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Using the IBM System i to IBM System x iSCSI connection with Oracle's JD Edwards EnterpriseOne 8.11

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Executive summary

JD Edwards EnterpriseOne customers who choose to deploy the web application server components on the IBM® System x™ or IBM BladeCenter® servers can connect those servers directly to the IBM System i™ application logic and database server by installing the iSCSI Host Bus Adapters (HBAs) and industry-standard 1 Gbps Ethernet networking technology.

Using the iSCSI HBAs, this combination of System i as the JD Edwards EnterpriseOne application logic and database server and System x or BladeCenter as the JD Edwards EnterpriseOne web server offers not only improved performance but the flexibility to run mixed server environments in a single, consolidated infrastructure with minimum complexity.

In order to demonstrate the performance advantage of this exclusive IBM solution in a JD Edwards EnterpriseOne environment, the IBM / Oracle International Competency Center conducted tests using JD Edwards EnterpriseOne standard test protocols. The JD Edwards EnterpriseOne web server achieved as much as a 28% reduction in CPU utilization when the System x server was connected using the iSCSI adapters to a System i application logic and database server compared to when the System x was a standalone server using its own disk drives and communicating over external TCP/IP connections. Response times of the users remained consistent and sub-second.

Background

Many businesses today, including those running JD Edwards EnterpriseOne software, operate mixed server environments that include Intel® processor-based servers running Microsoft® Windows® server applications in addition to core business applications running on System i. This mix of servers may grow into a challenging environment that involves supporting many discrete Intel servers at higher costs with increased management complexity.

System x (formerly IBM eServer™ xSeries®) offers one of the widest ranges of choices of commodity based servers in the market today. By leveraging the combined capabilities and experiences of each server brand within the IBM System Group, System x incorporates technology and capabilities that competitors charge additionally for, offered in reduced height chassis that customers embrace. IBM BladeCenter is now available in 3 different chassis that can house Intel, AMD® or POWER™ processors and a wide assortment of networking technologies and switches. System x is designed from the ground up for performance and availability.

IBM announced the System i iSCSI HBA solution, adding to the existing offerings of the IBM Integrated xSeries Server (IXS) and IBM Integrated xSeries Adapter (IXA), because customers had been asking for more capacity and additional models of BladeCenter and System x servers to attach to the System i. Not only does the iSCSI solution support BladeCenter Servers and an expanded list of System x models, it also lowers hardware costs and utilizes open standards.

iSCSI stands for internet SCSI (Small Computer System Interface) which is an industry-standard storage networking protocol for linking data storage facilities. iSCSI commands are channeled across an Ethernet network in TCP/IP packets. By taking advantage of iSCSI HBAs, one or more diskless System x or BladeCenter servers can be attached to the System i platform via standard 1 Gbps Ethernet switches and cables. These iSCSI HBAs tightly integrate and centralize server management and leverage customers' investment in System i resources. Each System x server or BladeCenter has its own processors, memory and iSCSI HBA card, but shares the dynamic storage, tape, DVD and systems management resources of the System i. Disk storage is allocated to Windows by creating a Storage Space object (i.e. dynamic virtual disk space) from the System i pool of disk resources. See Figure 1 for an example of a BladeCenter iSCSI solution and Figure 3 for an example of a System x iSCSI solution.

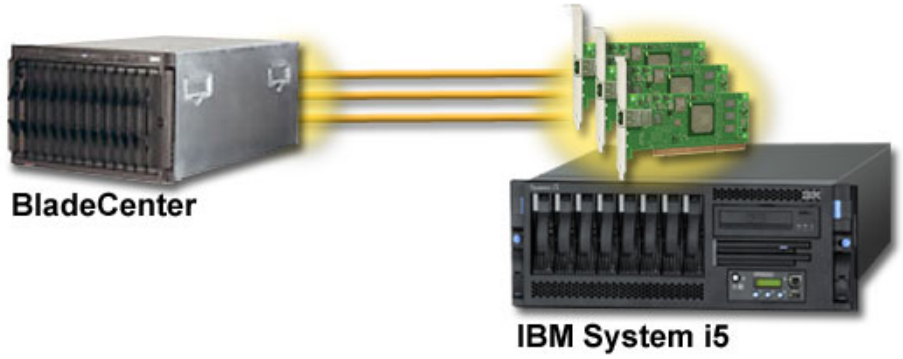

Figure 1. IBM BladeCenter connected via iSCSI HBA solution to System i

System i integration with System x and BladeCenter via iSCSI HBAs is supported on i5/OS® V5R4 with POWER5™ hardware, and coexists with IXSs and IXAs. For more information on the System i and System x models that support the iSCSI adapters see Appendix A.

