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JD Edwards EnterpriseOne on Oracle Engineered Systems

Transforming Business with Extreme Performance, Simplicity, and Agility

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Executive Overview

Today's business climate puts requirements on business systems that cannot be satisfied with incremental improvements. A generational evolution that addresses performance, capacity, simplicity, and agility is necessary. That generational evolution is in-memory computing.

Oracle's engineered systems—in this paper discussed specifically as Oracle Exadata Database Machine, Oracle Exalogic Elastic Cloud, and Oracle SuperCluster—provide the foundation for such a generational evolution for JD Edwards EnterpriseOne applications. Engineered systems offer in-memory capabilities that inspire a new way to look at enterprise business processes. Extreme performance, simplicity, and agility offer immediate benefits for existing applications and business processes. New enterprise applications designed explicitly to exploit the performance of Oracle engineered systems provide capabilities that were inconceivable on traditional systems.

Business users benefit from the extreme performance and agility of Oracle engineered systems. New capabilities transform business processes and accelerate the activities that drive business benefits. Technical staff benefits from simplified architecture, tightly integrated and tested components, and agile application deployment.

Customers realize immediate business and technical benefits and set the foundation for the next generation of in-memory business applications. JD Edwards EnterpriseOne running on Oracle engineered systems is the culmination of Oracle's "Engineered to Work Together" strategy.

Introduction

JD Edwards customers manufacture, distribute, build, extract, service, and grow things that the world needs, and they are recognized among the leaders in their industries. JD Edwards customers are renowned for maintaining highly competitive enterprises and operating efficiently in markets of every size and in every geography. Operating efficiently necessarily means keeping costs low, including technology costs. Historically the JD Edwards products have enjoyed a well-earned reputation of providing tangible business benefits with extraordinarily low total cost of ownership.

Today as part of Oracle's comprehensive hardware and software portfolio, JD Edwards products have never been better. Synergies among Oracle product teams, Oracle's continued investment in JD Edwards products, and Oracle's overt strategy to create "Hardware and Software Engineered to Work Together" combine to provide JD Edwards customers with solutions that preserve their traditional high-value/low-TCO value proposition and yet provide an evolutionary path into the next generation of technology.

The next generation of technology is in-memory computing. This technology is born out of the necessities of today's business environment. Consider the requirements and stress put on today's enterprise software systems. Data volume is growing rapidly. We see this simply in the units we use to measure data. A few short years ago we spoke of data in terms of megabytes and gigabytes. Today those units have risen by orders of magnitude to terabytes and heading toward petabytes. Users' expectations are expanding just as rapidly. The transactional and report-oriented systems of yesterday are being replaced by rich user interfaces that provide a composite working environment, access to many systems that churn high volumes of data in parallel, and response times measured not in seconds but in hundredths of a second. Additional business requirements compound the frenetic pace, such as 24x7 business operations, agility in launching new business units, and timely roll-out of new functionality. Simple linear improvements to speed and capacity cannot possibly keep up with the nonlinear growth curve of business requirements. A generational change in technology is required, and that new generation is in-memory computing.

Such generational changes in technology often pose a dilemma for IT executives: "Can the business continue to tolerate the old systems, or must we throw away everything and start over?" Regardless of the value proposition offered by next-generation systems, the prospect of starting over can be prohibitive. In other words, starting over is a "nonstarter." The ideal solution to the dilemma is a system that can be implemented incrementally, providing

immediate benefits to currently implemented business processes and setting the foundation for easy adoption of next-generation in-memory applications. Running JD Edwards EnterpriseOne on Oracle engineered systems provides this ideal solution.

Oracle engineered systems—specifically Oracle Exadata Database Machine, Oracle Exalogic Elastic Cloud, and Oracle SuperCluster—are the culmination of Oracle's "Engineered to Work Together" strategy. Not only do they provide the generational technology advancements necessary to meet today's business requirements, but they also demonstrate Oracle's ability to optimize the technology stack at each and every layer, from enterprise applications such as JD Edwards EnterpriseOne all the way through to the storage of data on disk. Applications, middleware, database, operating systems, virtualization, and hardware all work together as a unified, simplified, and high-performance system. The end result is apparent to IT organizations that spend less time managing server sprawl and troubleshooting issues, and more time providing agile systems and services to accelerate business. The benefits of engineered systems extend naturally to the business users themselves, who experience stable, high-performance systems and business processes fueled by "big data" that would never be possible on yesterday's generation of technology.

