IBM

Oracle's JD Edwards EnterpriseOne Scaling with IBM POWER6, POWER7, and IBM i

Demonstrating leadership scalability with the "Day in the Life" benchmark kit

Jim Denton
IBM i ERP Team
June 2010

Table of contents

Change history

Version	Date	Editor	Editing description
1.0	09/28/2009	Patrick Moore	Original version
2.0	06/13/2010	Jim Denton	POWER7 updates

Abstract

This paper describes the results of recent performance measurements which demonstrate the scalability of Oracle's JD Edwards EnterpriseOne on IBM Power Systems™ POWER6™ and POWER7™ processor-based servers running IBM i. The POWER6 results show near linear scalability across several measurements of 500, 1000, and 2000 web-based users on two, four, and eight core configurations. The POWER6 measurements also achieved a new high-water mark of 2400 web-based users on an eight core configuration. In this version of the document, that value has been surpassed by the results from an eight core POWER7 configuration which achieved 4000 web-based users.

This is the first publication of results from the "Day in the Life" benchmark kit on a POWER7 processor-based system running IBM i. These results demonstrate the commitment of IBM and Oracle to providing customers with an integrated, scalable, and easy to manage environment based on the latest processor technology and a robust software solution including the use of IBM PowerVM™, DB2® for i, and WebSphere® Application Server.

Introduction

IBM and Oracle continue to work together closely to ensure customers have the application and platform solutions needed to maximize their business results. This paper contains new performance results based on the combination of an IBM Power Systems POWER6 and POWER7 processor-based servers running IBM i and JD Edwards EnterpriseOne. It contains several key differentiators from other published results.

- These are the first published results for the "Day in the Life" benchmark kit on a POWER7 processor-based server running i. Provided by Oracle, this benchmark kit has broader coverage and is more realistic than previous benchmark kits. For more information, please see Appendix 1: Day in the Life workload.
- These updated results demonstrate leadership scalability of i with JD Edwards EnterpriseOne and include a new high-water mark of 4000 web-based users. This greatly surpasses the previous record of 2400 web-based clients contained in the first version of this document.
- All of the measurements take advantage of the integration capabilities inherent in i. They use the "All on i" option in which all three components of JD Edwards EnterpriseOne are run in the same instance of i. These measurements take advantage of IBM PowerVM virtualization technology which is a combination of hardware and software that supports and manages the virtual environments on POWER® processor-based systems. This allows for much greater flexibility in allocating CPU and memory resources in different classes of work. Using the same instance of i also facilitates many other normal activities such as backup and recovery.
- These latest measurements take advantage of the latest IBM technology including IBM i 7.1, the IBM Technology for Java JVM, and the Technology Foundation Blue Stack which includes DB2 and WebSphere Application Server 6.1.

These results demonstrate IBM's continued commitment to improving the performance of customer environments running JD Edwards EnterpriseOne software on IBM Power Systems servers with IBM i.

POWER6 performance tests

Test objectives

The objectives of these tests were as follows:

- Demonstrate scalability by running enough web-based users to achieve nominal processor utilization on different system configurations. Note that tests did not include any UBE (Universal Batch Engine) processing.
- Achieve a new high-water mark for the number of web-based users on a POWER6 processor-based server configuration.

These tests build on previous results which showcased the performance improvements available from POWER6 processor-based servers, i 6.1, and WebSphere Application Server 6.1.

Test environment

Table 1 shows the configuration information for the three environments used for the performance testing. All three were implemented in a single instance of i on the same server with different logical partition definitions to provide different processor and memory resources.

	2 core configuration	4 core configuration	8 core configuration
Processor	**2 cores**	**4 cores**	**8 cores**
Technology	**POWER6**	**POWER6**	**POWER6**
Clock rate	**4.2 Ghz**	**4.2 Ghz**	**4.2 Ghz**
CPW	**8,200**	**16,200**	**31,900**
Memory	**32 GB**	**64 GB**	**128 GB**
HTML servers	**1**	**2**	**4 to 5**
Disk arms	**72 arms**	**72 arms**	**72 arms**
Software			
Operating system	**i 6.1**	**i 6.1**	**i 6.1**
WebSphere	**6.1.0.21**	**6.1.0.21**	**6.1.0.21**
EnterpriseOne	**8.12 / 8.98**	**8.12 / 8.98**	**8.12 / 8.98**

Table 1 – Summary of POWER6 test configurations

Test results

This section describes the results of the performance tests. Table 2 shows the results of the scaling measurements.