This report covers the tests that were run to quantify the performance of the iSCSI adapters and outlines the advantages of the System i iSCSI HBA solution. An xSeries 336 was set up to run as a JD Edwards EnterpriseOne web server communicating to a System i application logic and database. The System x was tested using two different configurations:

- as a standalone web server
- as a web server attached via iSCSI HBAs

The only difference between the two test environments was the iSCSI HBA integration. All other variables were held constant and unconstrained in order to measure CPU utilization on the System x and user response time. JD Edwards EnterpriseOne standardized test scripts were used to generate the system load. See Appendix B for an overview of the test architecture, methodology, and the hardware and software of the two test configurations.

Improved performance

As shown in Table 1, CPU utilization was reduced by as much as 28% when System x was attached to the System i via iSCSI HBAs while the users' response time remained comparable.

System x configuration	# of users	Response Time in seconds	System x CPU %	System x CPU % Improvement with iSCSI HBAs
Standalone	500	.46	20	
ISCI HBAs		.43	18	10 %
Standalone	750	.64	39	
ISCI HBAs		.65	31	20 %
Standalone	1000	.76	63	
ISCI HBAs		.73	45	28%

Table 1. CPU Utilization comparison between standalone System x and iSCSI HBA-attached System x

By off-loading the iSCSI and TCP/IP protocol to the adapter from the host, the iSCSI server adapters eliminated the processing, interrupts, and bus accesses required to support protocols in the host software. The adapters virtually eliminated the host CPU system processing required of iSCSI and TCP/IP, increasing application processing. Figure 2 shows that the CPU utilization improvement when connected via iSCSI HBAs increases as the workload increases.