Of course, JD Edwards customers are well familiar with the value proposition of running their business applications on an integrated stack of hardware and software. Many loyal JD Edwards customers have experienced the evolution through many generational transformations, from monolithic midrange systems to client/server to pure internet architecture and service-oriented architecture. Throughout these generations the JD Edwards product lines have proven their ability to evolve by adopting the best of technology and translating it into business benefit for JD Edwards customers. That tradition continues. Current JD Edwards EnterpriseOne applications perform and scale extremely well on Oracle engineered systems, offering customers a seamless and immediate transition into the in-memory generation of computing. Today's business processes gain a boost from running on high-performance systems, while previously impossible or impractical business processes unfold to offer transformational benefits to technology and business teams alike.

This paper continues to describe the specific benefits—from both a business and a technical perspective—of running Oracle's JD Edwards EnterpriseOne on Oracle's engineered systems: Oracle Exalogic Elastic Cloud, Oracle Exadata Database Machine, and Oracle SuperCluster.

The Business Benefits of Running JD Edwards EnterpriseOne on Oracle Engineered Systems

IT systems should provide a foundation for accelerating business, but suboptimized systems can actually hold the business back. Traditional systems often cannot keep pace with data volumes generated by business today. Batch jobs take longer and longer to run, application response times lag and visibility into timely data becomes more difficult to achieve. The result, of course, is less than optimal decision making and a negative impact on bottom line results.

Oracle engineered systems provide the optimal platform for JD Edwards EnterpriseOne. Let's take a look at some of the key business processes that are delivered with JD Edwards EnterpriseOne and how those processes can become a competitive advantage for your organization through the deployment of Oracle engineered systems.

Example #1: JD Edwards EnterpriseOne Order to Cash

The Order to Cash process begins with everything required to manage and process your sales orders, and finishes with everything required to manage collections from your customers. There are many required steps between entering the sales order and receiving money from the customer, to making transactions work effectively and efficiently. Why does this take time? Each step in the JD Edwards EnterpriseOne Order to Cash process is crucial for satisfying your customers' needs.

Update Sales is an example of a key process and a performance sensitive batch job. Conventional thinking would build a process to schedule this during the slowest part of the day. Global companies running a 24 x 7 operation do not have a "slow part" of the day to submit this type of process. In a perfect world, your CFO requires all sales orders to immediately create the corresponding financial transactions. What if your systems were capable of processing the large amounts of data quickly? The ideal method for solving the Update Sales batch load window is to eliminate the need for one.

The benefits of using Oracle's engineered systems with your Order to Cash process include:

- Faster, more frequent Update Sales process, including large volume EDI or other system to system orders.

- Faster response for sales entry.

- Rapid adjustments for sales spikes, warehouse issues, shipping delays, and anything that might impact a customer's shipment.

- Now – not tomorrow – cash management information.

For more information please see the *JD Edwards EnterpriseOne Order to Cash on Oracle Engineered Systems* white paper.

Example #2: JD Edwards EnterpriseOne Financial Close

A financial close is an iterative process in which financial information must be validated, corrected, and postings completed until all the data is deemed correct. Depending upon the complexity of your

financial reporting needs, this process can take many days to complete with many reviews, corrections, and adjustments taking place continuously throughout the process.

A traditional close process entails having the batch processes for data validation, G/L posting, reconciliations, currency revaluations, cost allocations, and financial report generation run overnight. The manual processes then occur during your staff's daytime. This is usually done due to the amount of time it takes to process the large amounts of data needed to close the accounting period or year.

What if your systems were capable of processing the large amounts of data quickly? The batch processes can occur as needed throughout the day. The bottleneck of the nightly batch processes can be removed. This will enable your staff to iterate through their review, correct, and process cycle much faster.

The benefits of a faster financial close process include:

- Batch postings, revaluations, reconciliations, allocations, and financial reporting can all be done as needed throughout the day, with immediate access to the results.

- Shorter timeframe of limited access by business users.

- Enjoy more time to generate accurate forecasts.