Configuration	Number of Web-based users	Processor utilization in percent	Response time in seconds
2 core	500	59.6	0.720
4 core	1000	64.2	0.315
8 core	2000	70.2	0.368

Table 2 - Performance results from the POWER6 scaling measurements

The following are some additional observations regarding these results:

- CPU utilization increases slightly as the numbers of users and processor cores increases due to some additional system overhead. All are within normal guidelines for interactive or web-based user workloads and consistent with previously published results.
- The relatively high response time for the 2 core configuration was caused by an early spike in response times due to the workload definition in which web-based users are starting to enter transactions while other users are still signing on.
- In the case of the 2000 user configuration, the HTML server used four WebSphere Application Server JVM's with approximately 500 users each. This demonstrates the scalability of the IBM Technology for Java 32 bit JVM implementation.

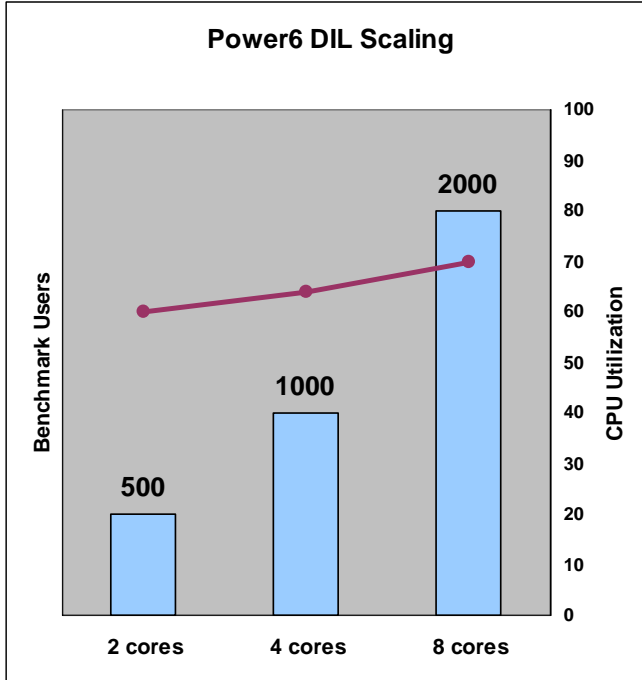Figure 1 shows the number of web-based users and the processor utilization in graphical form.

Figure 1 - Comparison of scaling measurements

Two additional runs were also done on the eight core configuration to provide additional demonstrations of scalability. These results are shown in Table 3.

Configuration	Number of web-based users	Processor utilization in percent	Response time in seconds
8 core	500	16.8	0.241
8 core	2400	79.6	1.129

Table 3 - Performance results from the additional scaling measurements

The following are additional observations regarding these results:

- Providing additional processor and memory resources improved both the processor utilization and response time for tests with 500 web-based users. The reduction in processor utilization showed near linear scalability of 72% which is very close to the theoretical value of 75%.
- The 2400 web-based user test represents a new high-water mark for JD Edwards EnterpriseOne on i in recent years. Since 2005, IBM has published separate whitepapers showing results for 1200 and 1600 web-based users on four core configurations. The result of 2400 on an eight core configuration represents a substantial increase because the "Day in the Life" benchmark kit has higher processor resource requirements than its predecessors.

POWER7 performance tests

Test objectives

The objectives of these tests were as follows:

- Demonstrate scalability by running enough web-based users to achieve nominal processor utilization on an 8 core system configuration. As before, these tests did not include any UBE (Universal Batch Engine) processing.
- Surpass the previous result of 2400 web-based users and demonstrate the continued scalability of POWER7 processor-based server configuration and of IBM i 7.1.

Test environment

Table 4 shows the configuration information for the environment used for the performance testing. Tests were run on an IBM Power 750 Express, feature code 8336.

