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The Benefits of Running Oracle E-Business Suite on Exalogic and Exadata

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Introduction

Business applications are the lifeline of any organization. The reliability and high performance of these applications can have immediate impact on top line growth and bottom line cost savings. Oracle E-Business Suite is the most comprehensive suite of integrated, global business applications that enables organizations to make better decisions, reduce costs, and increase business performance. In this paper we will discuss how to maximize the value of E-Business Suite by running it on Oracle Engineered Systems.

Application tuning and performance is an art that demands skills in networking, server configuration, storage, database, middleware and application domains. IT organizations spend significant time and money identifying the right mix of these components to run their demanding applications. Oracle Engineered Systems – Exalogic Elastic Cloud and Exadata Database Machine, deliver a balanced configuration out of the box. They offer the right combination of networking, storage and server components, paired with Oracle engineered software optimizations, to deliver the optimal configuration for running Oracle Applications such as Oracle E-Business Suite.

Oracle E-Business Suite customers when faced with performance and scalability issues, attempt to address them at the system layer (hardware and operating system) or at the software/application layer.

At the application layer, the goal is to remove bottlenecks from critical business processes such as Order-to-Cash and Self-Service. Order-to-Cash is the process of taking a customer order via a sales channel (email, internet, or some other means) and fulfilling the order, shipping, logistics, generating the invoice and finally receiving payment. Overcoming hotspots such as inaccurate Order entry and delayed booking leads to on-time Order fulfillment impacting customer satisfaction and top line growth. Typical performance hotspots are also found in Self-Service Applications such as viewing pay slips, logging expense reports, entering time card data and purchase orders. Poor response time with Self-Service Applications have high corporate visibility, as well as impact on employee productivity, and have a tendency to lead to internal support escalations. Additionally, poor performing batch jobs that execute as concurrent requests can cause delay in dependent business processes and in meeting reporting requirements or service level agreements.

Delayed response time and low transactional throughput in any step of the business process flow can be costly for a company. One method to address the bottleneck is to seek improvements in the underlying business processes and tune custom code. Developers and administrators have been known to go to extreme lengths to reduce use of CPU cycles, memory, network traffic and OS resources.

When improving the underlying business process does not resolve the performance constraints, improvements have been sought by augmenting server capacity (memory and CPU) or increasing the number of servers in the environment. The problem with this historical approach is that it increases the data center footprint and overall complexity of the environment. The traditional approach of adding more servers may also require additional headcount to manage the environment or an increase in the work-load scope of existing staff. Application IT managers are facing challenges with too many application instances running at too many data centers, on too many technology platforms that have been really difficult to assemble, manage and scale, resulting in under or poor utilization.

Engineered systems offer a cost effective and standardized set of hardware, network, storage and software components, all pre-wired and tested, ready to run critical business processes such as Order-to-Cash, Procure-to-Pay and Self-Service workloads. They use best in-class standardized components to provide maximum performance leveraging synergies between components that are based on open standards, reliable and scalable, allowing organizations to start small and grow with business needs. Engineered systems enable a shift that makes

sense for the majority of companies - to focus IT investment on enabling their core competencies and business rather than on managing low level infrastructure details. See figure (1).

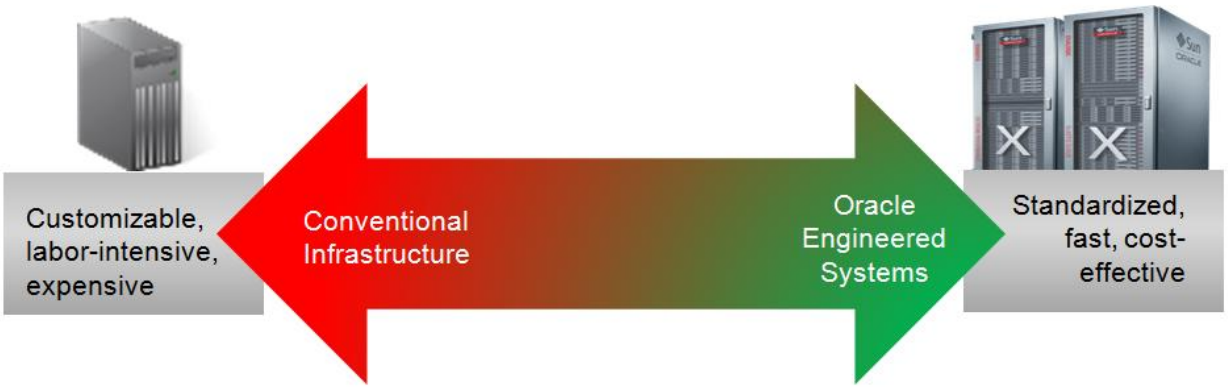


Figure 1: Standardization Yields Dramatic Cost & Performance Benefits

This paper looks at the specific business benefits derived from deploying E-Business Suite on Exalogic and Exadata and provides an overview and results of E-Business Suite benchmarks on these engineered systems.

