times remained low across the three configurations. In all cases, they stayed

well within the bounds of Microsoft best practices. The tests suggest that small, medium, and large organizations can all capitalize on the cost savings and flexibility of virtualization and multitenancy while experiencing exceptional application performance on an x3650 M3 server running Dynamics CRM.

Maximize Virtualization Success through Advanced Planning

Creating an optimal, high-performance virtualized environment on Hyper-V for CRM or other mission-critical applications requires careful planning. IT organizations should profile the physical systems that are being replaced by virtualization and consult the users who will use the applications running in the virtualized environment. Following several basic guidelines can also help with planning:

- **Processor allocation.** Avoid overcommitting the logical processors in the host system. Unlike past methods of consolidating legacy servers, in which overcommitment of processors often ranged from three to four times their capacity, overcommitting processors with high-performance VMs may result in an unwanted performance penalty as they switch among VMs.
- **Memory allocation.** Hyper-V does not support overcommitting memory. Clustered hosts must have enough memory to support any additional VMs that might need to be migrated. If there is not enough physical memory for all the VMs, migration will fail.
- **Operating system installation.** Install the operating system for the VM on a dedicated virtual hard disk that will be attached to the IDE controller in the virtual machine. Ideally, the virtual disk should be backed by a fault-tolerant physical disk.
- **Application installation.** Install applications on one or more dedicated virtual disks attached to a SCSI controller in the VM, again backed by a fault-tolerant physical disk. I/O requirements will help determine the number of spindles required to sustain operations at the desired level.
- **Storage.** Ensure there is sufficient disk I/O available to support the servers being hosted. Disk I/O is a function of multiple inputs, but several key elements to consider are the type of drive (SAS, SATA, or solid-state), the number of drives used to create an array, and the storage controller being used. Cluster Shared Volumes (CSVs) allow multiple clustered Hyper-V servers to simultaneously access the same logical unit (LUN). To maximize performance, plan a disk configuration of larger arrays of disks, as well as larger LUNs mapped to the host servers with CSVs to simplify LUN configuration.
- **Networking I/O.** Allow for sufficient network I/O or even consider dedicated network interface controllers (NICs) for particularly heavy workloads. The physical NICs can be used to create virtual network switches on the host and can be assigned to VMs on an as-needed basis. If using Live Migration, consider an additional "Private Network" in your cluster to keep memory copies from being transferred off your primary network.

Microsoft Dynamics CRM: Ready for Virtualization on IBM x3650 M3

Server virtualization with Hyper-V and Intel Virtualization Technology can help you make the most of the available computing power within your data center. By increasing server utilization rates, virtualization helps to reduce the number of servers required and improve workload manageability. In addition, virtualizing mission-critical systems such as Dynamics CRM on IBM System x3650 M3 servers can help to simplify IT infrastructure and increase efficiency, while controlling energy consumption, cooling, floor space, and management costs.

Testing demonstrates that Microsoft Dynamics CRM performance within a Hyper-V virtualized environment is sufficient for production deployment and well within Microsoft best-practice recommendations. However, deployments vary greatly. Careful analysis of the solution and

thorough testing prior to deployment into production is highly recommended. The solution shown in this document is only one of numerous deployment strategies that should be considered.

For More Information

To learn more about virtualization using Microsoft Hyper-V on the IBM System x platform, please contact your IBM representative or visit:
ibm.com/systems/x/solutions/infrastructure/virtualization

Details about the new IBM x3650 M3 servers can be found here:
http://www-03.ibm.com/systems/x/hardware/rack/x3650m3/index.html

Learn more about Microsoft Hyper-V Server 2008 R2:
microsoft.com/hyper-v-server/en/us/r2.aspx

See which Microsoft applications and operating system combinations are supported on Hyper-V:
www.windowsservercatalog.com/svvp.aspx?svvppage=svvpwizard.htm

Learn more about the new Intel Xeon 5600 series processors:
http://www.intel.com/Assets/PDF/prodbrief/323501.pdf

For More Information

IBM System x Servers	http://**ibm.com**/systems/x
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