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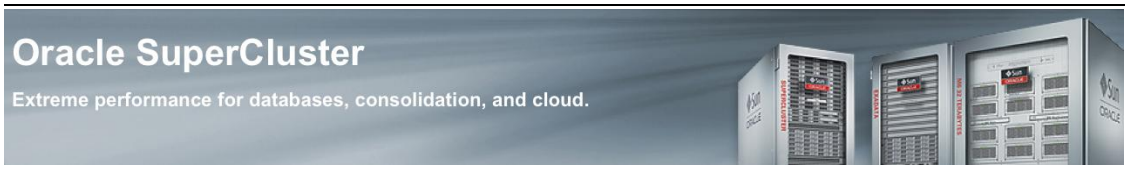
JD Edwards EnterpriseOne In-Memory Project Portfolio Management and In-Memory Sales Advisor on Oracle M6-32 SuperCluster

ORACLE

Introduction

Executives and business managers need to know the state of the business at any time of the day or night. In today's economy, organizations are looking for a competitive advantage and ways to do more with less in order to improve their bottom lines. Their searches span everything from staffing and facilities to manufacturing and logistics. Global businesses must be able to operate across all time zones. Access to the most current, up-to-date, and accurate information is vital for business managers to make timely and well-informed decisions rapidly. Organizations seek to respond quickly with near-real-time updates to critical project- and sales-related data, thereby empowering employees to understand the state of the business in the moment. Then, employees can respond rapidly with effective decision-making and effective management of multiple projects and sales initiatives.

This paper documents how Oracle's JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor application(s) on Oracle SuperCluster M6-32 using Oracle Database 11*g* Release 2 deliver superior interactive response times that can improve project and sales productivity—thereby improving business processes while delivering more to the bottom line.



Engineered Systems and In-Memory Applications

Oracle SuperCluster M6-32 with In-Memory Application technology is based on the fastest and most scalable database and application server, fastest database storage, fastest network and operating system combination for database, middleware and core business applications. The large memory capacity combined with Oracle In-Memory applications boosts performance by 10x-20x, resulting in faster, real-time decision making. Oracle Solaris 11 provides a highly available, secure and scalable operating system with zero overhead server, storage and network virtualization capabilities and best-in-class application performance resulting in greater consolidation ratios. Exadata Storage Servers, which are intelligent scale out storage, provide the database storage building block of SuperCluster M6-32, and are highly optimized for use with Oracle Database, employing a massively parallel architecture and Exadata Smart Flash Cache to dramatically accelerate Oracle Database processing and speed I/O operations. With the integration of Oracle Exadata Storage Servers, SuperCluster M6-32 minimum configuration offers up to 1.5 million database IOPS and rapid query throughput, enabling databases and data warehouses to run 10x faster and deliver quicker results than with other platforms. SuperCluster M6-32 is capable of running 1 million secure transactions per second at the web, middleware, and database tiers, concurrently with no performance impact. InfiniBand networking technology is the communication backbone delivering low latency, high performance 40 Gigabits per second of bandwidth – many times higher than traditional server or storage networks.

The In-Memory Application (IMA) feature delivers a high performance tiered database storage approach that delivers significant database performance improvements for Oracle applications such as JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor. As illustrated in Figure 1, a database can be created and stored depending on heuristics across all tiers of the IMA which includes on board DRAM on the Oracle M6-32, or via a high performance interconnect Infiniband fabric on the Oracle

Exadata Flash Cache which has a capacity of up to 22 Terabytes or finally on the Exadata Storage Server on board disk which can have a capacity of up to 500 Terabytes. Database size can be smaller databases and can extend into the massively larger databases because of optimized compression techniques such as Oracle Advanced Compression and Oracle Hybrid Columnar Compression that enable larger amounts of database rows to be retained in-memory (DRAM) as well as on the Exadata Storage Server based Flash Cache. Optimized heuristic algorithms distribute data across all three tiers of storage and insure that the hottest data is stored as close to the JD Edwards EnterpriseOne In-Memory application thereby insuring optimized performance, while "warm data" is stored and immediately available via the 40 Gigabit, low latency Infiniband interconnect on the Exadata Flash Cache. Data that is occasionally referenced remains on the Exadata Storage Server disk until referenced where the heuristic algorithms will migrate to higher performance tiered storage as required by the application. Data is migrated, kept consistent and safeguarded transparently by the In-Memory

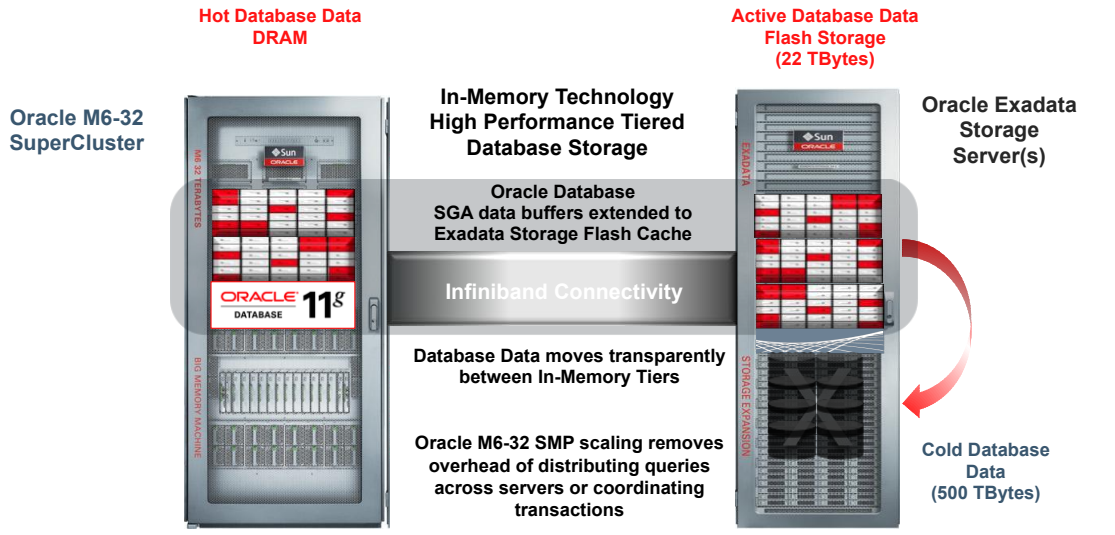
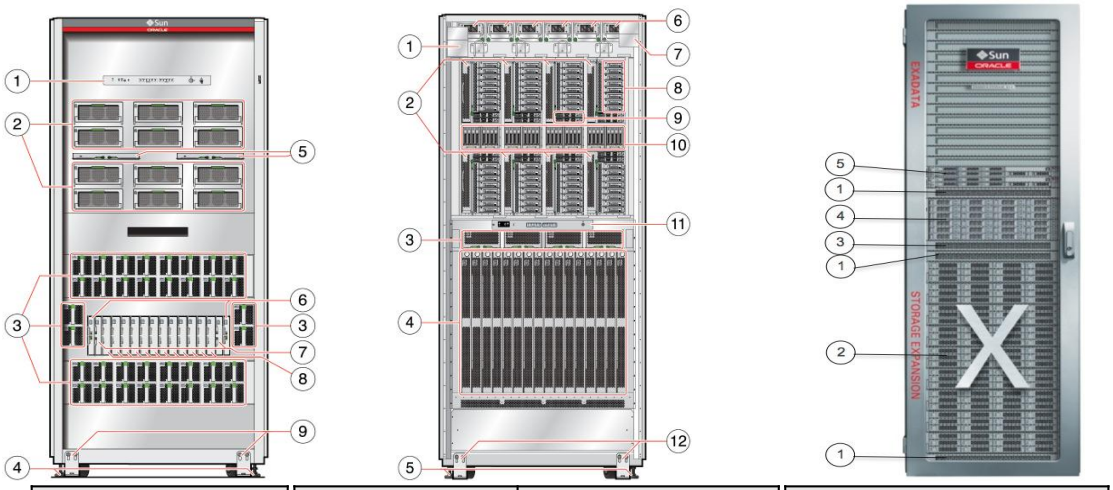


Figure 1. Heuristic Hierarchical Mass Memory or Oracle In-Memory Application (IMA)Technology.

Oracle SuperCluster M6-32

Oracle SuperCluster M6-32 is a multi-purpose engineered system that has been designed, tested, and integrated to run mission-critical enterprise applications such as JD Edwards EnterpriseOne
In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor. The system deploys cloud services rapidly while delivering extreme efficiency, cost savings, and performance. Oracle SuperCluster M6-32 is well suited for JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor because it supports multitier enterprise applications with web, database, and application components. This versatility, along with powerful, bundled virtualization capabilities, makes it an ideal platform on which to consolidate large numbers of applications, databases, and middleware workloads, or to deploy complex, multiuser development, test, and deployment environments. It combines highly available and scalable technologies, such as optional Oracle Database 12*c*, Oracle Database 11*g* with Oracle Real Application Clusters (Oracle RAC), and optional Oracle Solaris Cluster software with industry-standard hardware.



Oracle SuperCluster M6-32 Front Cabinet Components
1 Operator Panel
2 Fans
3 Power Supplies
4 Leveling Feet
5 Power Supply Distribution Boards
6 Service Processors
7 Clock Boards
8 Scalability Switch Boards
9 Mounting Brackets

Oracle SuperCluster M6-32 Rear Cabinet Components	
1 Left cable management bracket	7 Right cable management bracket
2 I/O Units (IOUs)	8 PCIe hot-plug carrier (low profile)
3 Service Processor Proxies	9 Express Module for SAS HDDs (EMS)
4 CPU Memory Units (CMUs)	10 Hard Disk Drives
5 Leveling Feet	11 Second operator panel
6 AC input filters (3+3)	12 Mounting Brackets

Exadata Storage Server Components
1 InfiniBand Switch
2 Exadata Storage Servers
3 GbE management switch
4 Oracle ZFS Storage ZS3-ES storage tray
5 ZS3-ES ZFS Storage ZS3-ES storage controllers

Figure 2. Oracle SuperCluster M6-32 and its respective components

Its architecture enables a high degree of isolation between concurrently deployed applications, which may have varied security, reliability, and performance requirements. Oracle SuperCluster M6-32 also provides hardware isolation between groupings of CPU, memory, and I/O resources for higher availability within the node. Oracle SuperCluster M6-32 provides an optimal solution for all database workloads, ranging from scan-intensive data warehouse applications to highly concurrent online transaction processing (OLTP) applications. With its combination of Oracle Exadata Storage Server, Oracle Database software, and the latest hardware components, Oracle SuperCluster M6-32 delivers extreme performance in a highly available, highly secure environment. Figure 3provides technical and configuration details of the Oracle SuperCluster M6-32.

An example of the performance gains that come with Oracle SuperCluster M6-32: Each Oracle Exadata Storage Server uses the Exadata Smart Flash Logging feature, which improves user transaction response times and increases overall database throughput for I/O-intensive workloads by accelerating performance-critical database algorithms.

Oracle SuperCluster M6-32 also offers new capabilities, such as more processing power with up to 32 SPARC M6 processors; more memory with up to 1 TB per physical SPARC M6 processor; more built-in I/O with 64 PCIe Gen 3 slots; and finally, all three levels of virtualization: physical domains (or PDoms), logical domains (LDoms), and Oracle Solaris Zones. Customers can integrate Oracle SuperCluster M6-32 systems with other Oracle SuperCluster systems, Oracle Exadata, or Oracle Exalogic machines by using the available InfiniBand expansion ports and optional data center switches. The InfiniBand technology used by Oracle SuperCluster M6-32 offers high bandwidth, low latency, hardware-level reliability, and security. For application environments that follow Oracle's best practices for highly scalable, fault-tolerant systems, no application architecture or design changes are required

to benefit from Oracle SuperCluster M6-32. Customers also can integrate Oracle SuperCluster M6-32 systems with their current data center infrastructure using the available 10 GbE ports in each of the SPARC M6-32 servers within Oracle SuperCluster M6-32.