	8 core configuration
Processor	**8 cores**
Technology	**POWER7**
Clock rate	**3.55 Ghz**
CPW	**52,690[1]**
Memory	**120 GB**
HTML servers	**8**
Disk arms	**48 arms**
Software	
Operating system	**i 7.1**
WebSphere	**6.1.0.29**
EnterpriseOne	**9.0 / 8.98.3**

Table 4 - Summary of POWER7 test configuration

---

[1] Estimated value based on internal measurements

Test results

This section describes the results of the performance tests. Table 5 shows the results of the scaling measurements.

Configuration	Number of Web-based users	Processor utilization in percent	Response time in seconds
8 core	4000	64.2	0.621

Table 5 - Performance results from the POWER7 scaling measurement

The following are some additional observations regarding these results:

- The relatively high response time was caused by an early spike in response times due to the workload definition in which web-based users are starting to enter transactions while other users are still signing on. This effect becomes more pronounced with higher numbers of users. Oracle plans to address this through changes to the benchmark scripts or agreed upon changes in script warm up procedures.

Table 6 compares the performance statistics from the POWER6 8 core configuration tests documented above and the new POWER7 8 core results.

Comparison values	POWER6 configuration	POWER7 configuration	Improvement from POWER6 to POWER7
Processors	8	8	No change
CPW Rating	31,900	52,690	65%
Number of Users	2000	4000	100%
Processor utilization	70.2	64.2	9%

Table 6 - Comparison of POWER6 and POWER7 results

The following are some additional observations regarding these results:

- The increase in the CPW rating from the POWER6 to POWER7 configurations was 65% but these results show an increase of 100% in capacity, 4000 users versus 2000 users on 8 core configurations. This additional improvement comes from a combination of factors including increased efficiency in IBM i 7.1, improvements in the newer releases of EnterpriseOne. and POWER7 processor technology.

Summary

These results demonstrate IBM's continued commitment to improving the performance of customer environments running JD Edwards EnterpriseOne software on Power Systems servers with IBM i. The results reflect the following:

- These are the first published results for the "Day in the Life" benchmark kit on a POWER7 processor-based server running i.
- They show leadership scalability with up to 4000 web-based users on an eight core configuration.
- They demonstrate the integration capabilities of i which allow the entire workload to be run in a single instance.
- They validate the use of IBM technologies including i 6.1, i 7.1, the IBM Technology for Java JVM, and the Technology Foundation Blue Stack which includes DB2 and WebSphere Application Server 6.1.

Resources

The following resources contain additional information which supplements the content of this paper.

- System i JD Edwards Solutions from Oracle
  http://www.ibm.com/systems/i/advantages/oracle/

- Performance benefits of POWER6 processors and IBM i 6.1 for Oracle's JD Edwards EnterpriseOne - a customer case study
  http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS3620

- Overview of Oracle's JD Edwards EnterpriseOne "Day in the Life" 8.12 Sizing Kit on the IBM System i Platform
  http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101153

- IBM System i Performance and Tuning Tips for Oracle's JD Edwards EnterpriseOne 8.12, WebSphere 6.0, and WebSphere 6.1
  http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100985

- IBM Power Systems with IBM i Performance and Tuning Tips for Oracle's JD Edwards EnterpriseOne 9.0
  http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101504

- Using JD Edwards EnterpriseOne Server Manager to create an HTML server vertical cluster on WebSphere ND and IBM i
  http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101647

About the author

Jim Denton has been an IBM Rochester employee since 1981 and has held a variety of positions in operating system development and performance analysis on the S/38, the AS/400®, the System i®, and Power Systems platforms. Jim is the senior JD Edwards software on IBM i specialist and is responsible for working with JD Edwards EnterpriseOne and JD Edwards World developers on functional enhancements and customer issues, producing performance benchmark results, and providing performance and tuning guidance for JD Edwards EnterpriseOne customers on IBM i. Jim frequently attends and speaks at conferences such as Collaborate, Oracle OpenWorld, and UKOUG. He is also available for technical consulting.

Questions or comments on this paper can be sent to jldenton@us.ibm.com.

Appendix 1: Day in the Life workload

Table 7 contains the list of the web-based transactions used in the Day in the Life workload. Note that H3411AE, H3411BE, and H3411CE are run sequentially. That means that at any given point in time, only one of those three is active. This explains why the sum of the "Percent of Users" column is 112 rather than 100.