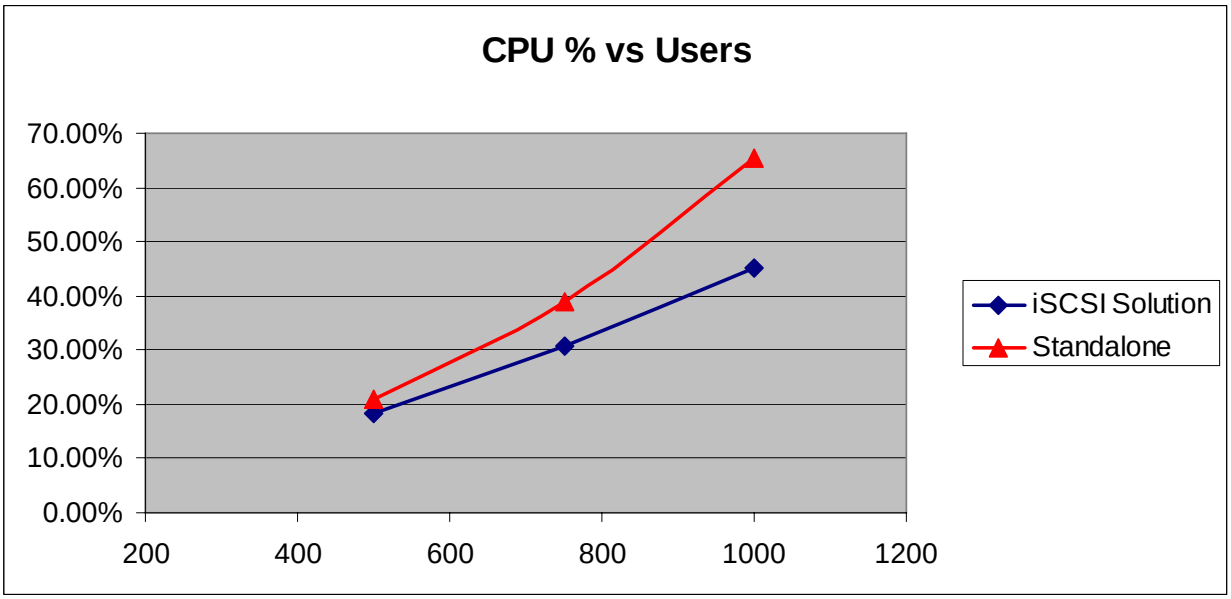

Figure 2. System x CPU utilization with the iSCSI solution vs. as a standalone Web Server

Another advantage of the iSCSI implementation is that the network traffic between the web server and the application logic / database server can flow over the virtual Ethernet internal connection which is private, secure and fast. Additional tests were performed to compare the iSCSI solution when using this virtual Ethernet internal connection vs. the iSCSI server's external Ethernet connection. In the lab, because the external network was not congested, the response times were comparable. In an environment with heavy

network traffic, the virtual Ethernet internal connection could easily outperform the external network while providing additional security.

Additional benefits

In addition to better performance, the iSCSI HBA solution can provide many other benefits to a customer running a JD Edwards EnterpriseOne suite of applications as described below.

Flexible Storage Area Network (SAN) management

One of the most significant advantages of the System i family is its unique storage architecture. It can provide more flexibility than standalone Windows server implementations, where dedicated disk drives are typically attached to each server and every server's capacity is managed separately. With System i integration, there is a single pool of virtual storage that Windows may share. "Virtual disks" are allocated in i5/OS to each System x or blade server individually, yet all physical disk capacity and drive utilization is automatically managed by the System i for improved performance and asset utilization. If a Windows server begins to run out of disk space, additional virtual storage may be allocated simply and easily, without rebooting.

Flexible server deployment with high availability

System i storage virtualization also provides innovative options for enhancing the reliability and recoverability of Windows servers. If a physical server fails, its storage spaces can be quickly and easily switched to a "hot spare" System x or blade server without having to reinstall Windows. This can reduce the overall number of servers needed by enabling one "spare" to be available to protect multiple production Windows servers.

In a typical Windows implementation there may be several server configurations, including production servers, development servers, and test servers—each with its own set of software and device drivers. Testing and deploying changes across the various Windows servers can be problematic because of the number of configurations that must be maintained. A test server may need to be rebuilt from scratch to match a production server whenever there are changes to be deployed. A single System x or blade server integrated with System i may be used to support multiple test and deployment environments. One physical System x or blade server is easily reassigned to the role of another server, because the hardware may be completely disconnected from the virtual storage on which a specific Windows server configuration and data image resides.

Lower costs of administration through synchronized security

One of the ways System i can reduce IT costs is by enabling i5/OS and Windows Server user IDs and passwords to be managed centrally. When a user is added to i5/OS, the user can be automatically added to the Windows environment with proper authorizations. When the user changes his or her i5/OS password, the corresponding Windows password can be automatically updated. Eliminating the need for users to maintain multiple passwords across multiple systems eases user administration efforts and reduces help desk costs by reducing/eliminating password reset requests.

Consolidated backup

i5/OS can consolidate the backup of System i, System x and BladeCenter systems allowing businesses to use their hardware and IT support resources more fully. In a typical server farm, data may be scattered

across multiple servers, with backup processes running on each one requiring multiple tape drives to manage. With the integrated System i environment, all data and files are centralized in virtual storage and a single process can backup i5/OS and Windows data to a high-speed System i tape device.

Streamlined communications

System x and BladeCenter servers can communicate over System i virtual Ethernet network connections, which may be utilized for Windows-to-Windows or Windows-to-i5/OS on POWER communications. Using virtual Ethernet networks can isolate server-to-server traffic to help provide more reliable communications between applications and reduce external network traffic.