Oracle's SPARC M6-32 Servers The SPARC M6-32 server offers a large memory capacity and a highly integrated design that supports virtualization and consolidation of mission-critical applications. Oracle SuperCluster M6-32 comes in either base configurations or extended configurations.	• 16 to 32 SPARC M6 processors from Oracle—each processor comes with 12 cores and eight threads per core. • 8 TB to 32 TB of memory—512 GB (16 GB DIMMs) or 1 TB (32 GB DIMMs) of memory per SPARC M6 processor. • 16 to 32 disk drives—there are eight 900 GB SAS2 disk drives per I/O unit (IOU). • Oracle's Sun PCIe Dual Port QDR InfiniBand Host Channel Adapters—low-latency 40 Gb/sec InfiniBand HCAs in a modular hot-pluggable PCI Express (PCIe) low-profile form factor. There are four InfiniBand cards in each IOU. • 8 to 16 base I/O cards—these provide SAS controllers for disks in an IOU. There are four in each IOU, and each card also provides two 10 GbE ports. The 10 GbE ports are for client access to Oracle SuperCluster.
Oracle Exalogic Provides extreme performance for key technology segments in the infrastructure.	• Supports Java applications and Oracle Applications • Reduces application implementation and ongoing costs • Enables private clouds to be assembled from separately sourced components

Integrated Virtualization
 	
Enhances security, optimizes utilization, and improves reliability
	• Supports multiple virtualization environments
	  ○ Dynamic Domains (aka physical domains)
	  ○ Oracle VM Server for SPARC
	  ○ Oracle Solaris Zones

Oracle Enterprise Manager Ops Center Delivers a converged hardware management solution.	• Integrates management across the infrastructure • Assists IT managers in deploying/managing more efficiently

Oracle Exadata Storage Expansion Rack
 	
InfiniBand delivers up to 63 percent higher transactions per second for Oracle RAC versus GbE networks. There are three InfiniBand switches in Oracle SuperCluster M6-32 offering private connectivity within the system.
	• **Oracle ZFS Storage ZS3-ES Appliance**
	  ○ Provides 80 TB of capacity
	  ○ Uses the flash-enabled Hybrid Storage Pool, a feature of Oracle ZFS Storage Appliance
	  ○ Includes storage analytics using DTrace Analytics, a feature of Oracle ZFS Storage Appliance, which improves file-based storage performance through drill-down observability
	• **Nine of Oracle Exadata Storage Server**
	  ○ Improves Oracle Database performance
	  ○ Intelligent scale-out storage
	  ○ Includes the Exadata Smart Flash Cache and Exadata Hybrid Columnar Compression features of Oracle Exadata
	• **Three of Oracle's Sun Datacenter InfiniBand Switch 36**
	  ○ High-throughput, low-latency, and scalable fabric suitable for fabric consolidation and storage connectivity
	• **Ethernet Management Switch**
	  ○ Provides network management connectivity
	  ○ Manages ports on all servers/switches
	Note: Cisco switch is provided, and customers can use their own switch if desired.

Figure 3.Components of the Oracle SuperCluster M6-32 engineered system.

Business Benefits of the Oracle SuperCluster M6-32

Figure 4 shows the business benefits that result when organizations deploy JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor on Oracle SuperCluster M6-32.

TECHNICAL BENEFITS	BUSINESS BENEFITS
High Availability Oracle SuperCluster M6-32 is architected with built-in redundancy to minimize downtime.	• Maximize productivity from uninterrupted mission-critical business processes • Reduce business disruption through reduced risk of failure(s) • Improve regulatory compliance
High Performance Deploying JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor application(s) dramatically improves job response times to near real time, and in some cases improves interactive response times.	• Increase competitiveness through quick, informed decisions based on real-time access to business insights • Improve employee productivity due to dramatically improving end-user responsiveness • Improve manufacturing, fulfill more orders, and react to changes quickly by reducing or eliminating batch processing times for critical applications • Increase revenue opportunities due to timely completion of orders or services • Improve customer retention due to increased customer satisfaction from delivering on-time services or goods and complying with service level agreements
Scalability Consolidate applications to improve data center efficiency.	• Achieve instant consolidation • Conduct efficient, rapid, low-cost assimilation during mergers and acquisitions • Gain the ability to increase business units, users, and transactions without worrying about performance degradation
Standardization Through consolidation, standardize and save support and administration costs.	• Simplify deployments • Speed up deployments across the enterprise in multiple business units and multiple regions
Advanced Storage for Analytics	• Reduce TCO and IT costs savings from reduced storage costs • Reduce IT costs through consolidation(s) • Improve storage performance using analytics and Oracle Exadata Storage Server

Figure 4. Business benefits derived from the Oracle SuperCluster M6-32

Oracle SuperCluster M6-32 Configuration

As stated earlier, JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor were deployed and tested in order to document the positive effects of deploying them on the Oracle SuperCluster M6-32 with Oracle Database 11gR2 employing the Oracle In-Memory technology in order to realize the performance gains and commensurate business benefits. While there are a variety of ways these software applications can be deployed on the Oracle M6-32 SuperCluster, Figure 5 provides a block diagram that illustrates high-level details associated with this configuration. Note, that Oracle Virtualization was employed to deploy into the M6-32 Physical (PDoms or Dynamic Domains). Oracle Database 11gR2 was deployed in a Real Application architecture as illustrated and JD Edwards EnterpriseOne Project Portfolio Management as well as JD Edwards EnterpriseOne were deployed into the PDoms as illustrated in the block diagram. The Oracle ZFS Storage Appliance was deployed as designed with Oracle Engineered systems in purely a support role for systems based storage in this case for the Oracle M6-32 SuperCluster.

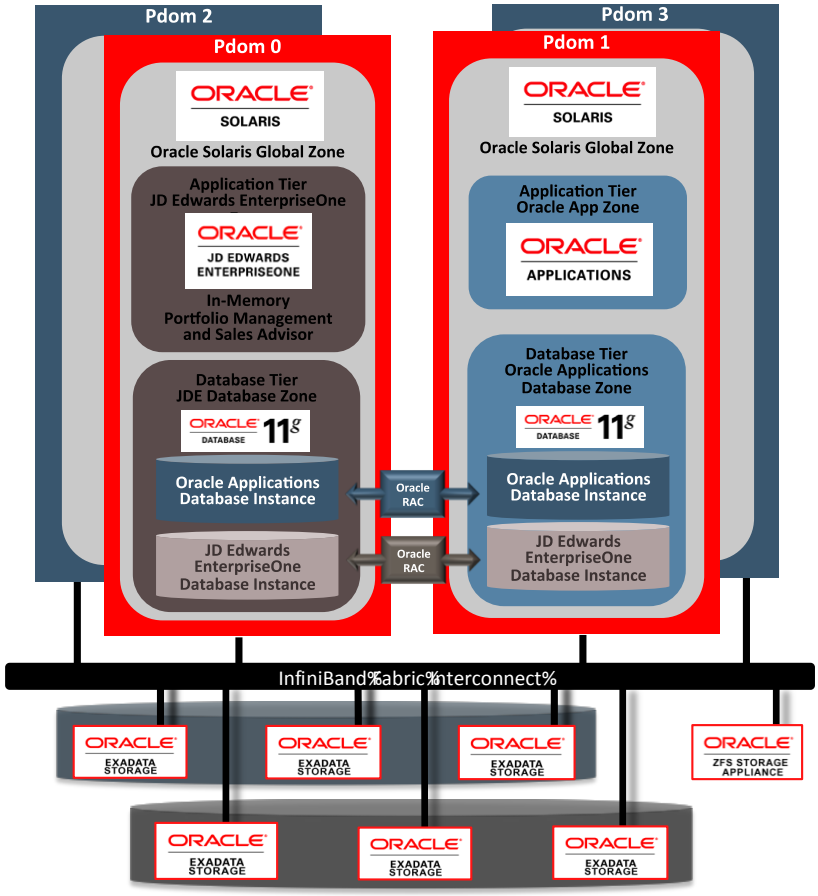


Figure 5. Block diagram of JD Edwards EnterpriseOne applications deployed on Oracle SuperCluster M6-32

JD Edwards EnterpriseOne Platform Testing

JD Edwards EnterpriseOne Load Generation

Workload characterization was divided into and characterized by both day in the life (DIL), which was singularly used to characterize the interactive workloads, as well as typical JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor workloads, all instantiated using workload generation scenario scripts.

Oracle's JD Edwards EnterpriseOne DIL kit is a suite of scripts that exercises the most common transactions of Oracle's JD Edwards EnterpriseOne applications, including business processes such as payroll, sales order, purchase order, work order, and other manufacturing processes such as shipment confirmation. Other JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor workloads also were scripted emphasizing online users of the software, JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs and/or batch (universal batch engine or “UBE”) workload scenarios using a workload generator tool independent of DIL scripting. A list of the JD Edwards EnterpriseOne interactive applications that were profiled for this project is found in Figure 6.

Job	Script	Description
Interactive		
1	H03B102E	Apply Receipts
2	H0411I	Supplier Ledger Inquiry
3	H051141E	Daily Time Entry
4	H17500E	Case Mgmt Add
5	H31114U	W.O. Completion
6	H3411AE	MRP Msg (WO Orders)
7	H3411BE	MRP Msg (OP Orders)
8	H3411CE	MRP Msg (OT Orders)
9	H4113E	Inventory Transfer
10	H42101E	S.O. Entry - 10 line items
11	H42101U	S.O. Update
12	H4310E	P.O. Entry - 25 line items
13	H4312U	P.O. Receipts
14	H4314U	Voucher Match
15	H4915AU	Ship Confirm - Approval only
16	H4915CE	Ship Confirm - Confirm/Ship only
17	H4915CU	Ship Confirm - Confirm and change entry
Batch		
1	R31410	Work Order Processing
2	R3483	MRP Processing
3	R42565	Sales Order Invoicing
4	R43500	Purchase Order Print
20+	Various	Short running UBEs, inquiry only

Figure 6. Day in the life (DIL) of JD Edwards EnterpriseOne interactive and batch application scripting

All of the interactive load generation, including DIL and the JD Edwards EnterpriseOne In-Memory Project Portfolio Management or JD Edwards EnterpriseOne In-Memory Sales Advisor jobs, were initiated through a workload management controller. From a technical perspective, batch processes were submitted through a UNIX shell script using the runube process to instantiate all runbatch UBE processes.

Prior to the formal DIL or workload scenario run(s), an initial "warm-up" scenario was initiated. It emulates a small set of users exercising each of the 17 workload scripts. This served as a "preload" of any caches and memory structures so as to measure only the metrics in a steady state condition as the test progressed. UBE processes did not have any warm-up requirements. The DIL kit includes the data to run the load along with the 17 interactive applications, which cover 5 of the major JD Edwards EnterpriseOne modules and their respective processes. The total size of the database exceeded 1 TB for use in testing.

Key User Performance Indicators of JD Edwards EnterpriseOne

Key performance metrics were collected in order to characterize the performance of JD Edwards EnterpriseOne in-memory applications. The primary metrics collected include the average end-user response times typically called out as average response time for interactive workloads, and JD Edwards EnterpriseOne In-Memory Project Portfolio Management job workloads along with infrastructure metrics such as operating system CPU and memory utilization.

Key Infrastructure Performance Indicators

Operating system metrics such as CPU utilization and memory utilization provided valuable measures of the JD Edwards infrastructure as it responded to the JD Edwards EnterpriseOne workloads. They help gauge the utilization of resources during testing and the capacity to execute additional work given the allocation of hardware resources.