Business Value of Higher E-Business Suite Performance

Customers deploying Oracle Applications on Exalogic and Exadata derive benefits among others, in four major areas: performance, consolidation, manageability and supportability. In this section, we will focus on performance and more specifically on the business value of high E-Business Suite performance. We recommend reading other Exalogic and Exadata white papers for a more complete understanding. See resources section.

Performance

E-Business Suite on Exalogic and Exadata delivers faster online response time, faster batch process completion and faster reporting resulting in tangible business gains. Not only will knowledge workers be more efficient, satisfaction among customers, suppliers and partners will be higher; whether they call into a call center or use self-service, they will get a response quicker. Efficiency delivers cost savings to the bottom-line, while customer and partner satisfaction is proven to drive the top line. With faster response time and higher throughput it becomes possible to fit more users per core compared to comparable hardware. Scaling for peak loads becomes easier with an overall reduction in hardware footprint.

Domain-Specific Benefits

- In the Fulfillment and Logistics space, faster Sales Order Import and higher Booking throughput speeds up order fulfillment and removes bottlenecks common in high-volume order processing environments. Improved Pricing performance results in slashing the time to process complicated pricing rules, promotions and other price modifiers. This allows customers to continue to leverage the power of Oracle Advanced Pricing for customer compliance and margin maintenance, without holding up end-users trying to enter quotes and orders. Improving the Wave Planning throughput in complex, high volume

warehouses, the process of launching orders to the floor, allocating inventory based on stock rotation policies and identifying the appropriate plan for those order lines can be a bottleneck in the fulfillment process. By increasing throughput in that wave plan (also known as pick release) process, you can get product out the door faster and decrease your order fulfillment cycle time.

- In the Incentive Compensation space, Oracle provides forms applications based on Application framework with Oracle Business Intelligence for Analytics & BI Publisher for reporting. Improved collection, crediting and calculation throughput of commissionable events on a nightly basis will increase sales force productivity through reduced shadow accounting. More frequent incentives insight helps align sales forces and partner communities allowing them to zero-in on where they are and where they need to be relative to targets. For customers with high commissionable transaction volumes and many payees, the improved throughput is critical to meeting fulfillment deadlines and tight SLAs. In addition, many companies have seen overtime reductions due to incentive compensation personnel being able to better meet deadlines.

  This throughput can be achieved and maintained from a large pool of available resources without specific application knowledge. What-if plan modeling cycle times are reduced, enabling compensation groups to test more plan scenarios and with a greater level of accuracy by refining compensation strategies. Refined compensation strategies will drive desired sales-force behavior that aligns better with corporate objectives. Better tuned compensation plans can motivate a sales-force to increase revenue production, drive margin expansion, ensure discounting discipline, increase wallet share through cross-sell and up-sell, win new customers, and build customer loyalty.

- In Supply Chain Planning, through the combination of Exalogic and Exadata features (Smart Flash Cache, Infiniband), the supply chain planning features that are part of E-Business Suite (ASCP) enable more agile supply chain planning. All the steps in the ASCP process including collections, data export/import to planner, and database cleanup, are accelerated, enabling the supply chain planning process to decrease by up to 60% (Internal testing for a customer). One customer saw a 5x reduction in ASCP batch runs. By having faster planning, firms can plan and re-plan within a day to optimize inventory and production facilities.

- In Procurement, there is a need for faster response time, particularly with high volume documents such as Catalogs and Agreements which may have hundreds or thousands of lines. For example, a supplier sales administrator can more efficiently update their catalog in iSupplier Portal due to faster processing and speedier response times. Buyers can more quickly scan through the many documents that may reference a Contract Purchase Agreement. Together this leads to higher efficiency between suppliers and buyers leading to increased purchases.

  Improved batch processing throughput by speeding up programs such as PDOI Purchasing Document Open Interface) and Requisition Import which process large data volumes will lead to meeting and exceeding validation SLAs. Improved UI performance, such as in a Sourcing auction, allows supplier bids to undergo transformation to standardized bids with variable factors such as freight charges, tariffs, currency risk, or supplier risk of non-incumbency. Where suppliers are competing for the lowest possible price, even slightly faster response times to display the newest bid on a graph may allow suppliers time to place a lower bid, prior to auction close time.