Flexible and reliable server management via centralized, graphical server management

The iSeries Navigator provides a graphical user interface (GUI) for managing the System i and attached BladeCenter and System x servers for such tasks as starting and stopping servers, enrolling i5/OS users in a Windows domain, and adding new virtual disks to a Windows server. In addition, Navigator for Wireless enables viewing server status as well as starting and stopping of servers from a Web-enabled cell phone, personal digital assistant (PDA) or a Web browser.

Conclusions

For customers wanting to run a JD Edwards EnterpriseOne web server workload on an Intel platform, a System i iSCSI HBA connection provides a recommended solution and allows the entire JD Edwards EnterpriseOne implementation to operate as a single infrastructure with minimum complexity. Customers can reduce the System x CPU utilization by as much as 28% while maintaining response times when integrated via iSCSI HBAs to a System i driving the application and database tiers.

In addition, the System i iSCSI solution with System x or BladeCenter provides a powerful and flexible alternative to standalone Intel servers through virtual storage, high availability, and lower costs through synchronized security and consolidated backups.

Appendix A - System i and System x / BladeCenter servers that support iSCSI HBAs

The iSCSI solution is very flexible in the way that blade or System x models are connected to the System i platform. Within the BladeCenter Blade Server family of servers, the iSCSI solution currently supports 1- or 2-processor servers featuring high-performance Intel Xeon™ processors and AMD Opteron™ processors. Rack-optimized servers like the x346 (recently rebranded as the x3650) and the x336 (recently rebranded as the x3550) now support dual-core Intel Xeon Processors. Supported BladeCenter Models, chassis and System x models can be found at the website:
http://www-03.ibm.com/systems/i/bladecenter/iscsi/servermodels/

The total number of iSCSI HBAs that are supported for each System i model are listed below in Table 2.

Model	Max iSCSI HBAs*
i5-520	21
i5-550	42
i5-570	21-168**
i5-595	168
i5-595	168

Table 2. Maximum iSCSI HBAs supported by System i models

**These maximums are dependent on available resources on the System i.*

***These maximums increase with the number of CPUs.*

Appendix B - Test architecture and methodology

These tests compared CPU utilizations and end user response times when the JD Edwards EnterpriseOne web server was running on a System x as a standalone web server vs. when directly attached to the System i via integrated iSCSI HBAs. Launched by Mercury LoadRunner testing software, this standardized test scenario for web clients consisted of seventeen test scripts provided by Oracle® used to simulate tasks for three types of users: Financial, Manufacturing, and Distribution. See Table 3 for a list of the applications.

17 JDE scripts:		
Distribution:	**Financial:**	**Manufacturing:**
Inventory Adjustments	Standard Receipts Entry	Work Order Entry
Summary Availability	Standard Voucher Entry	Single Level BOM Inquiry
Confirm Shipments	Supplier Ledger Inquiry	Inventory Issues
Customer Service Inquiry	Journal Entry	Work Order Partial Completions
Purchase Order Entry	Trial Balance/Ledger Comparison	Supply/Demand Inquiry
Sales Order Entry		
Open Receipt Inquiry		

Table 3. JD Edwards EnterpriseOne 17 standard scripts

The System i Model 570 LPAR (Logical Partition) was loaded with V5R4 of i5/OS. All additional software and PTFs were installed, as well as the JD Edwards EnterpriseOne application logic version 8.11_SP1 with 8.95_E1 system code. The x336 was set up to run as a standalone web server with Windows 2003 Service Pack 1 Enterprise Edition. WebSphere® 5.0.2.7, HTTP software, and JD Edwards EnterpriseOne Java™ Virtual Machine (JVM) version 8.95_E1 were loaded on its own disk drives for the first round of tests.

The disks were then removed from the System x336 which was directly attached to the System i by installing iSCSI HBAs in each system. The HBAs were connected by a dedicated VLAN on a 1 Gbps switch. See Figure 3 for a schematic of the direct-attached System x to System i architecture. Windows 2003 Service Pack 1 Enterprise Edition, WebSphere and HTTP software were loaded onto the iSCSI storage spaces carved out of System i disk.