Although the servers were run under the auspices of Oracle Solaris-based virtualization, CPU utilization and other infrastructure level metrics were taken at the physical domain (PDom) level of the Oracle SuperCluster M6-32. For example, to collect CPU utilization, the Oracle Solaris command prstat –Z 15, which collects statistics every 15 seconds, was utilized to examine CPU utilization. Figure 7 shows a typical snapshot of the output this command provides.

```
ZONEID    NPROC  SWAP   RSS MEMORY      TIME  CPU ZONE
     0      440 1217M 1214M   0.0%  35:19:16 0.9% global
     4       48   15G 8786M   0.1%   1:12:56 0.1% wlserver
     2      100 2661M 2846M   0.0%  19:34:34 0.0% etc5madm02vm01
     1      689   81G   80G   1.0%  31:35:15 0.0% etc5madm02vm02
     5       81 2157M 1619M   0.0%   0:07:56 0.0% e1server
     3       28  255M  278M   0.0%   0:02:09 0.0% e1batch
```

Figure 7. An example of PDom-level metrics collected by the Oracle Solaris prstat –Z 15 command

Deploying the JD Edwards EnterpriseOne Testing Environment

Standard Oracle virtualization and JD Edwards EnterpriseOne techniques were utilized to install, configure, and test the in-memory applications of JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor. This was done in tandem with DIL on JD Edwards EnterpriseOne Application Toolset release x9.1.3.2. The software-specific design elements for JD Edwards EnterpriseOne and Oracle infrastructure software on the Oracle engineered solution are provided below in Figure 8.

Oracle SuperCluster M6-32

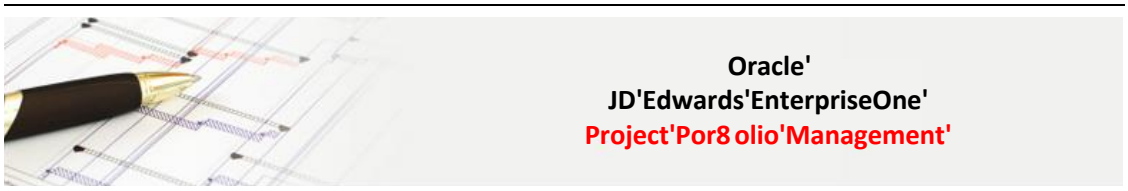
- Oracle Database 11g Release 2 (11.2.0.3) with Oracle RAC on Oracle Solaris 11.1
- JD Edwards EnterpriseOne Application Toolset release x9.1.3.2
- Oracle WebLogic Server 10.3.6 with Java 1.7

Figure 8. JD Edwards EnterpriseOne in-memory software design on the Oracle SuperCluster M6-32

Oracle's JD Edwards EnterpriseOne

Oracle's JD Edwards EnterpriseOne—with components for JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor—for Oracle engineered systems combines the hardware and value-added features of Oracle SuperCluster M6-32 with the application layers of JD Edwards EnterpriseOne. This provides unprecedented speed for gathering, aggregating, and summarizing real-time project information. JD Edwards EnterpriseOne is an integrated applications suite of comprehensive enterprise resource planning (ERP) software that combines business value, standards-based technology, and deep industry experience into a business solution with a low total cost of ownership. The underlying JD Edwards EnterpriseOne architecture

is based on a flexible and scalable toolset built with open standards so it can easily grow and expand with business requirements. The Oracle Optimized Solution for JD Edwards EnterpriseOne combines JD Edwards EnterpriseOne, Oracle WebLogic Server, and the flagship Oracle Database on Oracle's SPARC T4 and SPARC T5 in conjunction with Oracle engineered systems, each of which has integrated storage, Oracle Exadata Storage Server, and Oracle's Sun Flashfire technology. Oracle's SPARC T-Series servers include the Oracle Solaris operating system with built-in virtualization. This delivers the perfect combination of security, performance, and reliability and provides an economical and scalable foundation for JD Edwards EnterpriseOne deployments.



Oracle's JD Edwards EnterpriseOne In-Memory Project Portfolio Management

When operational on the Oracle SuperCluster M6-32 engineered system, the JD Edwards EnterpriseOne In-Memory Project Portfolio Management solution can be deployed to provide near real-time executive-level visibility into project portfolio cost and profitability, which has never been possible until now. It is in this way that JD Edwards EnterpriseOne In-Memory Project Portfolio Management empowers executives and project managers to make quick, informed decisions about their portfolio and projects. The JD Edwards EnterpriseOne In-Memory Project Portfolio Management solution is a value-added software solution that is separately licensed and deployed on Oracle SuperCluster M6-32. JD Edwards EnterpriseOne, when deployed with In-Memory Application provides unprecedented speed for gathering, aggregating, and summarizing real-time project information, thereby empowering organizations to rapidly and proactively respond to project-related issues.

Figure 9 summarizes the capabilities and benefits of JD Edwards EnterpriseOne In-Memory Project Portfolio Management when it is deployed on Oracle engineered systems. In-depth information is provided in the For More Information section in this document.

JD EDWARDS ENTERPRISEONE CAPABILITY	BUSINESS BENEFIT	IN-MEMORY BENEFIT
Single Integrated Project Management Solution 	• Manage multiple projects • Gain the ability to report, aggregate, and select data from multiple projects • Save valuable time and money in day-to-day project reviews	Near real-time updates empower project managers to respond proactively and manage projects effectively, thereby avoiding costly potential project delays.
Visibility into Multiple Views of Projects. 	• Allow multiple stakeholders to view projects • Promote organizational view of projects, which improves project management effectiveness • Enable rapid roll-up of project amounts by stakeholder(s) to improve overall profitability.	Near real-time updates through project manager interactive updates or batch updates provide an organization with a wide view of project planning and execution with up-to-date visibility into cost and profitability.
Optimization of Project Profitability	• Track cash flow with up-to-date amounts • Gain insight into cash availability and	Whether interactive or batch, in-memory technology keeps content up to date so that managers can see project-related

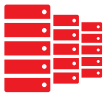
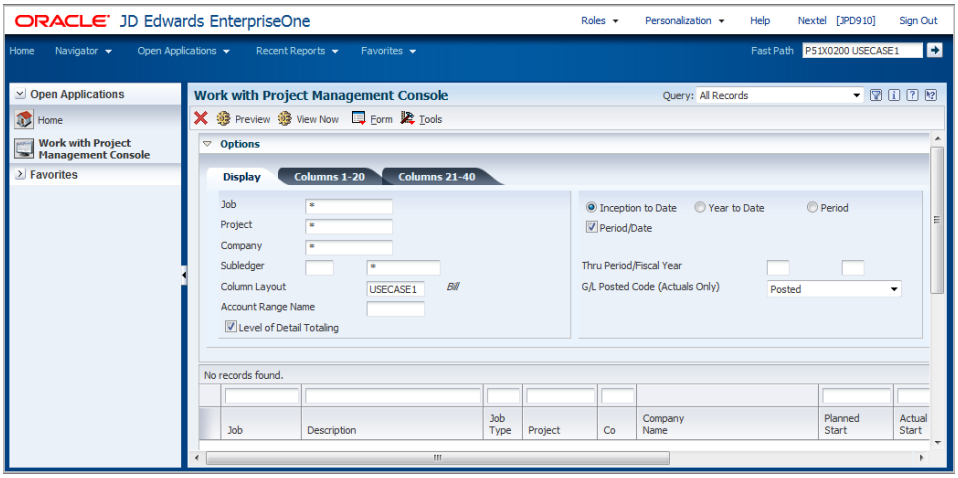
	project profitability for projects or groups of projects • Make changes to projects that drive cash flow and profitability	profitability at near real-time speeds.
Drill-Down Project Visibility 	• Gain single-click project analysis visibility up and down throughout the project portfolio • Summarize groups of projects and drill down to view project details • Manage projects, keeping them within cost parameters and profitable and decrease risk to on-time delivery	In-memory technology accelerates project management and delivery because project managers are always seeing up-to-date data.
Built for Engineered Systems 	• Improve response by deploying JD Edwards EnterpriseOne In-Memory Project Portfolio Management with Oracle Database on Oracle engineered systems • Accelerate business profitability with Oracle hardware and software, engineered to work together.	Improve and accelerate productivity with the In-memory capabilities of JD Edwards EnterpriseOne Project Portfolio Management can be deployed only on Oracle engineered systems such as Oracle SuperCluster M6-32 and Oracle Exadata

Figure 9. Capabilities and benefits of JD Edwards EnterpriseOne In-Memory Project Portfolio Management

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Performance Testing Approach

The use case that was initiated while testing JD Edwards EnterpriseOne In-Memory Project Portfolio Management was to "fastpath" into the application and use the advanced query process to specify the job criteria that were to be tested. A depiction of the general JD Edwards EnterpriseOne In-Memory Project Portfolio Management console is illustrated in the upper portion of Figure 10. In the lower portion of Figure 10 are examples of the column options and an advanced query used during testing. The checkboxes in Figure 10 indicate which options will be included in the illustrations for viewing after the View Now action is instantiated.

In Figure 10, on the lower right in the Query Options panel, as an example, 20 jobs are specified representing 63,000 JD Edwards EnterpriseOne In-Memory Project Portfolio Management accounts in the database.



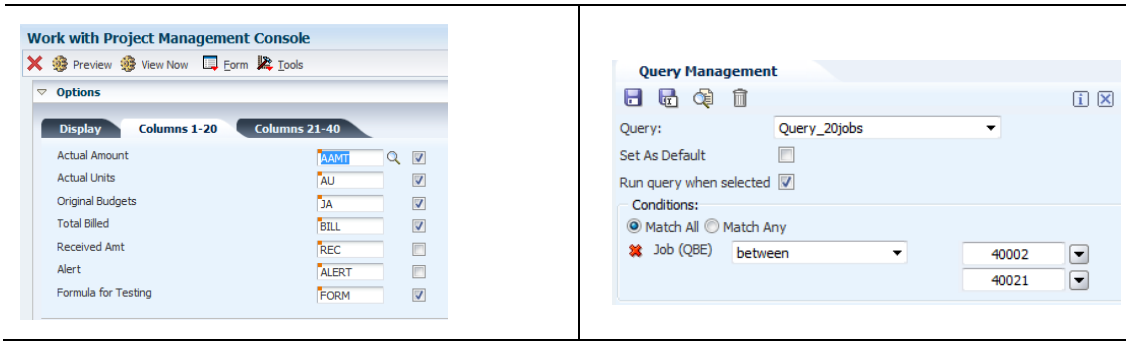


Figure 10. JD Edwards EnterpriseOne In-Memory Project Portfolio Management display (P51X0200) in the upper part of the figure, column specification in bottom left, and advanced queries in bottom right

Workloads Examined During Testing

The goal of load generation was to measure the interactive and JD Edwards EnterpriseOne In-Memory Project Portfolio Management job query response times while increasing user, project job accounts, and various other user actions that can be taken once the View Now calculations are completed. These intermediate actions are summarized in the right side of Figure 11 below.

In addition, during the testing, three different workloads were examined while determining average response time. These workloads are illustrated on the left side of Figure 11.