- Make more timely business decisions based on the true state of your business.

- Meet your regulatory deadlines with ease.

For more information please see the *JD Edwards EnterpriseOne Financial Close on Oracle Engineered Systems* white paper.

Example #3: JD Edwards EnterpriseOne Materials Requirements Planning (MRP)

Material Requirements Planning (MRP) provides a short to medium range plan to cover material requirements that are needed to make a product. For a given period of time, MRP calculates the requirements for the material and recommends release of replenishment orders with due dates and quantities.

Why can MRP be so time intensive? Because of how it processes requirements based on general industry practices while factoring in the amount of data to be processed, such as sales orders, forecast, and purchase orders; and the depth of the bills of material.

A traditional requirements planning process entails having the batch MRP processes run periodically (mainly overnight), and reaction to the output occurs during the planners and buyers normal workday. The nighttime processing and daytime reaction generally occur due to the amount of time it takes to process the large amounts of data. In a perfect world, this works fine. Now enter into the picture an unexpected material delay, production mix change, or expedited fulfillment request and its effect on the plan. Often the best case would be to run the MRP generation again and see the effects.

What if your systems were capable of processing the large amounts of data and MRP calculations quickly? In an organization where traditionally the risks of additional requirements planning generations outweigh the benefits due to processing time, critical decisions are delayed. What if

frequent changes and unexpected delays could be acted on within minutes or hours rather than days and weeks?

The benefits of a faster Materials Requirements Planning process include:

- Faster, more frequent MRP generations.

- Quicker runs, means more accurate planning information. Rapid adjustments to changes and material delays. Optimum inventory balance, less cost wasted on expediting materials and unused inventory.

  - Less production down time

  - Increased customer order fulfillment rates

  - Increased Inventory Turns

  - Decreased DSI

  - Decreased DSO

- Less disruption to daily tasks.

- More accurate order promising and better customer service levels.

- For more information please see the *JD Edwards EnterpriseOne MRP on Oracle Engineered Systems* white paper.

Example #4: JD Edwards EnterpriseOne Job Status Inquiry

The Job Status Inquiry (JSI) application provides a comprehensive view of all financial information associated with a project. Project managers can use the JSI application for a variety of project management tasks including: viewing all expenses booked to the project, comparing actual costs to budget, exiting to change management to revise budgets, and drilling into accounts for detailed research.

Why does viewing project financial information take time? JSI provides real-time views of jobs and projects. Inquiring on big jobs and projects often involves large volumes of data. The JSI application performs sorting, summarizations, and calculations; performing this on hundreds of thousands of records takes time. Waiting for the JSI application to process large volumes of data results in a project manager taking longer to react to changes to their projects. Or worse, project managers are using the previous night's batch status reports on which to base their decisions.

What if your systems were capable of processing large amounts of data quickly? In an organization where the Job Status Inquiry (JSI) application processes slowly, project managers delay making decisions or base their decisions on the prior snapshots of the data. What if the wrong materials were delivered to a job site, subcontractors over charge based on their contracts, or weather delays impact completion dates? Real-time project information displayed in the JSI application enables the project manager to make good business decisions within minutes or hours rather than day or weeks, thus resulting in more projects that are on time and on budget. An improved Job Status Inquiry application

processes data faster, allowing project managers to view all small and large jobs and projects in real time.

Benefits of using Oracle's engineered systems with the Job Status Inquiry application include:

- Faster response of the Job Status Inquiry (JSI) application.

- View actual and budget comparisons for large and complex projects.

- Quickly track and identify problems with a project or job.

- Real-time information for large, complex jobs and projects.

For more information please see the *JD Edwards EnterpriseOne Job Status Inquiry on Oracle Engineered Systems* white paper.

Additional Examples

In addition to the examples discussed above, there are many other performance sensitive processes, both interactive and batch, which would benefit from executing the entire JD Edwards EnterpriseOne application suite on Oracle engineered systems. Some additional examples may include Configure-to-Order validation, One View interactive reporting, fulfillment processing, EDI inbound and outbound processing, Allocations, Project and Real Estate forecasting, Invoicing and Billings, and batch cash receipts and payables processing.