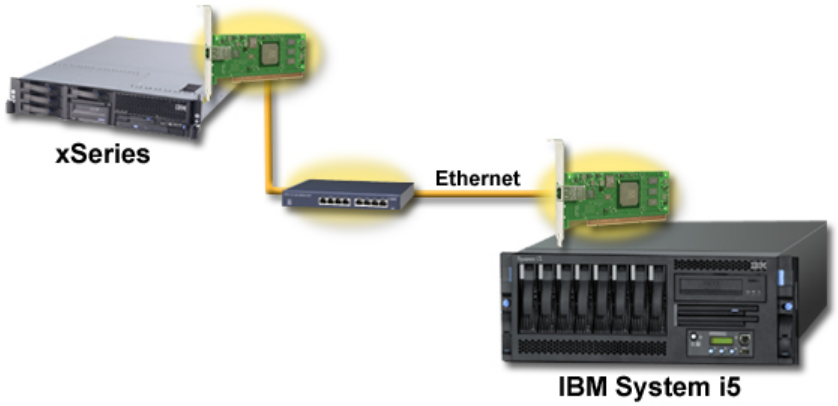

Figure 3. iSCSI HBA test environment

The System x in each scenario was tuned according to the white paper, "*IBM eServer xSeries Performance and Tuning Tips for the PeopleSoft EnterpriseOne Web Server*." The System i was tuned according to the white paper: "*IBM eServer iSeries Performance and Tuning Tips for Oracle's JD Edwards EnterpriseOne 8.10 and 8.11*." Both documents can be found on IBM's TechDocs website: http://www-1.ibm.com/support/techdocs/atsmastr.nsf/Web/TechDocs

The server models used in the tests and their specifications are shown in Tables 4 and 5. The level of software used in the tests is shown in Table 6.

	Web Server	Enterprise Server
System	IBM System x 336 2-way 3.6 GHz	IBM i5 570 3-way (Model 8961) LPAR
Memory	8 GB	18/24/30 GB*
Disk	72.4 GB usable disk (RAID-1), 2 arms	1.058 TB usable disk (RAID-5), 18 arms
Network	One 100 Mbps Ethernet adapter	One 100 Mbps Ethernet adapter

Table 4. Hardware for standalone web server solution

*18 GB memory for 500 users, 24 GB memory for 750 users, 30 GB memory for 1000 users

	Web Server	Enterprise Server
System	IBM System x 336 2-way 3.6 GHz	IBM i5 570 3-way (Model 8961) LPAR
Memory	8 GB	18/24/30 GB*
Disk	1.058 TB usable disk (RAID-5), 18 arms, with 73 GB of disk carved out for storage spaces for the iSCSI server (sized comparably to standalone)	
Network	One 1 Gbps virtual Ethernet internal connection on the iSCSI	

Table 5. Hardware for integrated web server solution with iSCSI solution

**18 GB memory for 500 users, 24 GB memory for 750 users, 30 GB memory for 1000 users*

System i:	JD Edwards EnterpriseOne SP 8.11_SP1 with system code 8.95_E1 application logic
	I5/OS V5R4 and DB2 Universal Database™ for System i (5722-SS1) (V5R4 or higher is required)
	Integrated Server Support (5722-SS1, option 29)
	Digital Certificate Manager (5722-SS1, option 34)
	IBM Director 5.10 (5722-DR1) – no cost option of Virtualization Engine (5733-VE2)
	IBM HTTP Server for iSeries (5722-DG1)
	IBM TCP/IP Connectivity Utilities for i5/OS (5722-TC1)
	iSeries Navigator (part of 5722-XE1)
System x:	Windows 2003 Server with Service Pack 1, Enterprise Edition (Service Pack 1 is required)
	WebSphere 5.0.2.7
	JD Edwards EnterpriseOne Java™ server
	IBM HTTP Server
Mercury LoadRunner 7.8	Test software to drive simulated users to create workload

Table 6. IBM and JDE software details

Contact Information

Please send questions or comments via email to IBM Oracle International Competency Center at ibmoracl@us.ibm.com

For More Information

For information on integrated, collaborative enterprise solutions from IBM and JD Edwards, visit http://www-03.ibm.com/solutions/businesssolutions/oracle/index.jsp

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