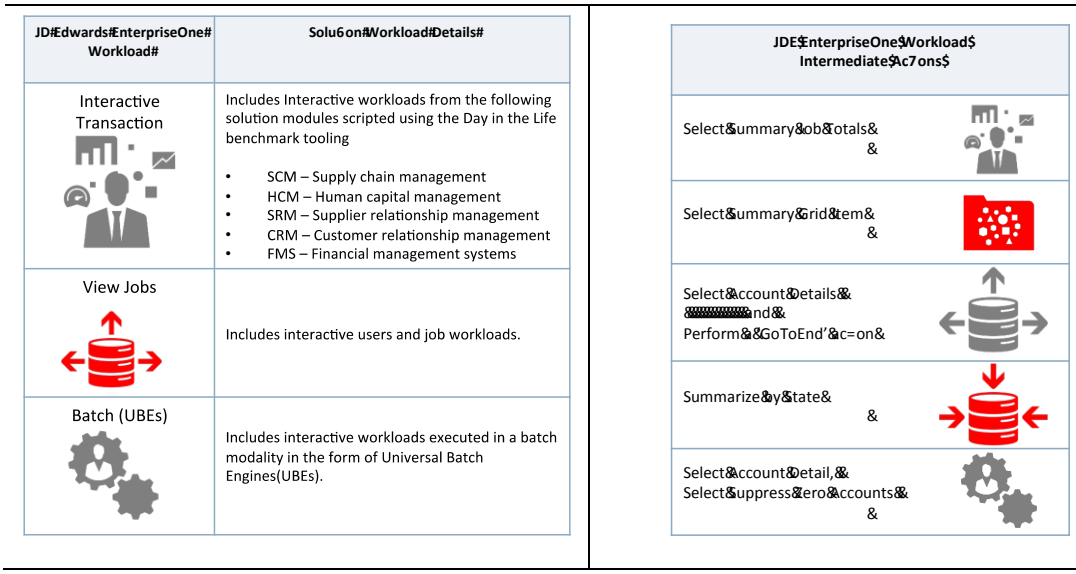


Figure 11. Workload details and various user actions taken once the View Now calculations are completed

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Workload

There are several factors that can contribute to a typical workload in a JD Edwards EnterpriseOne environment, and these are illustrated in Figure 11 and Figure 12. Factors include the number of interactive users, number of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs as well as the amount of batch workloads. Integral to these workloads is the number of accounts processed, number of simultaneous jobs, and the amount of demand on the Oracle Database.

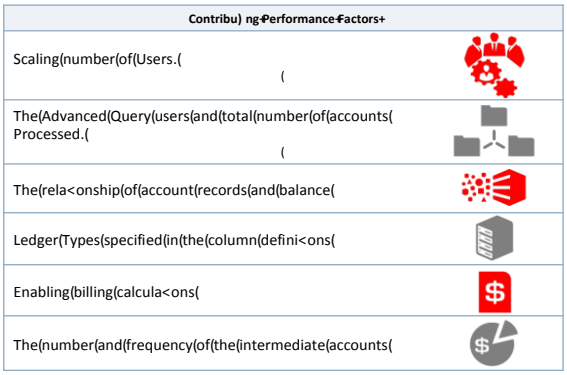


Figure 12. Contributing performance factors

JD Edwards EnterpriseOne In-Memory Project Portfolio Management User and Account Relationships

In Figure 13 below is depicted the relationship between JD Edwards EnterpriseOne In-Memory Project Portfolio Management accounts and the data that will be accessed through the in-memory application. In this example a user chooses a series of jobs in the advanced query; each job in turn has a number of associated database account records. Following the illustration downward, each account has a number of account records. In this example, there are 12 account records per account.

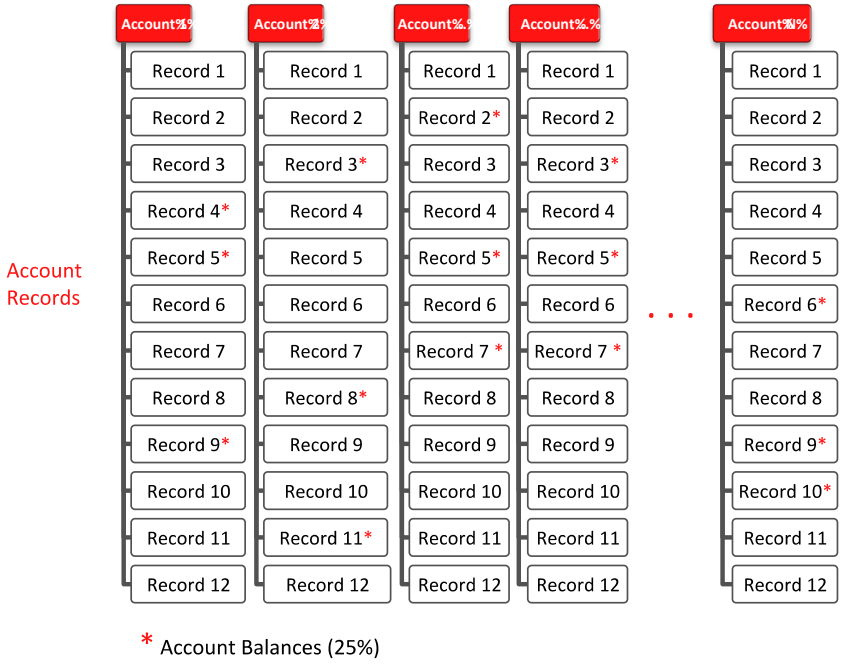


Figure 13. JD Edwards EnterpriseOne In-Memory Project Portfolio Management user and account relationships

An examination of these account records shows that only 25 percent are of the account balance type, and it is this type of account record that drives in-memory and database performance in the calculation of any billing categories.

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Application Performance Results

This section describes results of testing JD Edwards EnterpriseOne In-Memory Project Portfolio Management in order to examine performance using JD Edwards EnterpriseOne Application Toolset release x9.1.3.2. The results are interpreted from the metrics collected during testing. During the testing, the workloads were scaled in terms of jobs and accounts with the JD Edwards EnterpriseOne In-Memory Project Portfolio Management application. The objective was to observe interactive and JD Edwards EnterpriseOne In-Memory Project Portfolio Management batch job average response time metrics and CPU loads as each of the workload factors were scaled upward. The nature of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs is that they are more resource intensive than interactive work and require more time to complete associated database work. Typically, this workload can take one minute or more to complete and can, with medium to heavier workloads, adversely affect interactive response times in traditional deployments.

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Response Time While Scaling Jobs

JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs were profiled for each category and executed iteratively during the testing intervals. To scale users, as illustrated in Figure 14, the number of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs was scaled upwards from a single job running iteratively to 60 jobs executing iteratively. During each of these tests, CPU loads were measured on the Oracle WebLogic Server, the JD Edwards EnterpriseOne server, and the Oracle Database server.

As illustrated in Figure 14, a single JD Edwards EnterpriseOne In-Memory Project Portfolio Management job executing iteratively sustained an average response time of 9.7 seconds while CPU utilization(s) for each server in the JD Edwards infrastructure never exceeded 0.12 percent CPU utilization. As the job workloads scaled from 10 jobs executing iteratively to 20, 40, and 60 jobs executing iteratively, the corresponding average JD Edwards

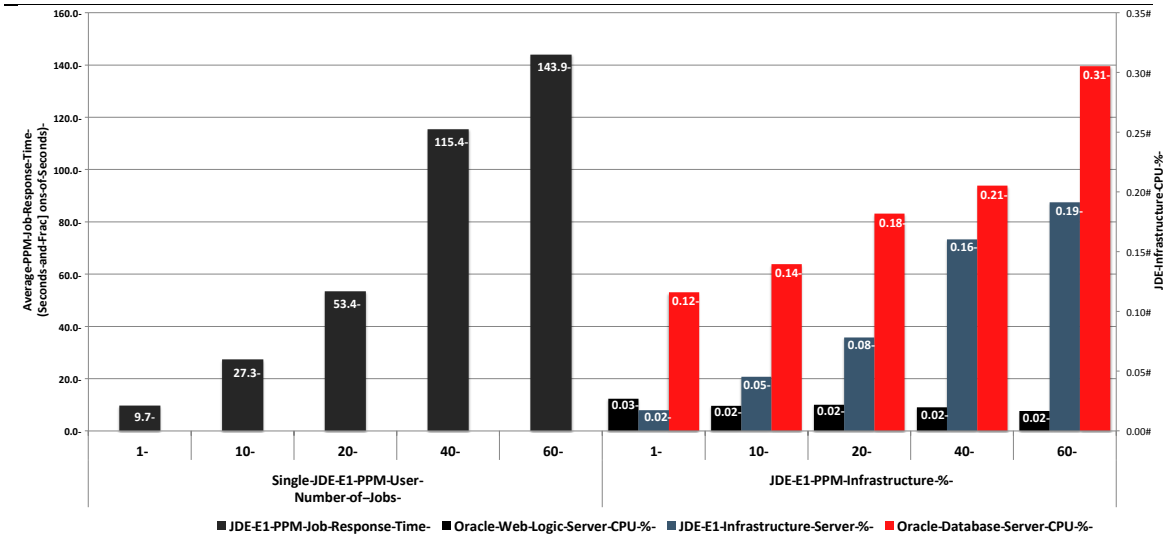


Figure 14. JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs' scalability and performance results with the in-memory application enabled.

EnterpriseOne In-Memory Project Portfolio Management job response times tracked linearly yet never exceeded, at the top end of the job mix of 60 jobs executing iteratively, 143.9 seconds average response time. This easily achieved the objective of rapidly completing jobs in the seconds to minutes of average elapsed time. As these jobs scaled from a single job upwards to 60 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs executing iteratively, Oracle WebLogic Server CPU load remained almost constant, the JD Edwards server CPU load never exceeded approximately .19 percent CPU utilization, and the Oracle Database server topped out at just less than 0.31 percent CPU utilization. In all cases the CPU resource on each of the JD Edwards EnterpriseOne infrastructure servers was hardly taxed during the tests.

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Response Time While Scaling Accounts

It is also valuable to examine response time as the nature of JD Edwards EnterpriseOne In-Memory Project Portfolio Management job(s) workload is manipulated to access, update, and process account information in the Oracle Database. To this end, jobs were profiled for each category to access, update, and process an escalating number of accounts, which executed iteratively during the testing intervals. The number of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs was scaled from a single job executing iteratively upwards to 60 jobs executing iteratively. Within each of these job sets, an escalating number of accounts was accessed, updated, and processed from 3,000 accounts increasing upwards to 189,000 accounts. During each of these tests CPU loads were measured on the Oracle WebLogic Server, the JD Edwards EnterpriseOne server and Oracle Database server. The objective was to examine the JD Edwards EnterpriseOne In-Memory Project Portfolio Management job average response time versus CPU load on the JD EnterpriseOne infrastructure as it responded to this scaled workload. As illustrated in Figure 15, as would be expected, a single JD Edwards EnterpriseOne In-

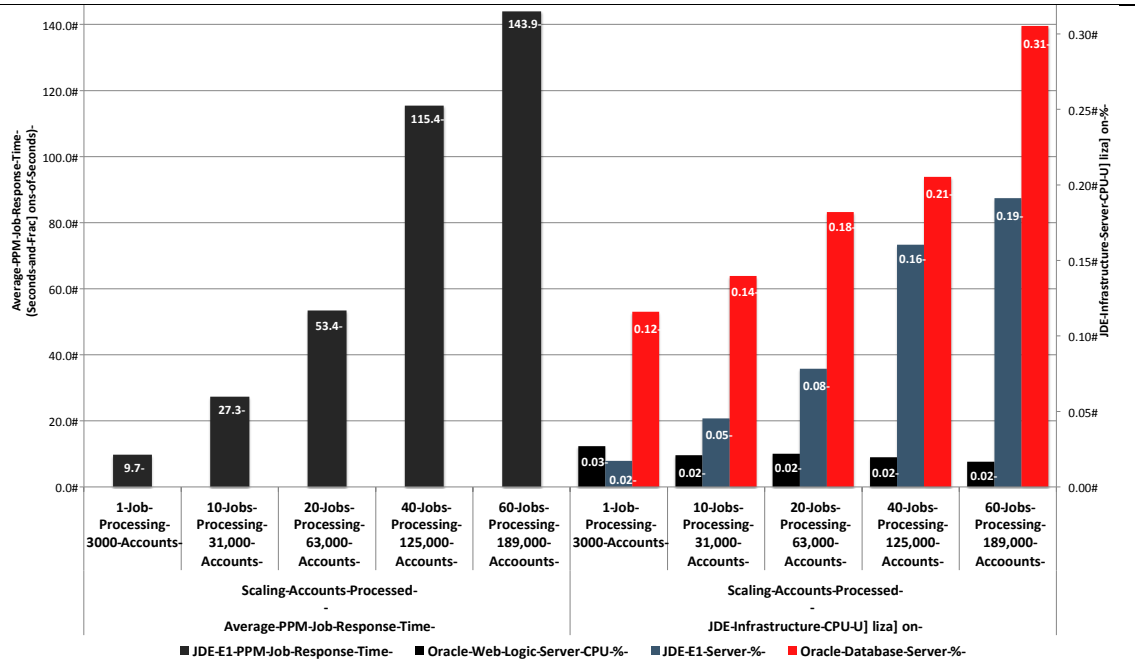


Figure 15. Jobs and accounts processed with scalability and performance results using the in-memory application

Memory Project Portfolio Management job executing iteratively and accessing, updating, and processing 3,000 accounts sustained an average job response time of 9.7 seconds; at the same time, CPU utilization(s) for each server in the JD Edwards EnterpriseOne infrastructure never exceeded 0.31 percent CPU utilization. As the job workloads scaled from 10 jobs executing iteratively to 20, 40, and 60 jobs executing iteratively, the corresponding number of accounts also escalated from 31,000, 63,000, 125,000, to189,000 respectively. JD Edwards EnterpriseOne In-Memory Project Portfolio Management job average response times tracked linearly yet never exceeded, at the top end of the job mix, 143.9 seconds or 2 minutes and on or about 24 seconds thereby achieving the objective of executing these JD Edwards EnterpriseOne In-Memory Project Portfolio Management workloads in seconds and minutes rather than larger elapsed times and without the benefit of the in-memory application feature that would otherwise adversely affect interactive response times. An examination of the CPU load as these jobs scaled reveals that nominally, while the Oracle WebLogic Server CPU load remained almost constant, the JD Edwards EnterpriseOne server CPU load never exceeded approximately 0.19 percent CPU utilization, and the Oracle Database server topped out at just less than 0.31 percent CPU utilization.