The Technical Benefits of Running JD Edwards EnterpriseOne on Oracle Engineered Systems

The previous sections of this paper outlined many of the benefits business users can expect from running JD Edwards EnterpriseOne applications on Oracle engineered systems. Naturally, the direct benefits realized by the business are the most important scorecard. But beneath those business benefits lie solid technology. The IT organizations that support the business also claim a share of the value offered by Oracle engineered systems.

Although most JD Edwards customers have established highly competent IT operations, it is often an objective to contain their IT spending and increase overall efficiency. A highly competent IT organization provides its value to the business by providing enabling technologies, creative solutions to business challenges, and rock-solid systems. But scarce and precious IT resources can quickly be consumed by lengthy system design sessions, trial-and-error tuning, and reactive problem resolution, leaving little left for true innovation and value-add to the business.

Oracle engineered systems simply eliminate many of the non-value-add tasks that plague IT organizations. The systems are delivered to customers as tightly integrated systems in which the CPU, memory, disk, and networking are predetermined in optimal balance. A finite number of system configurations allow customers some degree of flexibility in acquiring the capacity they need, yet the components can be racked and cabled quickly according to rigorously standard models. And because the system configuration is so well known, the operating systems, virtualization software, database, and middleware is deployed just as efficiently. Customers have reported complete Oracle Exadata Database Machine and Oracle Exalogic Elastic Cloud systems up and running on their premises in a matter of days.

Cutting the up-front costs of acquisition and deployment is a good start, but the TCO story certainly doesn't end there. Because business is dynamic, enterprise systems need attention. Data grows—often very rapidly. Business operations continually bloat databases, and users demand more live (unarchived) data from more systems. User count grows, sometimes gradually as businesses grow organically, but sometimes drastically due to acquisitions or seasonal spikes. Even a system that was designed and well-tuned for a given level of performance may find itself undersized and underperforming sooner than anticipated. This issue is faced by companies of all sizes, in all industries, and in all geographies. The traditional solution is to expand capacity by scaling out the hardware. But with that scale-out comes the additional burden—and cost—of maintaining multiple disparate systems. Over time IT organizations can find themselves spending a majority of time administering these systems and less time providing innovative value-add to the business. What if that ratio could be inverted?

Oracle engineered systems—specifically Oracle Exalogic Elastic Cloud, Oracle Exadata Database Machine, and Oracle SuperCluster —are standard data center building blocks of integrated compute, storage, and network components designed to provide an out-of-the-box platform for a broad range of enterprise application workloads such as JD Edwards EnterpriseOne, other Oracle enterprise applications and middleware, and third-party products.

The following topics in this paper will describe the technical benefits of running JD Edwards EnterpriseOne on Oracle engineered systems in three general categories:

- Performance
- Simplicity
- Agility

Performance: JD Edwards EnterpriseOne Runs Fast on Oracle Engineered Systems

When IT support organizations receive input from business end-users about system performance, the input is rarely that the system is running too fast. At best IT organizations and business users can negotiate a reasonable service-level agreement on system performance; then IT lives with the continuous burden of keeping the system running according to the service-level agreement as data volume and the number of end users increase. But interactive response time is not the only measure of performance. In JD Edwards EnterpriseOne business processes, batch processing is equally important and can put a strain on the system at levels even higher than many thousands of interactive users. And of course there is the other dimension of performance: scalability, which can take the form of increased number of users, increased number and size of batch jobs, and increased size of data in the database. How can an IT organization keep up?

Oracle Exadata Database Machine and Oracle Exalogic Elastic Cloud are engineered to provide extreme performance. Benchmark testing with JD Edwards EnterpriseOne shows just how good response time, batch throughput, and scalability can be.

How Fast Is Fast?

How fast is fast? That seems like a simple enough question, but in fact teams of performance engineers could spend entire careers testing every facet, dimension, and permutation of configurations looking for that elusive metric of "performance." Nevertheless, Oracle has executed several rounds of performance testing with JD Edwards EnterpriseOne on Exadata and Exalogic. This topic discusses some of the key results observed during those tests and what they can mean for your business.