- For Financials, faster Forms apps help the 'Financial Close' process, alleviating delay for Invoice Entry Clerks entering 100s of invoices in the last few days of the quarter. Using the Oracle Receivables Applications on Exalogic, invoices can now be processed 2 times faster enabling organizations to considerably reduce their invoice processing cost and predict the cash flow based on customer orders.

- In Human Resources Management, faster HR Self Service for companies with a lot of temporary employees who lookup pay checks at every pay period aids employee satisfaction and allows for other workloads to proceed unhindered.

Overview of Oracle Engineered Systems

Oracle's family of engineered systems includes among others, Oracle Exadata Database Machine, Oracle Exalogic Elastic Cloud, Oracle Exalytics In-Memory Machine, Oracle Big Data Appliance and Oracle Database Appliance. Details on each of these systems and the varied set of scenarios they support are available on Oracle sites. See more details in the reference section. For the purposes of this white paper, we shall focus on Exalogic and Exadata and their ability to support high transaction volumes, a much needed capability for E-Business Suite. On top of the key business value of performance, Exalogic and Exadata deliver additional value through consolidation, supportability and simplified manageability.

Consolidation

Application instance creep is a common issue for all organizations. Exalogic and Exadata address application sprawl in multiple ways. First, with higher performance and throughput and resulting smaller footprint, it becomes possible to reduce the number of instances by aggregating more business applications and databases. Second, with multiple configurations (from 1/8th rack to full rack for Exalogic and 1/4th rack to full rack for Exadata) to suit a wide range of E-Business Suite deployments, customers can consolidate disparate E-Business Suite instances into a configuration that suits them today and be assured of growth and scalability on the same hardware platform. Finally, in addition to these bare metal consolidation features, mission-critical server virtualization offers a whole new level of consolidation where multiple virtual machines are sharing a single physical server in order to maximize the utilization of server hardware, while minimizing costs associated with the proliferation of physical servers, namely hardware-, cooling-, and real-estate expense.

Designed for near-native performance of physical severs and consolidation, the Exalogic has been engineered to leverage a technique known as Single-Root I/O Virtualization to simultaneously eliminate virtualization overhead to deliver the maximum performance and scalability, while also allowing the same adapter to be shared by up to 63 virtual machines and thus enable highly efficient, consolidated operations. Other virtualization solutions force you to choose between performance and consolidation while Exalogic is the only offering that allows IT to efficiently deliver both the ultra high-performance the business demands with flexibility IT operations needs. Through Oracle's unique ownership of the entire stack – applications-to-disk -from the hardware, to the virtualization layer, operating system, middleware, and applications - only Oracle can engineer a complete solution to give you the best of both worlds and eliminate the need to choose between high consolidation ratios and high performance.

Supportability

Exalogic and Exadata are pre-assembled systems with limited variations in end user configuration. Pre-assembly saves 1000s of hours spent by customers in researching and building a system to scale to the demanding needs of Oracle E-Business Suite. Reduced number of end user configurations (uniform Operating system, CPU, memory, network, and storage) allows Oracle to replicate customer issues easily and maintain consistent patchsets across components, reducing regressions and simplifying diagnosis and hence faster problem resolution. In fact, Oracle offers Platinum Services available at no additional cost to Oracle Premier Support customers. This service provides peace of mind to customers with industry-leading response and restore times including a 5-minute Fault Notification service level agreement. Running an E-Business Suite instance on a well-known single vendor configuration and keeping it up-to-date with consistent patches lowers business risk.

Manageability

A reduced number of E-Business Suite instances and physical servers results in tangible cost savings in system operations and management. Fewer E-Business Suite instances, and these fewer instances on a uniform scalable

Exalogic and Exadata platform results in systems administrators having fewer boxes to manage. Oracle Enterprise Manager with management packs for Exalogic, Exadata, E-Business Suite and Oracle Database provides a single tool to manage the entire stack from Applications to Disk, saving system administrators and data center staff countless hours.

Oracle Exalogic - Engineered System for Application Workloads

Exalogic consists of Exalogic Elastic Cloud Hardware and Exalogic Elastic Cloud Software as shown in figure (2).