Scalability with Interactive, JD Edwards EnterpriseOne In-Memory Project Portfolio Management Job and Batch Workloads

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Interactive Response Time During Batch Workload(s)

Typical JD Edwards EnterpriseOne operational workloads show that interactive users, JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs, and batch universal batch engine(s) (UBEs) can and do execute simultaneously. It is always preferred to preserve interactive response times to less than one-half second, while balancing and optimizing UBE batch and JD Edwards EnterpriseOne In-Memory Project Portfolio Management job response times. In addition, UBE batch workloads are infrastructure intensive and can run the gamut from small jobs that execute in minutes to long-running jobs, which are Oracle Database intensive, that take hours or indeed may execute overnight in order to avoid prime time processing.

To that end, it is valuable to examine interactive and JD Edwards EnterpriseOne In-Memory Project Portfolio Management job response times as the nature of the job(s) workload is manipulated to access, update, and process database information in the Oracle Database while the number of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs and interactive jobs are scaled upward during a steady state small to medium UBE batch workload. Again, JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs were profiled for each category to access, update, and process data in Oracle Database while escalating the number of simultaneous JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs executing iteratively as well as the number of interactive users. The number of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs was scaled from 20 jobs executing iteratively, to 40 jobs, and subsequently to 100 jobs executing iteratively. Within each of these job sets, an escalating number of interactive users were added to the job mix in order to examine interactive response time and see if it was possible to preserve the less than one-half second service level response time requirement. Finally, during this test there were 300 to 400 concurrent batch (UBE) jobs. Of these, there were 16 midsized jobs with the balance being simultaneously executing smaller jobs during the test interval. During each of these tests, CPU loads also were measured on Oracle WebLogic Server, the JD Edwards EnterpriseOne server, and the Oracle Database server.

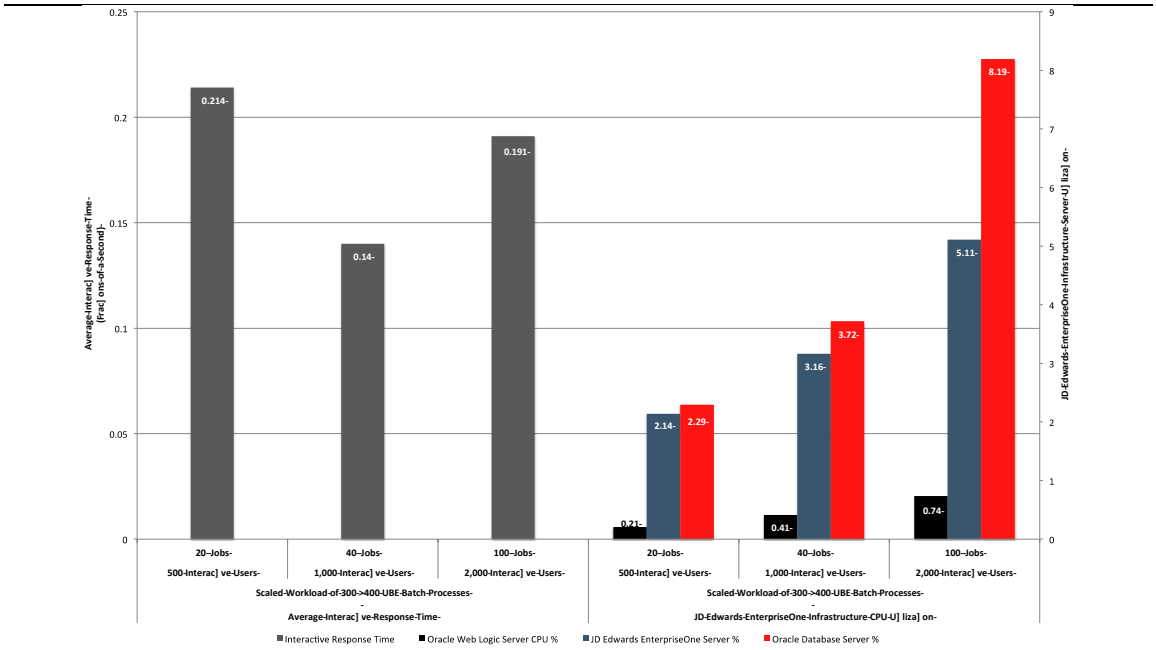


Figure 16-1. Interactive user response time during job and batch (UBE) workloads

As illustrated in Figure 16-1, and as would be expected, with 20 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs executing iteratively and 500 concurrent interactive users, the average interactive response time was 0.21 seconds while average JD Edwards EnterpriseOne In-Memory Project Portfolio Management job time to completion as illustrated in Figure 16-2, was 21.299 seconds. The jobs were scaled to 40 concurrent JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs executing iteratively and 1,000 concurrent interactive users, which in Figure 16-1 showed an interactive response time of 0.14 seconds and average JD Edwards EnterpriseOne In-Memory Project Portfolio Management job time to completion as illustrated in Figure 16-2, of 8.4 seconds. Finally, with 100 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs executing iteratively with 2,000 concurrent interactive users an average interactive response time as shown in Figure 16-1 was 0.19 seconds with an average job time to completion as illustrated in Figure 16-2 of 11.46 seconds. These results show the JD Edwards EnterpriseOne infrastructure, both hardware and software, handily met the service level objectives of less than one-half second interactive response time and job completion time within the seconds-to-minutes timeframes.

An examination of the CPU load as these jobs scaled reveals the Oracle WebLogic Server CPU load nominally scaled from 0.21 percent CPU utilization to 0.41 percent and subsequently to 0.74 percent CPU utilization. As would be expected, the larger CPU loads were attributed to the JD Edwards EnterpriseOne server and the Oracle Database server. When the smallest JD Edwards EnterpriseOne In-Memory Project Portfolio Management job and concurrent load executed, the JD Edwards EnterpriseOne server reached an average of 2.14 percent while the Oracle Database server was at 2.29 percent CPU utilization. During the medium JD Edwards EnterpriseOne In-Memory Project Portfolio Management job and interactive load, the JD Edwards EnterpriseOne server reached 3.16 percent while the Oracle Database server increased to 3.72 percent. At the highest tested JD Edwards EnterpriseOne In-Memory Project Portfolio Management job and interactive load, the JD Edwards EnterpriseOne server reached 5.11 percent, and the Oracle Database server topped out at 8.19 percent CPU utilization.

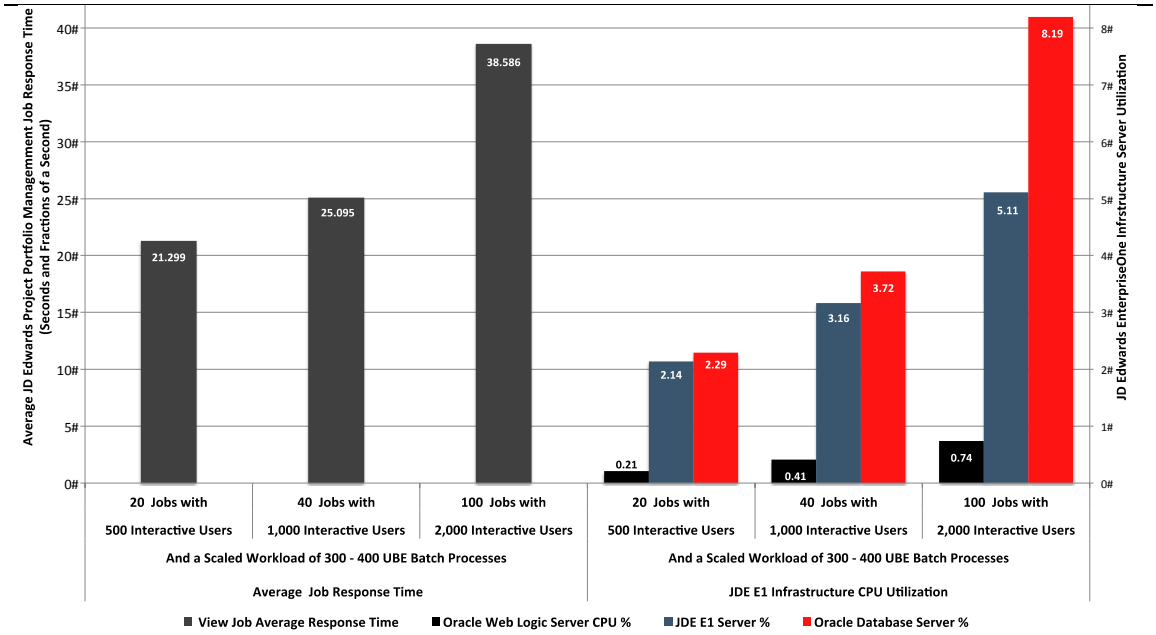


Figure 16-2: JD Edwards EnterpriseOne In-Memory Project Portfolio Management Average Response Times during Scaling Interactive and batch job and UBE workloads.

JD Edwards EnterpriseOne In-Memory Project Portfolio Management Performance Improvement

The primary objective of deploying JD Edwards EnterpriseOne In-Memory Project Portfolio Management is to help executives and project managers make quicker, more informed decisions than they can now about their portfolio and projects in order to empower the overall business model to operate efficiently and improve the bottom line. To that end providing an enterprise class environment with less than or equal ½ second interactive response time is critical to improving overall online productivity and thus providing these executives and project managers up to date data rapidly.