TABLE 1. PERFORMANCE TEST RESULTS FOR JD EDWARDS ENTERPRISEONE ON EXALOGIC, EXADATA, AND SUPERCLUSTER						
WORKLOAD	**EXALOGIC X2-2**	**EXADATA X2-2**	**EXALOGIC X3-2 USING ORACLE VM * EXADATA X3-2**		**ORACLE SUPERCLUSTER M6**	
Interactive Users	1,000	2,000	1,000	2,000	1,000	2,000
Interactive Response Time without Batch (seconds)	0.161	** 0.075	** 0.037	0.041	.063	.058
Interactive Response Time with Batch (seconds)	0.185	0.104	0.039	0.043	.035	.109
Concurrent Batch Throughput (jobs per minute)	400	400	416	668	340	360

* Exalogic X2-2 testing was conducted using "bare metal" compute nodes, with each node having 12 CPU cores and 96 GB of memory. Exalogic X3-2 testing was conducted using multiple virtual machines, with each VM configured with 4 virtual CPUs and 32 GB virtual memory. Using Oracle VM allowed more granular utilization of compute resources and a 3X net reduction in resources.

** At the time of testing with Exalogic X2-2 and Exadata X2-2, this was the fastest interactive response time ever recorded for a JD Edwards EnterpriseOne benchmark. Current testing with Exalogic X3-2 and Exadata X3-2 improves this metric by 2X or more.

This table provides a small sample of test results. Refer to My Oracle Support for detailed white papers on various performance tests of JD Edwards EnterpriseOne on Oracle engineered systems.

Comparing Oracle Exadata and Oracle Exalogic to Other Systems

In addition to Oracle's own internal performance testing of JD Edwards EnterpriseOne running on engineered systems, there is a body of knowledge in the public domain represented by white papers and benchmarks performed by various hardware vendors. Due to variations in test approach, software release levels, scalability targets, and many other variables, no two benchmarks ever provide a scientific "apples-to-apples" comparison. Nevertheless, we can gain some insight by putting Oracle's measured results from Table 1 against other benchmarks. For example, 5 vendor benchmarks running the same JD Edwards EnterpriseOne test scripts for 1000 users reported interactive response times of 0.085, 0.193, 0.240, 0.290, and 0.340 seconds, for an average of 0.230 seconds. Compared to the response time of 0.039 seconds recorded for Exadata and Exalogic, that's a 5.9 times increase in interactive application response time.

Naturally, the most important comparison is against your own current systems and the performance gains you stand to achieve by deploying JD Edwards EnterpriseOne on Oracle Exadata and Exalogic.

Concurrency between Interactive and Batch Workloads

Most JD Edwards EnterpriseOne business processes require a combination of both interactive (live user) transactions and asynchronous batch processing. A typical scenario is that many end users, for example users entering sales orders or financial transactions, record transactions throughout the day. At some point a batch process must run against an aggregation of the many transactions that have

been recorded up to that point. The batch processing can range from very small jobs that complete within a few seconds to very large, data-intensive jobs that process many thousands of rows of data and can run for hours.

A commonly reported pain point among customers is the conflict between interactive transactions and batch processing. Oftentimes systems are tuned to provide acceptable interactive response times for live users and the ability to complete large batch jobs within an acceptable window, but not both at the same time. If both interactive and batch activities process at the same time, the combined load on the system can exceed its capacity. The result is that end users complain about unacceptable response times, and batch jobs do not complete within their allotted window. The typical resolution is to allow interactive users to dominate the system during daytime working hours, and defer the intensive batch processing to overnight. Although this is generally a tolerable solution, there are several pitfalls that can hamper business operations:

- Some batch processes are designed to return information that is critical to business decisions, such as financial reports and materials requirements planning for manufacturing. If these jobs are relegated to overnight processing, critical business decisions might be deferred for days while the jobs are run and rerun for various adjustments or "what if" scenarios. Business simply moves at a faster pace.

- While the original system might have been tuned for acceptable performance, data grows over time. Data growth might be the result of normal business operations over time, or it might be accelerated by expansion of operations, additional business units, or acquisitions. The typical symptom of this situation is a gradual degradation of performance. Overnight batch jobs that once completed within an overnight window are now completing precariously closely to the next day's business.

- Companies who operate in multiple time zones often don't have a full separation of daytime and nighttime windows. They may always have interactive users on the system and always have batch processes running.

Does your IT staff answer support calls like these?