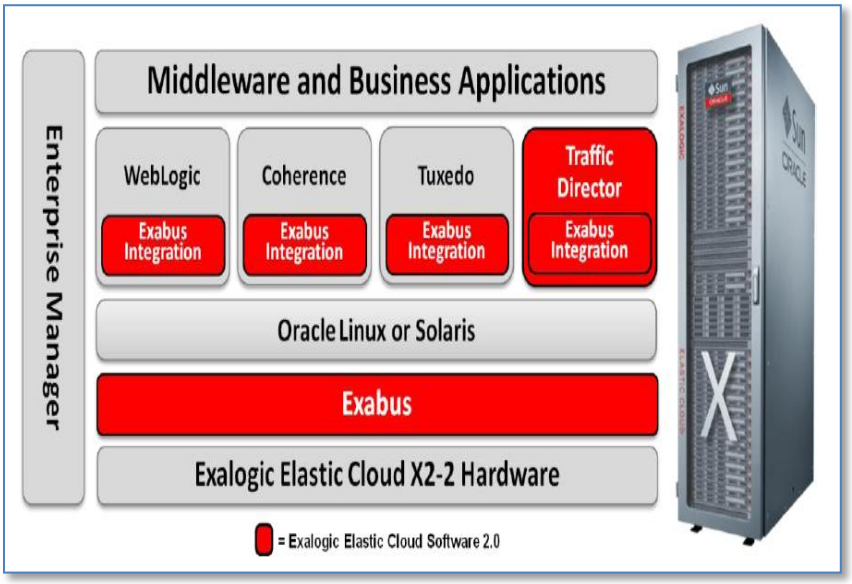


Figure 2: Key Software Components of Exalogic Elastic Cloud

Oracle Exalogic is an Engineered System, consisting of software, firmware and hardware. It is designed to meet the highest standards of reliability, serviceability and performance under widely varied, performance-sensitive, mission-critical workloads. Because the Exalogic system is fully pre-integrated
by Oracle it is also easier to provision, manage and maintain, further reducing ongoing costs and shortening time to value for new projects.

Oracle has made optimizations and enhancements to Exalogic components and Oracle's middleware and applications that would be extremely difficult and time consuming for customers or any 3rd party to reproduce. These range from on-chip network virtualization to operating system and Java Virtual Machine support for extremely high performance Remote Direct Memory Access (RDMA) and Exalogic-aware workload management in Oracle's Java EE application server.

Among the new features available are mission-critical server virtualization, application-to-disk management and built-in Application Delivery Control.

- Exalogic now includes a tightly integrated server virtualization layer with unique capabilities allowing the consolidation of multiple, separate virtual machines containing applications or middleware on each server node while introducing essentially no I/O virtualization overhead to the Exabus InfiniBand network- and storage fabric.
- Built-in apps-to-disk management with a single tool is available through integration with Oracle Enterprise Manager. It enables prioritization of computing resources and IT work according to business priorities.

- Oracle Traffic Director is a fast, reliable, and scalable Application Delivery Controller that may be deployed as the entry point for all HTTP and HTTPS traffic to application servers and Web servers in an Exalogic deployment.

Together, these optimizations deliver the highest system performance and lowest TCO ever achieved for Oracle applications such as E-Business Suite. More details on Exalogic features can be found in multiple white papers. Seethe reference section.

Oracle Exadata - Engineered System for Database Workloads

The Oracle Exadata Database Machine provides an optimal solution for all database workloads, ranging from scan-intensive data warehouse applications to highly concurrent OLTP applications. It is a complete package of software, servers, storage and networking that is easy-to-deploy, completely scalable, secure and redundant. Innovative technologies such as Exadata Smart Scan, Exadata Smart Flash Cache, and Hybrid Columnar Compression enable Exadata to deliver extreme performance for everything from data warehousing to online transaction processing to mixed workloads.

Exadata's unique grid architecture—featuring an InfiniBand network—ensures that the network will not bottleneck. Because Oracle Exadata is delivered as a complete pre-optimized and pre-configured package of software, servers, and storage, a significant amount of the integration work, cost and time typically required to deploy a database is eliminated.

The combination of Oracle Exadata's Smart Flash Cache feature, large memory capacity, fast performance for running multiple simultaneous workloads and fast IO capabilities, make it the ideal platform for deploying Oracle E-Business Suite. Additionally, as organizations look to improve efficiencies by consolidating OLTP databases and data warehouses, many are turning to Oracle Exadata for their infrastructure platform. See figure (3). More details on Oracle Exadata can be found in multiple white papers. See the reference section.