Interactive Response Time Performance

In general, overall objective with JD Edwards EnterpriseOne In-Memory Project Portfolio Management testing was to preserve interactive response time to be at or less than one-half second. The measure of improvement over this service level can be measured through observation when JD Edwards EnterpriseOne In-Memory Project Portfolio Management workloads were added to the overall workload mix. As can be seen in Figure 17, the margin in which interactive response time is less than the one-half second service level is dramatic. On the left hand side of the figure is plotted the margin at which the observed average response time was less than the one-half second service level requirement when there were 500, 1,000, and 2,000 interactive concurrent and active JD Edwards EnterpriseOne users. In addition, during each of these workload categories, 20, 40, and 100 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs were executed iteratively. The plot shows that when 500 interactive users were active, and 20 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs were executing iteratively, interactive average response time was 84 percent better than the service level requirement response time of ½ second. When 1,000 users were active and 40 JD Edwards EnterpriseOne In-

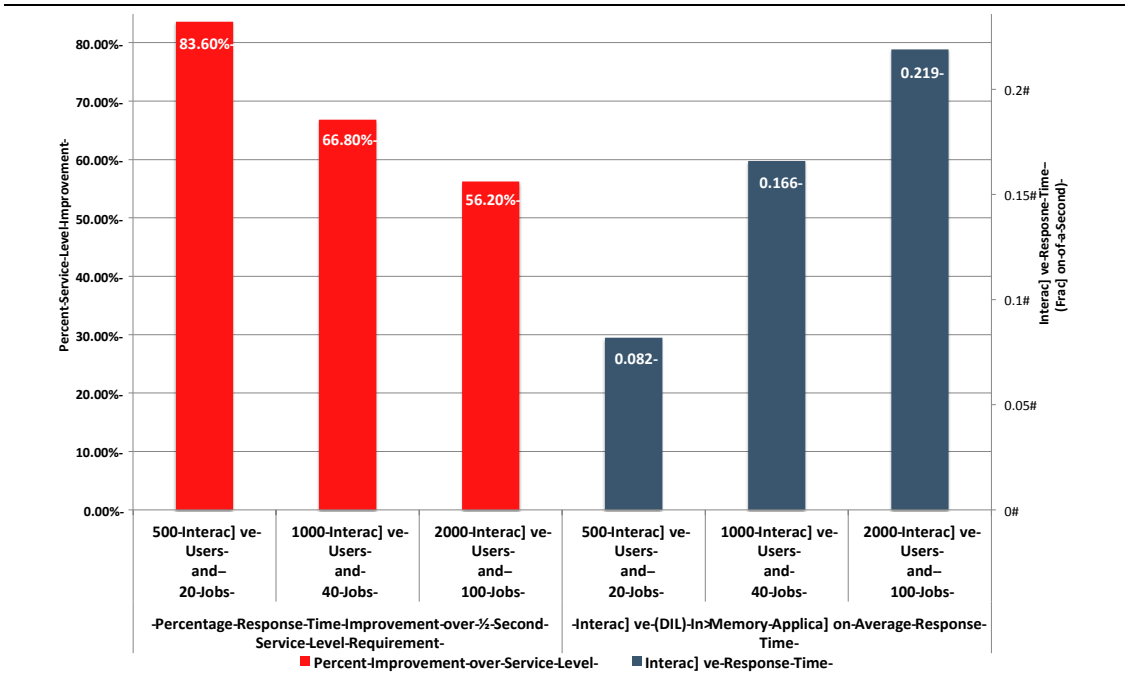


Figure 17. Average interactive response time improvement over ½ second service level requirement results

Memory Project Portfolio Management jobs were executing iteratively, response time was 67 percent better than the recommended interactive service level response time. And, finally, when 2,000 interactive users were active, and 100 JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs were executing iteratively, interactive response time bested the service level requirement of ½ second by 56 percent. This shows that the execution of JD Edwards EnterpriseOne In-Memory Project Portfolio Management jobs minimally affected average interactive response time while processing the workload. It also demonstrates the inherent ability of the JD Edwards EnterpriseOne In-Memory Project Portfolio Management application in responding to user demand and the depth as well as performance of the underlying Oracle SuperCluster M6-32 and Oracle Database in responding to JD Edwards EnterpriseOne In-Memory Project Portfolio Management interactive workload demand.

Oracle's JD Edwards EnterpriseOne In-Memory Sales Advisor Application

Companies with customer service centers want to capitalize on their customer interactions and drive additional revenue. Managing multiple price lists and promotions makes it difficult for customer service representatives (CSRs) to recommend higher quantities, related products, or promotional discounts to drive sales. Yet, product sales must be profitable to keep a company in business. Executives need rapid insight into the impact of changing sales conditions on their bottom line to enable knowledgeable decision-making. JD Edwards EnterpriseOne In-Memory Sales Advisor empowers executives with rapid results during analysis of current and historical data so they can respond to market conditions with respect to future product pricing and promotions.

JD Edwards EnterpriseOne In-Memory Sales Advisor	Business Benefit	In-Memory Benefit
Driving Sales Revenue	• Suggest sales in real time, opening more revenue opportunities • Set pricing to encourage larger sales volumes and on purchase history • Set dynamic analysis quantity-level discounts through evaluation of pricing, discounts, and promotions	• Near real-time sales opportunities empower CSRs to respond proactively and manage sales opportunities effectively, thereby avoiding the costly loss of potential sales revenue.
Driving Higher Customer Satisfaction	• Provide real-time product suggestions to customers • Enhance customer relationships with intelligent product and purchase history analysis • Improve customer loyalty through proactive customer-related product conversations	• Near real-time customer-intelligent product suggestions based on the current order or customer purchase history increases future sales by improving customer satisfaction and loyalty.
Drill-Down Product Profit Visibility	• Know the profit margin for each product in the portfolio as well as for each order as it is taken • Export historical and current product profitability data into desktop tools to improve productivity • Display graphically product profit margin outcomes in real time • Recommend high-margin products or higher quantities to customers	• In-memory performance improvements empower CSRs because they know know accurate product profit margins on the fly in real time and can maximize profitability during each sales encounter.
Built for Engineered Systems	• Improve sales productivity by deploying JD Edwards EnterpriseOne In-Memory Sales Advisor with Oracle Database on Oracle engineered systems • Accelerate business profitability with Oracle hardware and software, engineered to work together.	• Improve and accelerate productivity with the In-memory capabilities of JD Edwards EnterpriseOne Sales Advisor which can be deployed only on Oracle engineered systems such as Oracle SuperCluster M6-32 and Oracle Exadata

Figure 21. Features and benefits of JD Edwards EnterpriseOne In-Memory Sales Advisor

Oracle SuperCluster M6-32 and JD Edwards EnterpriseOne In-Memory Sales Advisor

This section of the white paper documents the benefits of deploying the JD Edwards EnterpriseOne In-Memory Sales Advisor solution on Oracle SuperCluster M6-32, as illustrated in Figure 21. In addition, this section of the white paper provides performance results from in-depth testing of the JD Edwards EnterpriseOne In-Memory Sales Advisor application on Oracle SuperCluster M6-32. These results illustrate how both interactive and JD Edwards EnterpriseOne In-Memory Sales Advisor job response time(s) are improved and provide business-critical benefits to an organization.

Key Application Factors	Description
Performance	A checkbox in this column can mean that performance of the application is data dependent. The more records that are present in the table that this feature of Sales Advisor queries, the slower the application can perform.
Tab	A checkbox in this column indicates that the feature is not exercised unless a click action to a specific Sales Advisor tab is performed.
Toggle	A checkbox in this feature indicates that it can be toggled ON/OFF through the Sales Advisor P42X00 application.

JDE EnterpriseOne Sales Advisor Feature	Performance	Tab	Toggle
Cross:Sell	%	%	% %
Frequency			% %
Line Up:Sell	% %	% %	% %
Order Fulfillment	% %		% %
Order Up:Sell		% %	% %
Preferred Items		% %	
Supply & Demand	% %	% %	% %

Figure 22. Table of JD Edwards EnterpriseOne In-Memory Sales Advisor capabilities and key application factors noted during testing.

JD Edwards EnterpriseOne In-Memory Sales Advisor Performance Testing Approach

The JD Edwards EnterpriseOne In-Memory Sales Advisor application has eight major features that are included as part of the application and three key factors about each feature. These are depicted in Figure 22. Of importance are the relationships between each of the factors and each application feature.

As illustrated, the number of records referenced during Oracle Database query(s) while using each of the features affects query performance. Capabilities have to be selected in the tab checkbox or toggled on or off in order for each one to be enabled and thus affect JD Edwards EnterpriseOne In-Memory Sales Advisor performance. Users should examine each of the JD Edwards EnterpriseOne In-Memory Sales Advisor capabilities and their relationship to performance, Tab selection, and Toggle selection in the table on the right side of Figure 22.

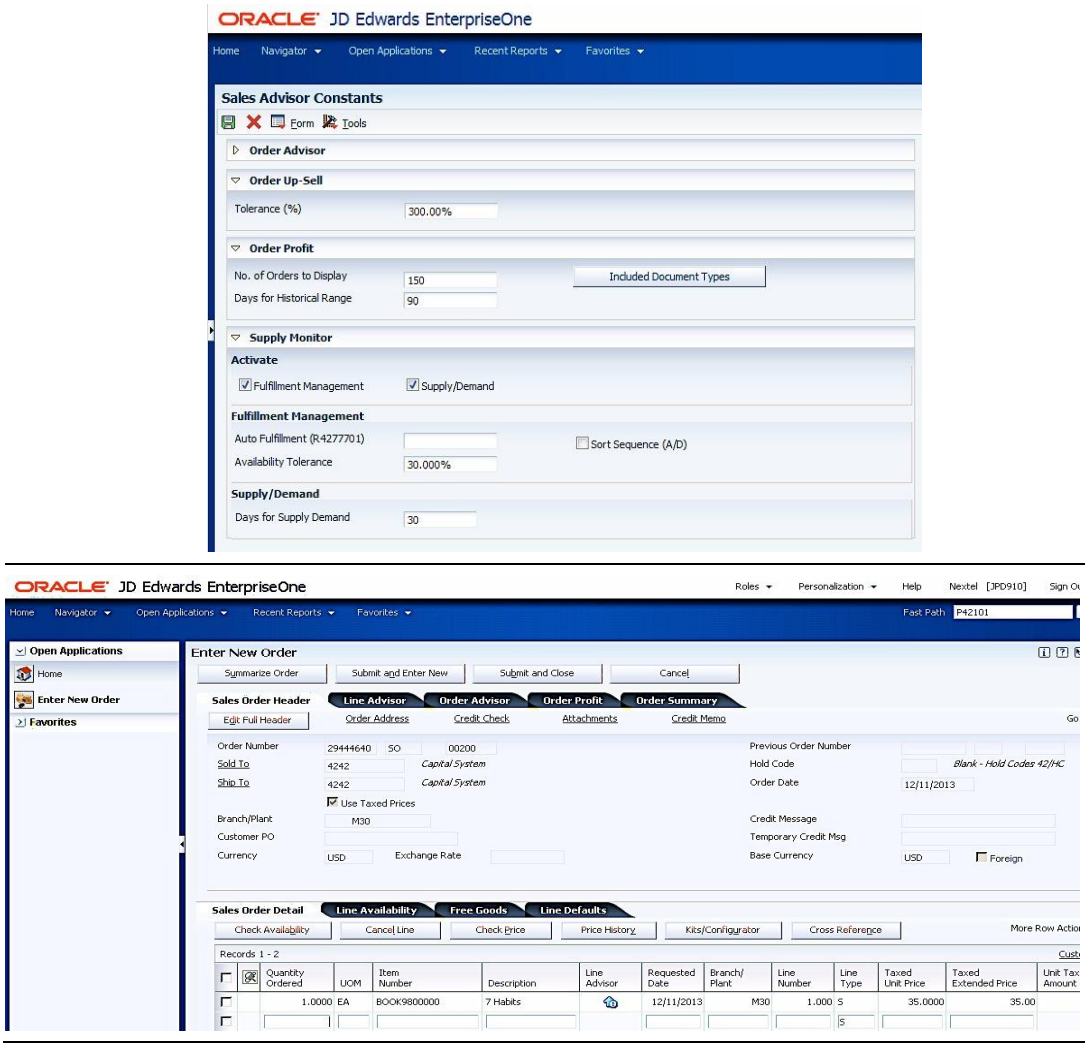


Figure 23. JD Edwards EnterpriseOne In-Memory Sales Advisor constants (P42X00)

Of key importance in understanding these relationships is the ability to visualize the actual application as depicted in Figure 23 where these elements of user behavior while using the JD Edwards EnterpriseOne Sales Advisor graphical user interface to interact with those factors that can potentially affect performance. The use case discussed in this section is the JD Edwards EnterpriseOne In-Memory Sales Advisor application dialogue, which is a modified version of the sales order entry application.