"Hi, this is Mary in the warehouse. We're trying to ship our holiday orders but the system is slow. Is Finance running those month-end reports again?"

"Hi, this is Tom in Finance. Our month-end reports are running slow. Is the warehouse shipping those holiday orders again?"
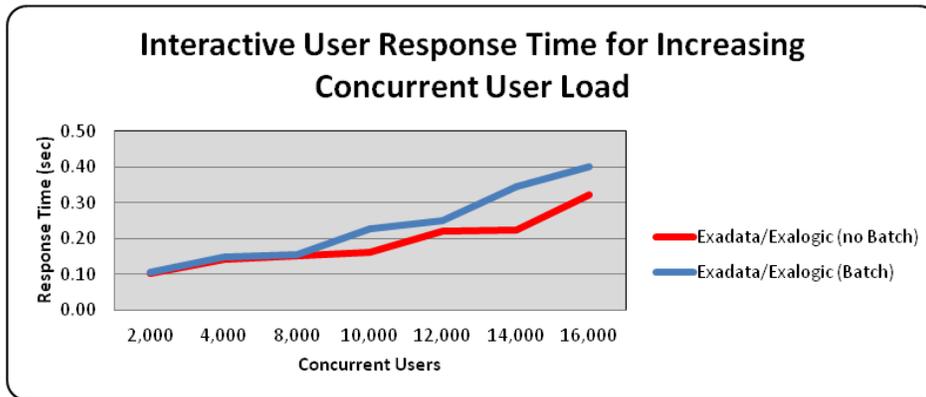
Performance testing has shown that running JD Edwards EnterpriseOne on Oracle engineered systems offers significant benefits to customers who have conflicts between interactive and batch processing. Here's why:

- The JD Edwards EnterpriseOne multitiered architecture is already well-disposed to distributing workloads across multiple servers. Customers often designate discrete servers for horizontal scale-out of interactive and batch workloads. The down-side is the added cost of managing multiple servers.

- The Oracle Exalogic and Oracle SuperCluster architectures are well-suited to the same sort of horizontal scale-out, but without the increased overhead of managing multiple physical machines. Thus, multiple JD Edwards EnterpriseOne servers can be defined to accommodate the workload,

while the Exalogic or SuperCluster management utilities make easy work of managing them as a unified system.

- The extreme performance of the Oracle Exadata Database Machine is able to keep up with the increased simultaneous workload of both interactive and batch operations.

The result is a JD Edwards EnterpriseOne deployment in which interactive and batch workloads can function simultaneously, in relative physical isolation. Interactive end-users perceive a responsive system that they have to themselves, while batch processes can be tuned to run within the required windows, even during the day.

Figure 1. Concurrent Interactive and Batch Processing. Performance testing shows that running batch jobs concurrently with interactive transactions has very little impact on the response times of the interactive transactions.

Why Does JD Edwards EnterpriseOne Run Fast on Oracle Engineered Systems?

Naturally, skeptics will remind us that benchmark testing is conducted in a laboratory "perfect world" environment (which is true), and that such performance metrics might seem too good to be true. However, an objective look at some of the innovations in Oracle engineered systems provide some insight into how and why JD Edwards EnterpriseOne runs so well on these machines. For a more complete description of the innovations within engineered systems, refer to the topic "Introduction to Engineered Systems" later in this paper.

We'll begin with the database. Simply put, Oracle Exadata reads, writes, and performs database operations at extreme speeds and for extreme data volumes due to the following innovations:

- Exadata Smart Flash Cache uses Flash memory to dramatically reduce the time to read and write database and log records. The intelligence in Smart Flash Cache transparently moves active database blocks from disk to flash in real time, thus ensuring that "hot" data is in Flash memory when the next access occurs. Blocks that should not be in Flash are similarly recognized, maximizing the amount of space in Flash for active data. Exadata configurations can often be delivered with enough Flash Cache to contain an entire JD Edwards EnterpriseOne database.

- Exadata Smart Scan speeds up data-intensive queries by leveraging the processing power of Exadata Storage Servers to scan and filter out results. By moving queries to storage instead of moving the

data to the database servers, long-running reports and queries often complete 10x faster than on conventional systems.

- The use of InfiniBand as the networking fabric within Exadata ensures the lowest latency for messages and the highest bandwidth for data transfers. High-speed transactions as well as data-intensive queries and reports reap the benefits.