Figure 3: Oracle Exadata Database Machine

Deploying E-Business Suite on Exalogic and Exadata

Oracle Exalogic and Exadata support numerous deployment patterns for E-Business Suite. A typical Oracle E-Business High availability configuration is depicted in figure (4). It is recommended that customers run the web tier, forms server, admin tier (known as mid tier or application tier), and batch processing tier (known as concurrent processing) on Exalogic compute nodes, and the database tier on Exadata machines. Hardware load balancers can be used to load balance to multiple web and Forms servers. Multiple concurrent managers can be run in parallel to increase concurrency and throughput.

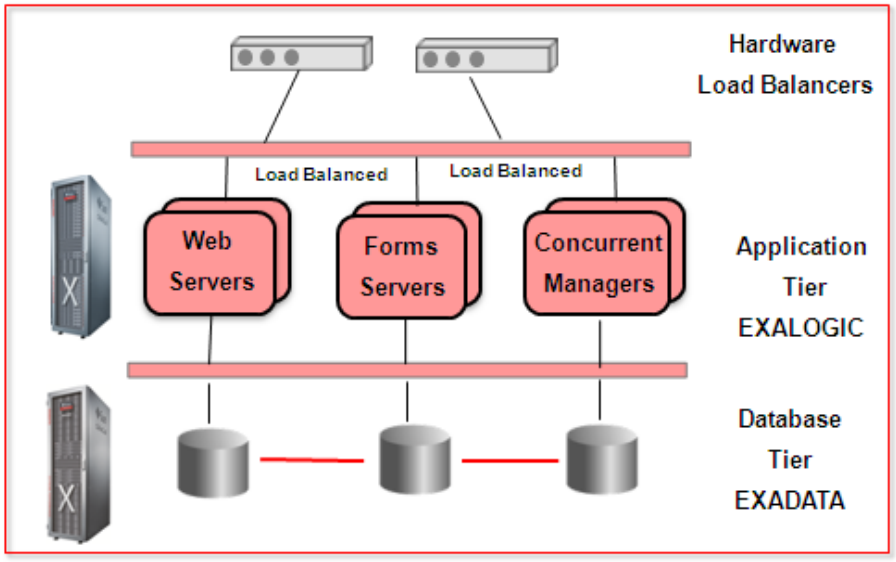


Figure 4: Oracle E-Business Suite High-Availability Configuration

E-Business Suite Performance Summary on Engineered Systems

Not only were Exalogic and Exadata designed for optimal E-Business Suite performance, but there is ongoing collaboration between Engineering teams to rundetailed performance characterization of E-Business Suite on Exalogic and Exadata. In this section we provide a summary of benchmark methodology, test cases and results.

Benchmark Configuration and Methodology

Testing on the Exalogic and Exadata systems followed the methodology developed for benchmarking Oracle E-Business Suite applications, where selected transactions from common business flows have been scripted to run on load-generator servers, allowing large numbers of 'concurrent users' to exercise the system under test. This allows for repeatable tests to verify performance, scalability and processing accuracy while tailoring application and environment attributes.

Transactions are apportioned within each business flow and paced according to real-life production scenarios. A test starts with the gradual initiation, or ramping up, of the simulated users until the target load is reached. This begins the 'steady-state' sampling period which may be anywhere from a few minutes to a few hours. During steady-state, the response times and transaction behavior are logged for later analysis. After the steady-state period, the users are ramped down and the test concludes.

Summary of Performance Test Scenarios and Test Hardware

A subset of EBS benchmark transactions were selected to alternately exercise 'Forms' and 'Web-based' application handling. The following Eleven transactions from Order Management, Shipping, Human Resource Management Systems and iProcurement were used in the test.

HR Self Service	Procure to Pay Self Service	Order Management
Create and Query Cash Expense	Create & Query Requisition	Create & Book Order
Create & Query Card Exp.	Auto-create & Approve PO	Pick Release
Create Project Timecard	View Purchase Order	Ship Confirm / ITS
View Employee Payslip		Receivables – Invoice

Figure 5: Key Business Process Capabilities Of E-Business Suite Benchmarked

The transactions were run on two testing environments: a commodity hardware environment and separately on an Exalogic/Exadata environment as shown in figure (5). A standard server was used to generate transaction load onto E-Business Suite 12.1.3 deployed on Exalogic and Exadata. The Web Server and Forms Server components of E-Business Suite were deployed on Exalogic. The database components were deployed on Exadata.