Oracle's JD Edwards EnterpriseOne Baseline Performance Results

This section describes results of testing JD Edwards EnterpriseOne In-Memory Sales Advisor in order to illustrate performance improvement using JD Edwards EnterpriseOne Application Toolset release x9.1.3.2. The results are interpreted from the metrics collected during testing.

JD Edwards EnterpriseOne In-Memory Sales Advisor Application Performance Results

During the testing, interactive workloads characterized by using Day in the Life (DIL) workload scripts as well as scripted scenarios of online JD Edwards EnterpriseOne In-Memory Sales Advisor. The objective was to observe average response time metrics and CPU loads as each of the workload factors were scaled upward while preserving less than half-second interactive response time.

JD Edwards EnterpriseOne In-Memory Sales Advisor Online and Interactive Workloads

While it is clear that the online JD Edwards EnterpriseOne In-Memory Sales Advisor workloads can be more focused and substantial in terms of average response time, it is useful also to examine these same response time metrics versus CPU load on the JD Edwards EnterpriseOne infrastructure as it responded to these workloads. As illustrated in Figure 24, both interactive and JD Edwards EnterpriseOne In-Memory Sales Advisor workloads were examined scaling from 500 to 1,000 total users. Specifically, for 500 users, an average response time of .20 seconds was observed for 125 JD Edwards EnterpriseOne In-Memory Sales Advisor online users while a simultaneous average response time observation of .081 seconds was observed for interactive users. As the workloads scaled up to 1,000 total users, an average response time of 0.38 seconds was observed for 250 JD Edwards EnterpriseOne In-Memory Sales Advisor users and an average response time of 0.138 seconds was observed for 750 interactive users. All interactive average response times were well within the one-half second service level requirement. The JD Edwards EnterpriseOne server infrastructure responded to this workload demand with negligible Oracle WebLogic Server CPU utilization(s), with the JD Edwards EnterpriseOne server responding to all workloads in this test with less than 2 percent server CPU utilization. The Oracle Database server responded with 4 percent server CPU utilization at 500 total users and 7.59 percent server CPU utilization at 1,000 total users, indicating that the relative workloads have a higher impact on the Oracle Database than other servers in the infrastructure.

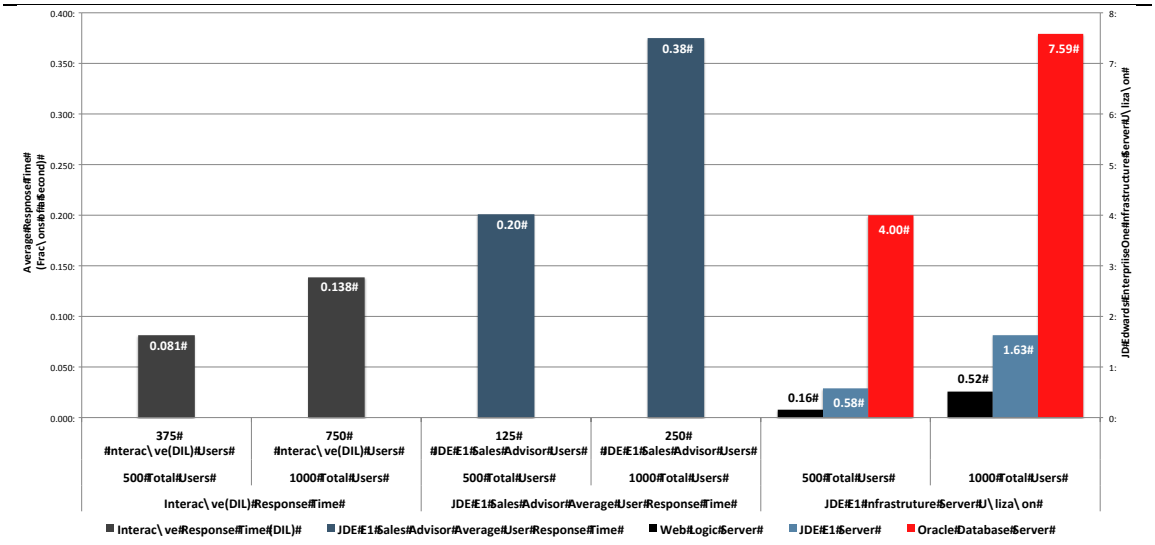


Figure 24. JD Edwards EnterpriseOne In-Memory Sales Advisor interactive (DIL) and online workload(s)

Scalability with Interactive, JD Edwards EnterpriseOne In-Memory Sales Advisor Job, and Batch Workloads

JD Edwards EnterpriseOne In-Memory Sales Advisor Response Time While Scaling Online Users

It is also valuable to examine response time as the number of JD Edwards EnterpriseOne In-Memory Sales Advisor users scale upwards because the Oracle Database CPU load responds to the frequency and character of JD Edwards EnterpriseOne In-Memory Sales Advisor users. To conduct the examination, the number of JD Edwards EnterpriseOne In-Memory Sales Advisor users was scaled from 100 to 250 and subsequently to 500. During each of these tests, response time data was collected and CPU utilization was measured on the Oracle WebLogic Server, the JD Edwards EnterpriseOne server, and the Oracle Database server. The objective was to determine the JD Edwards EnterpriseOne In-Memory Sales Advisor user's average response time versus JD Edwards EnterpriseOne server infrastructure utilization, and specifically, the Oracle Database server as it responded to this scaled workload.

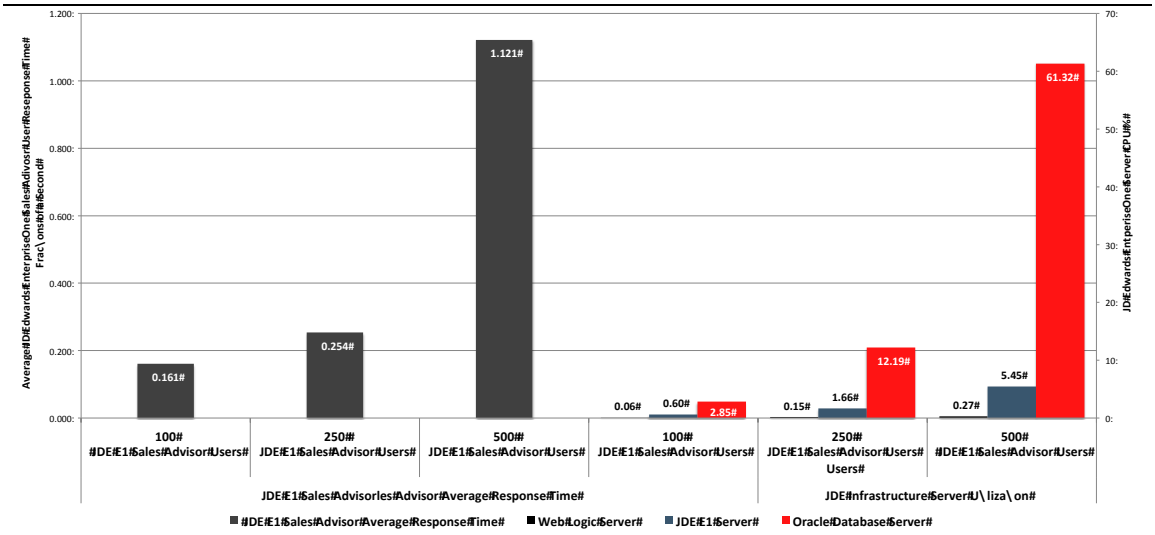


Figure 25. Scaling online JD Edwards EnterpriseOne In-Memory Sales Advisor user workload

As illustrated in Figure 25, as the number of JD Edwards EnterpriseOne In-Memory Sales Advisor users scaled upwards, 100 users were able to sustain an average response time of 0.161 seconds while each server in the JD Edwards EnterpriseOne infrastructure never exceeded 2.85 percent CPU utilization.

As the job workloads scaled from 100 to 250 JD Edwards EnterpriseOne In-Memory Sales Advisor users, average response time was 0.254 seconds with the Oracle WebLogic Server having negligible utilization. The JD Edwards EnterpriseOne server sustained an average utilization of 1.66 percent and the Oracle Database upward of 12.19 percent—indicating that JD Edwards EnterpriseOne In-Memory Sales Advisor workloads are more Oracle Database intensive than interactive workloads. And this also indicates that when interactive and JD Edwards EnterpriseOne In-Memory Sales Advisor users work simultaneously, the JD Edwards EnterpriseOne In-Memory Sales Advisor user's workload is what is driving the Oracle Database CPU utilization.

Finally, as the workload scaled to 500 JD Edwards EnterpriseOne In-Memory Sales Advisor users, average response time climbed to 1.12 seconds with the Oracle WebLogic Server still having negligible CPU utilization. The JD Edwards EnterpriseOne server also scaled linearly with the number of JD Edwards EnterpriseOne In-

Memory Sales Advisor users from 0.60 percent to 1.66 percent and, finally, to 5.45 percent. To confirm the sensitivity of the Oracle Database server workload to JD Edwards EnterpriseOne In-Memory Sales Advisor user workloads, the CPU utilization increased dramatically to 61.32 percent as the number of JD Edwards EnterpriseOne In-Memory Sales Advisor users scaled upward from 250 to 500, indicating a threshold had been exceede. This result contributed to driving the nonlinear growth of Oracle Database CPU utilization.

JD Edwards EnterpriseOne In-Memory Sales Advisor Online and Interactive Response Time During Batch Workload(s)

Typical JD Edwards EnterpriseOne operational workloads show that interactive, JD Edwards EnterpriseOne In-Memory Sales Advisor users, and batch jobs can and do execute simultaneously in typical production workloads, as illustrated in Figure 26, during this test. There is sensitivity about preserving interactive response time(s) to less than one-half second, while balancing and optimizing UBE batch and online user response times. JD Edwards EnterpriseOne In-Memory Sales Advisor user workloads can put more strain on the JD Edwards EnterpriseOne architecture relative to the interactive user workloads. And they can be CPU demanding and database query intensive while requiring more time to execute. In addition, batch workloads, which are called universal batch engine(s) or UBE(s) are infrastructure intensive and can run the gamut from small jobs that execute in minutes to

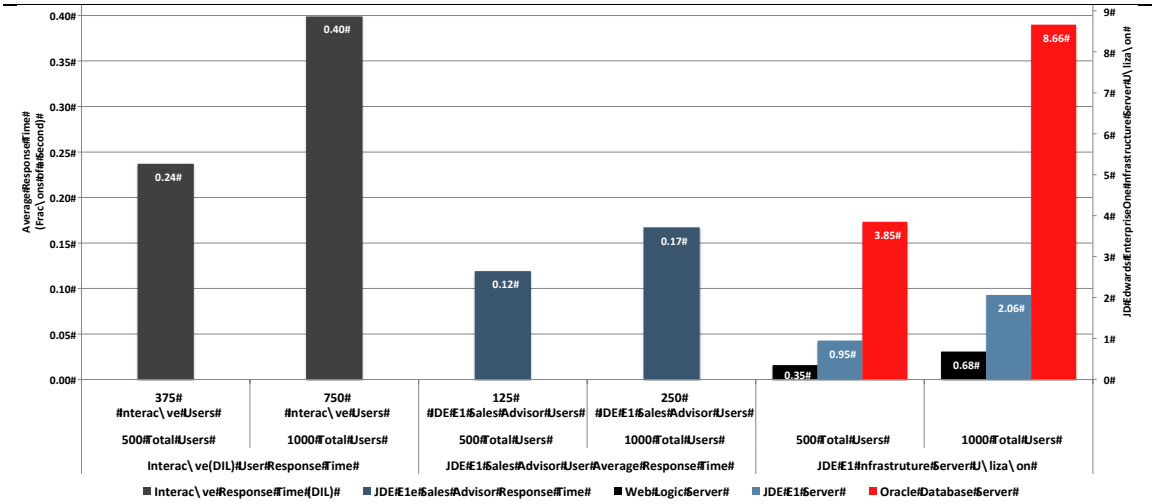


Figure 26. Average response time and CPU utilization during interactive (DIL), JD Edwards EnterpriseOne In-Memory Sales Advisor user, and batch (UBE) workloads

long-running jobs that are Oracle Database intensive and take hours. To this end, interactive (DIL) and JD Edwards EnterpriseOne In-Memory Sales Advisor response times were examined as the total number of users was scaled upward from 500 to 1,000 while accessing, updating, and processing database information in the Oracle Database while simultaneously executing a steady state UBE batch workload. The number of JD Edwards EnterpriseOne In-Memory Sales Advisor users was scaled from 125 to 250 while simultaneously interactive users were scaled from 375 to 750. All the while interactive response time was observed in order to preserve less than the one-half second service level response time requirement. During this test there were 300 to 400 concurrent batch (UBE) processes of which 16 were midsize jobs with the balance being simultaneously executing smaller jobs during the test interval. As before, during each of these tests, CPU loads were measured on the Oracle WebLogic Server, the JD Edwards EnterpriseOne server, and the Oracle Database server.