Transaction	Description	Percent of Users
H03B102E	Apply Receipts	10
H0411I	Supplier Inquiry	10
H051141E	Daily Time Entry	2
H17500	Case Mgmt Add	5
H31114U	Work Order Completion	3
H3411AE	MRP Messaging	6
H3411BE	MRP Messaging	6
H3411CE	MRP Messaging	6
H4113E	Inventory Transfer	10
H42101E	Sales Order Entry	20
H42101U	Sales Order Update	5
H4310E	PO Entry	20
H4312U	PO Receipts	2
H4314U	Voucher Match	2
H4915AU	Ship Confirmation	3
H4915CE	Ship Confirmation	1
H4915CU	Ship Confirmation	1

Table 7- Day in the Life transactions

The transaction mix was adjusted by Oracle provided scripts for use with JD Edwards EnterpriseOne Application release 9.0. Table 8 shows the revised figures. Note that the H3411AE, H3411BE, and H3411CE were changed to run in parallel so the sum of the "Percent of Users" column is now 100. These changes did not have any significant impact on the performance characteristics of the workload.

Transaction	Description	Percent of Users
H03B102E	Apply Receipts	10
H0411I	Supplier Inquiry	10
H051141E	Daily Time Entry	2
H17500	Case Mgmt Add	5
H31114U	Work Order Completion	3
H3411AE	MRP Messaging	2
H3411BE	MRP Messaging	2
H3411CE	MRP Messaging	2
H4113E	Inventory Transfer	5
H42101E	Sales Order Entry	25
H42101U	Sales Order Update	5
H4310E	PO Entry	20
H4312U	PO Receipts	3

H4314U	Voucher Match	1
H4915AU	Ship Confirmation	1
H4915CE	Ship Confirmation	1
H4915CU	Ship Confirmation	1

Table 8 - Revised Day in the Life transactions

The Day in the Life benchmark definition was designed to be more representative of customer environments and more realistic and has been the standard for performance evaluations since the release of JD Edwards EnterpriseOne 8.12. It has several changes from the previous classic 17 benchmark definition:

- It uses a larger database.
- It includes both web-based and UBE based operations.
- It has broader application coverage including options for turning on Advance Pricing and Advanced Transportation. It includes Customer Relationship Management (CRM), Human Capital Management (HCM), Supplier Relationship Management (SRM), and Financial Management Service (FMS). It also uses Powerforms.
- It is process oriented rather than inquiry oriented.
- It integrates the use of Verity and Vertex.

For additional information on the Day in the Life workload, please see the IBM whitepaper titled 'Overview of Oracle's JD Edwards EnterpriseOne "Day in the Life" 8.12 Sizing Kit on the IBM System i Platform' which is listed in the Resources section.

Appendix 2: System and application tuning

The following describes how IBM i, WebSphere Application Server, and JD Edwards EnterpriseOne were tuned for the measurements in this whitepaper.

System configuration

The POWER6 processor-based system used for this test was an IBM Power System 570 (9117-MMA, processor feature 7540) with a total of 16 cores. Tests were executed on specific partition definitions for the configurations described above. The CPW rating for the 16 core configuration is 56,400.

The POWER7 processor-based system used was an IBM Power 750 Express (processor feature 8336) with a total of 8 cores. Its CPW rating is 52,690.

IBM i tuning

- Activity levels were set to sufficiently large values to preclude job transitions to ineligible.
- Websphere Application Server and the HTML Server were run in a separate memory pool to minimize faulting.
- The memory pools were configured to minimize faulting in the machine pool and the pool used by WebSphere Application Server.

WebSphere tuning

- Up to eight HTML servers were used as indicated previously.
- Initial and maximum heap size for the HTML Server JVM's were set to 436MB and 1744MB respectively. This is consistent with guidance published for the 32 bit IBM Technology for Java JVM.
- Separate shareclasses caches were used for each JVM. All JVM's were configured for a garbage collection policy of gencon which more effectively manages the needs of both short lived temporary and tenured heap objects.

EnterpriseOne tuning

- All application users run using the same IBM i user profile.
- Kernels were configured based on previously published guidance. The only exception is that the number of Call Object Kernels was based on a value of one COK for 20 to 25 users.

Trademarks and special notices