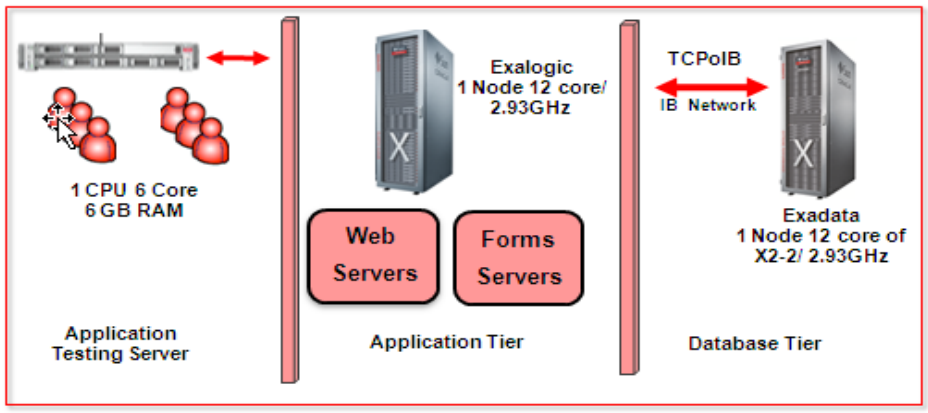


Figure 6: Benchmark Testing Environment

Since this was an OLTP only test, Concurrent manager and report servers were not used. For processing any batch or reporting requirements these EBS components would be deployed on Exalogic. With Exadata being a database-only platform, it is recommended to run concurrent manager on Exalogic. Please refer to the E-Business Suite on Exadata MAA white paper for more details on this recommendation. The commodity hardware platform matched the Exalogic/Exadata environment in CPU architecture and clock speed, memory and number of cores. Response times, transaction throughput and CPU performance were recorded for each testing environment.

Performance Analysis

The Exalogic and Exadata environment consistently yielded lower response times in combination with lower CPU utilization than the corresponding commodity environment. The Exalogic/Exadata environment enjoyed sub-second response times for all but a single 'report-generating' transaction (Cash Expense Reporting). However, even in this particular test, it performed 8x better than the commodity environment, which suffered significantly on this transaction. This may have been a test artifact and response time for customers may vary. Response time comparisons are provided in figure (6) for Forms transactions and in figure (7) and Fig (8) for Self-Service Transactions.

As seen here, different E-Business Suite transactions deliver varying benefits on Exalogic and Exadata platform.

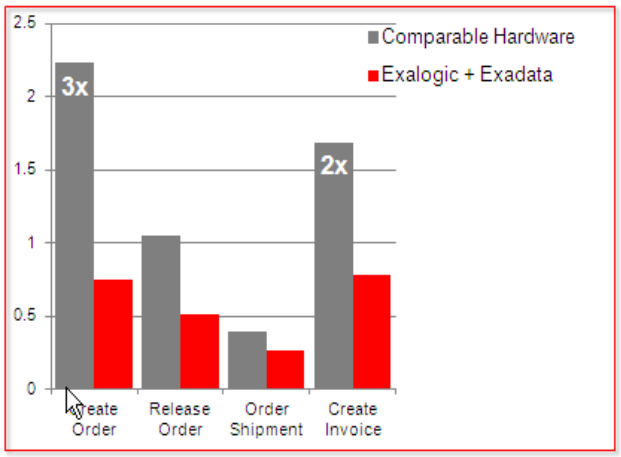


Figure 7: Order Management Forms Response Times

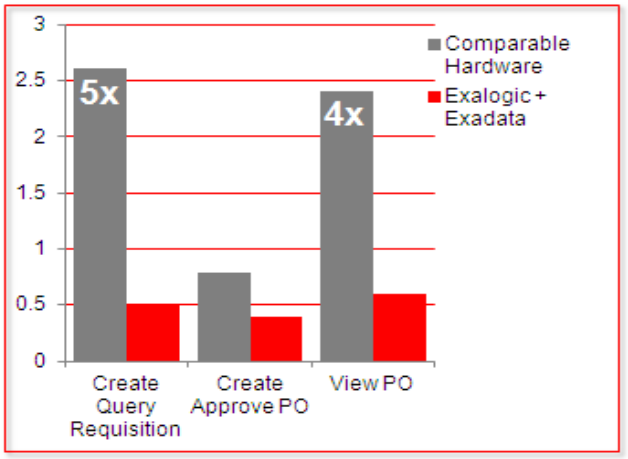


Figure 8: Self-Service iProcurement Response Times

Transactions that are "chatty" to the database both in terms of frequency and volume of data gain the most. In addition to a faster response advantage, the Exalogic/Exadata environment proved to yield a two-to-one users per core advantage. Users per core performance statistics are provided in figure (9) for the mid-tier and for the database tier. Consistently lower CPU on Exalogic and Exadata for the same workload translates into more transactions per core and more users for the overall system.