As illustrated in Figure 26, when a total number of 500 users was present—including 125 JD Edwards EnterpriseOne In-Memory Sales Advisor users and 375 concurrent interactive users—the average interactive response time was 0.24 seconds and average JD Edwards EnterpriseOne In-Memory Sales Advisor response time was 0.12 seconds. The workload then was scaled up to 1,000 total users with 750 interactive users, and this resulted in a sustained average response time of 0.40 seconds, while the remaining 250 JD Edwards EnterpriseOne In-Memory Sales Advisor users achieved an average response time of 0.17 seconds. In all cases, the required interactive user service level response time of one-half second was met handily.

The CPU load as these jobs scaled is shown on the right side of Figure 26. During the 500-user test, Oracle WebLogic Server CPU load achieved 0.35 percent CPU utilization and when scaling to 1,000 total users, achieved 0.68 percent. While Oracle WebLogic Server showed minimal load, the JD Edwards EnterpriseOne server scaled from 0.95 percent CPU utilization with 500 total users to 2.06 percent CPU utilization with 1,000 total users—a minimal impact to this part of the JD Edwards EnterpriseOne server infrastructure. The Oracle Database server utilization responded as observed earlier indicating that while scaling interactive and online JD Edwards EnterpriseOne In-Memory Sales Advisor user workloads upward they become database intensive. At the JD Edwards EnterpriseOne In-Memory Sales Advisor 500 total user workload level, Oracle Database server CPU utilization was 3.85 percent and, as the workload scaled to 1,000 users, it achieved a CPU utilization of 8.66 percent.

JD Edwards EnterpriseOne In-Memory Sales Advisor Interactive Performance Improvement

The primary objective of deploying Oracle's JD Edwards EnterpriseOne in-memory application is to help executives and project managers make rapid, more informed decisions than they can now during key inflexion points in the sales process. This empowers the sales representatives to improve margin and thereby improve the business bottom line. With this in mind, Interactive response time is critical to delivering results rapidly.

Interactive Response Time Performance

As can be seen in Figure 27, the margin in which the interactive response time successfully was less than the interactive response time service level requirement of one-half second was significant, even while scaling the total number of users upward to 1,000 users and with significant batch UBE loads as previously shown in Figure 26.

On the left hand side of Figure 27 is plotted the margin of improvement of interactive response time as observed when there were 500 and 1,000 concurrent total users. The plot shows that when 500 total users were present, average interactive response time bested the recommended interactive service level response time of ½ second by 84 percent.

When 1,000 users were active, average interactive response time bested the recommended interactive service level response time of ½ second by 67 percent. This demonstrates the inherent responsiveness of the JD Edwards EnterpriseOne in-memory application to user demand, Oracle Database workloads, and the performance of the underlying Oracle SuperCluster M6-32 and Oracle Database in responding to interactive workload demand.

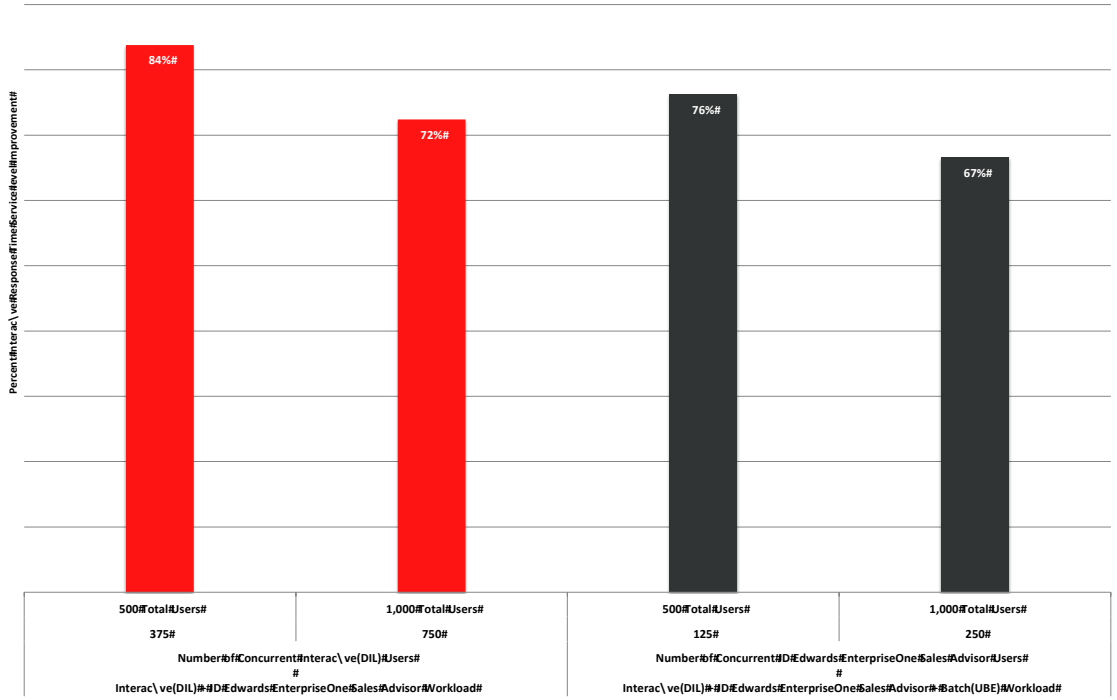


Figure 27. Interactive JD Edwards EnterpriseOne In-Memory Sales Advisor response time improvements

Summary of Key Takeaways Observed During Testing

Deployment

Overall, JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor software applications installed without incident on Oracle SuperCluster M6-32. All software was production stable and executed without incident. Performance was excellent as documented throughout this white paper for JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor online user workloads, as well as for interactive users while testing with both applications.

Testing

Workloads were emulated authentically and produced results as would be expected in similar customer workload environments. Day-in-the-life (DIL) was utilized to portray interactive workload scenarios utilizing the balance of JD Edwards EnterpriseOne productivity modules. In addition, scenarios for JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor, as well as for batch (UBE), were used to emulate JD Edwards EnterpriseOne workloads. The performance of DIL, JD Edwards EnterpriseOne In-Memory Project Portfolio Management, and JD Edwards EnterpriseOne In-Memory Sales Advisor as well as batch (UBE) metrics, provide a key indicator of how well the in-memory applications improve baseline JD Edwards EnterpriseOne productivity.

Response Time Outcomes

Average response times and JD Edwards EnterpriseOne infrastructure server utilization metrics were produced and illustrated in figures throughout the document with the following outcomes:

- All average interactive response times averaged well below the ½ second service level requirement.

  For JD Edwards EnterpriseOne In-Memory Project Portfolio Management: Figures 15 and 16

  For JD Edwards EnterpriseOne In-Memory Sales Advisor: Figures 23 and 25

- JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor workloads, which can be infrastructure intensive, had excellent scalability, and average response times improved dramatically over baseline measurements because of the in-memory application capability.

  For JD Edwards EnterpriseOne In-Memory Project Portfolio Management: Figures 14 and 15

  For JD Edwards EnterpriseOne In-Memory Sales Advisor: Figures 24 and 26

- Overall productivity for JD Edwards EnterpriseOne In-Memory Project Portfolio Manager online users improved significantly because of the in-memory application capability: Figure 17

- JD Edwards EnterpriseOne infrastructure servers CPU utilization was measured and documented during all workload testing. In general, all the workload scenarios, while providing JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor workload intensity had more than enough headroom to scale.

  For JD Edwards EnterpriseOne In-Memory Project Portfolio Management: Figures 14, 15, 16-1 and 16-2

  For JD Edwards EnterpriseOne In-Memory Sales Advisor: Figures 24, 25 and 26

- During the JD Edwards EnterpriseOne In-Memory Sales Advisor testing, it was observed that Oracle Database server CPU utilization was sensitive to online JD Edwards EnterpriseOne In-Memory Sales Advisor user workloads. It was clear during testing that there would be more than enough headroom for JD Edwards EnterpriseOne In-Memory Sales Advisor users to scale. See Figure 26.

Configuration

For a block diagram of the JD Edwards EnterpriseOne In-Memory Sales Advisor and Oracle Database infrastructure deployment and placement: Figure 5

Business Results Delivered Rapidly

The process of aggregating, summarizing, and analyzing consolidated project information can be very time consuming. Informed business decisions and planning are at risk whenever this process delays access to the timeliest information. By using an Oracle engineered system such as Oracle SuperCluster M6-32 with the JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor application solution, the summarization, aggregation, and analysis of projects within a portfolio can be done rapidly and efficiently within a single view to ensure that projects remain on time and on budget. This

provides project managers and executives with faster access to results. And, the solution allows them to take appropriate actionable steps quicker and provides accurate and timely information for planning and decision-making purposes.

Conclusion

Oracle SuperCluster M6-32, coupled with JD Edwards EnterpriseOne In-Memory Project Portfolio Management and JD Edwards EnterpriseOne In-Memory Sales Advisor, offers unequaled performance gains and time reduction for processes associated with managing multiple projects and accounts. With these kinds of results, companies can rethink their internal expectations and improve their processes. As a result, JD Edwards EnterpriseOne In-Memory Project Portfolio Management can result in a reduction in waste, timely initiation of project change controls, and increased portfolio performance with better utilization of available computing and business resources. In addition, JD Edwards EnterpriseOne In-Memory Sales Advisor can enhance revenue and accelerate the sales cycle as end customers perceive value in the options presented to them during each sales encounter. All components work together to enhance revenue and margins and thereby improve the overall business bottom line.

For More Information

TABLE 3. ADDITIONAL RESOURCES

WEBSITES	
Oracle Database	oracle.com/us/products/database/enterprise-edition/overview/index.html
Oracle Optimized Solutions	oracle.com/optimizedsolutions
Oracle SuperCluster	oracle.com/supercluster
Oracle Solaris	oracle.com/solaris
Oracle ZFS Storage Appliance	oracle.com/us/products/servers-storage/storage/unified-storage/
WHITE PAPERS	
Oracle SuperCluster M6-32: Taking Oracle Engineered Systems to the Next Level	www.oracle.com/us/products/servers-storage/servers/sparc/supercluster/osc-m6-32-taking-next-level-wp-2017907.pdf
JD Edwards EnterpriseOne In-Memory Sales Advisor on Oracle SuperCluster M6-32	http://www.oracle.com/us/products/servers-storage/servers/sparc/supercluster/jde-in-mem-sales-osc-m6-32-wp-2017914.pdf
Oracle E-Business Suite: Oracle In-Memory Cost Management for Discrete Industries on the Oracle SuperCluster M6-32	http://www.oracle.com/us/products/servers-storage/servers/sparc/supercluster/in-mem-cost-mgmt-osc-m6-32-wp-2017908.pdf

JD Edwards EnterpriseOne In-Memory Project Portfolio Management, JD Edwards EnterpriseOne In-Memory Sales Advisor, and Oracle SuperCluster M6-32
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