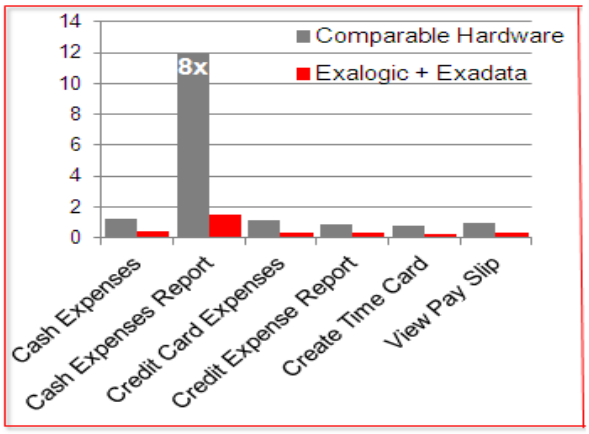
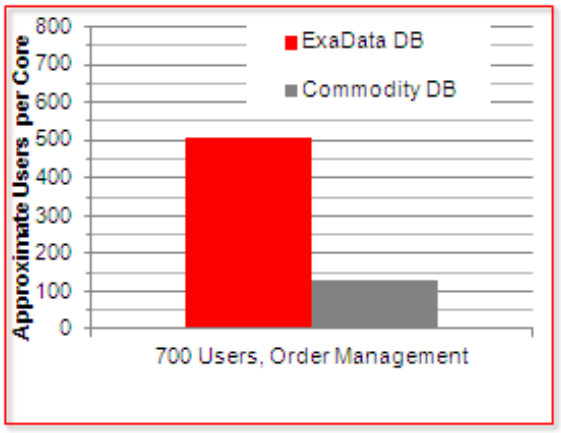


Figure 9: HR Self-Service Transaction Times



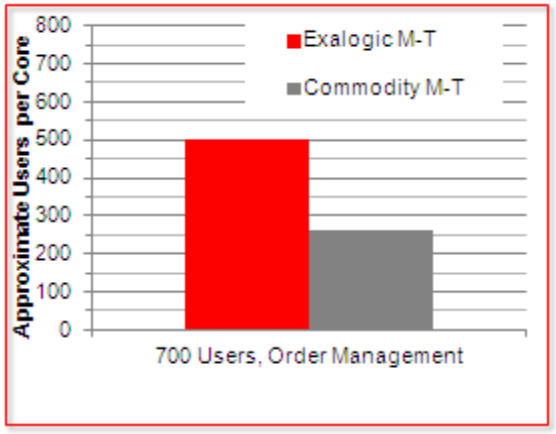


Figure 10: Exadata and Exalogic Tier Users per core for Order Management

The Self-Service and Forms transactions that were analyzed are very common business processes use-cases. A real-world use-case of Order-to-Cash was included in the analysis. The results demonstrate that Oracle E-Business Suite on Exalogic and Exadata is capable of delivering extreme throughput with more users supported per core.

Scalability Tests

Additionally, the Order Management (Forms) transactions were run to demonstrate the scalability of Exalogic and Exadata engineered system for this workload. Enterprise management depends upon responsive predictable performance over a range of workloads. In tests with 700, 1,400 and 2,100 concurrent users, Exalogic and Exadata metrics scaled smoothly. Response-time increased imperceptibly while the CPU and Memory utilization rose predictably. Figure (10) shows that response time stayed below 0.5 seconds while users were ramped up from 700 to 2100.

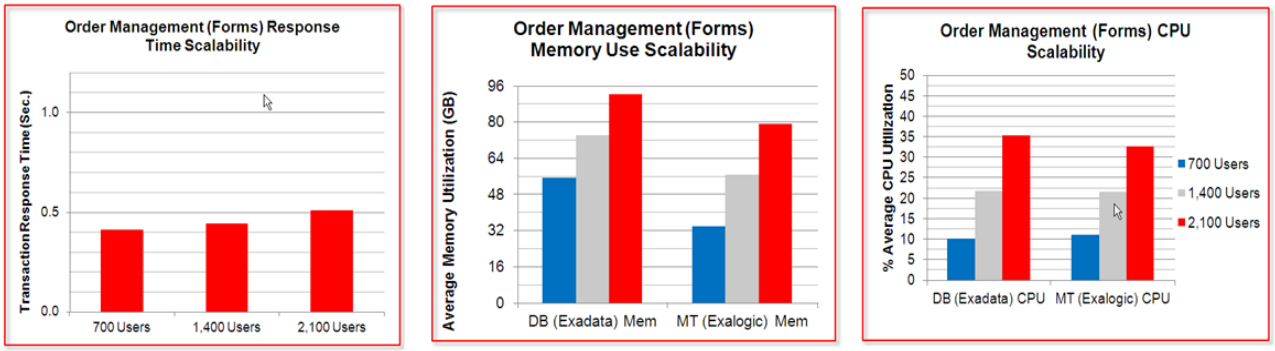


Figure 11: Response Time Scalability, CPU and Memory Scalability. Linear usage of memory and CPU.

Customer Case Study

A large distribution company built an Order management solution comprised of a custom Java web portal for Order entry, E-Business Suite 12.1.3 for back office Order fulfillment and Oracle SOA Suite for integration between the web portal and E-Business Suite. With aggressive growth at hand, the order management solution needed to scale from regional usage today to deployments in all geographies. Business SLAs for key logistics processes, such as online order entry and operational tasks, such as cloning and backups, were tight and getting even tighter in new geographies. Meeting this scale of global growth and tighter SLAs by deploying on commodity hardware was daunting and IT realized current approaches and deployment practices needed rethinking. The customer ran a detailed end-to-end benchmark in its data centers tohreplicate existing production scenarios on Exalogic and Exadata. Test-cases included Logistics, Finance, Online Order Entry and Backup and Cloning processes. Some of the key findings from evaluating Exalogic and Exadata were:

- Up to 10x gains in overall performance in running E-Business Suite on Exalogic and Exadata as compared to existing application infrastructure.
- Operational efficiency in activities such as weekly tape backup improved from 4 hours to 4 minutes.
- 17x improvement in cloning process from 22 hours down to 1.5 hours.
- 87% improvement in Shipping and Logistics processes, specifically the Drop Ship process, which was critical to meeting business SLAs.
- No down-time for existing operational best-practices on Exalogic and Exadata.

- Annual budget savings resulting from elimination of code-analysis and re-write effort re-allocated to priority areas i.e. improving performance and scalability.

Highest ROI Deployment Scenarios

Application upgrades and hardware re-platforming are key drivers of adoption of engineered systems for multiple applications. For EBS customers in particular, many of them will be looking to upgrade in the next 12-18 months from the 11i to the 12 release and engineered systems provide the most logical deployment option that can significantly enhance the ROI of the entire project and slash time to market. Another re-platform opportunity presents itself as commodity hardware ages and becomes cost prohibitive to maintain. Yet for other customers it's about performance where there is a compelling need for the performance boost and they need the extra scalability due to a stressful load that is taxing the existing hardware or the business is growing and their concerned about their ability to keep up. Finally, new users of EBS who are deploying it for the first time will find significant benefits in deploying on engineered systems.

Summary

Businesses are pushing the envelope of growth in terms of agility, efficiency and visibility with Oracle E-Business Suite. Till now, enhancing application performance has been a function of tuning various tiers or self-assembling disparate hardware and/or software components thus incurring significant time and effort.. Oracle's engineered systems represent a superior platform approach to accelerate application performance and deliver business capabilities while reducing application infrastructure lifecycle costs.

Customers have benefited from deploying mission critical E-Business Suite applications on Exalogic and Exadata. Exalogic and Exadata deliver performance out-of-the-box thus allowing businesses to scale-up back-office forms-based applications such as Order Management, Finance, and also front-office Self-Service applications.

Exalogic delivers the fastest E-Business Suite application tier performance for OLTP workloads. Exadata delivers the fastest performance for batch workloads and for system administrator activities involving the E-Business Suite database. The performance and consolidation benefits coupled with the benefits of reduced data center complexity and ease of management make Exalogic and Exadata an ideal application platform for running Oracle E-Business Suite.

Resources

For more details review the following resources:

- Exalogic & Exadata
  - Exalogic Brief Introduction White Paper
  - Exalogic Software Overview
  - Exalogic Hardware Overview
  - http://www.oracle.com/exalogic
  - http://www.oracle.com/exadata
  - twitter.com/OracleExalogic
  - Facebook.com/Exalogic

- E-Business Suite
  - Oracle E-Business Suite on Oracle Exadata Database Machine White Paper
  - Oracle E-Business Suite Online Documentation Library
  - MAA Best Practices – Oracle Applications

- Oracle Applications
  - Consolidating Oracle Applications on Exalogic

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