- Exadata Scale-Out Storage enables the full performance of Exadata to be realized against large and growing databases, without fear of bottlenecks. As the database size grows and storage capacity is added to Exadata, storage performance and networking bandwidth scale in equal proportion.

- Input/Output Resource Manager (IORM) allocates I/O bandwidth across different applications and databases, based on a prioritized allocation plan, to ensure that the most important applications get the performance they need when they need it.

- Advanced Compression reduces the footprint of data on disk. Independent partner testing has shown compression rates of up to 75% for JD Edwards EnterpriseOne data. In addition to the obvious benefit of reduced disk footprint, data compression often results in better performance due to a reduced payload of data being transmitted.

- Hybrid Columnar Compression dramatically reduces the storage space consumed by the database, while at the same time speeding up queries against the compressed data through reduced I/O. Compression often reduces the data storage by a factor of 10x or more, storing a petabyte scale database in 100TB of disk. Since compressed tables remain compressed in Flash memory as well as on disk, very large databases often fit entirely in Flash memory when compressed.

Similar innovations in Exalogic provide extreme processing for the JD Edwards EnterpriseOne logic and web tiers:

- Applications using WebLogic benefit from a number of optimizations for thread efficiency, faster interprocess communication and higher message throughput. An optimized work scheduler for Exalogic balances the number of threads per core available on Exalogic systems, providing better application processing efficiency. WebLogic Server has changed to use shared byte buffers instead of array copies when passing data, improving application interprocess communication performance and a 66% reduction in number of objects created. This reduces heap usage and results in fewer expensive garbage collections for applications. WebLogic also optimizes socket calls to reduce lock contention on Exalogic, allowing fewer threads to process a larger number of message requests.

- On Exalogic, the JRockit JVM makes more efficient network I/O calls using collections of chunked data resulting in higher throughput for Java applications. The JVM optimizes object management with fewer copies resulting in reduced garbage collection and less heap size resulting in better Java application performance.

- Applications running on Exalogic utilize Exabus, the underlying InfiniBand fabric, which provides low latency and high throughput eliminating I/O bottlenecks in every application layer. JD Edwards EnterpriseOne components, such as the enterprise server and the HTML server, are typically deployed in more than one physical or virtual server, and Exabus provides low latency for I/O across nodes on same Exalogic rack. Access to ZFS storage device over Exabus greatly reduces

latency for log file writes and other file access operations. For applications running on Exalogic and accessing database tier on Exadata, Exabus delivers faster I/O, reduces CPU usage on both the mid-tier and DB-tier and provides higher connection pooling efficiency.

- Exalogic Oracle VM can be used to subdivide a physical compute node into multiple virtual machines to increase application deployment efficiency while maintaining application performance. Oracle VM has been engineered for tight integration with Exalogic Exabus I/O backplane using a technique called Single Root I/O Virtualization (SR-IOV) ensuring Oracle VM significantly outperforms comparable hypervisors from other leading vendors. The benefit of this approach is unmatched application performance. In an Exalogic configuration, the impact of virtualization on application throughput and latency is negligible.

In addition to these performance optimizations provided by Oracle Exadata and Oracle Exalogic, Oracle is enhancing the JD Edwards EnterpriseOne product itself to better leverage the extreme capabilities of these engineered systems. Oracle JD Edwards EnterpriseOne applications have long benefitted from its metadata based architecture which abstracts the applications from the underlying technology infrastructure. This technology architecture, known as JD Edwards EnterpriseOne Tools, provides a highly scalable, reliable, and secure platform for running the JD Edwards EnterpriseOne applications. Also included is a broad set of tools for building highly interactive applications, batch processes, workflows, integrations, and other technologies required for modern enterprise applications.

A major innovation and key enabler of this new class of transformational JD Edwards EnterpriseOne In-Memory applications is the engineering that has gone into JD Edwards EnterpriseOne Tools to take advantage of the unique and powerful capabilities of Oracle engineered systems. JD Edwards EnterpriseOne Tools has been optimized to leverage the massive parallel processing capabilities including executing core business logic in multiple, concurrent process threads and managing this expansive thread pool. With this improved platform, more of the processing is done on the super fast database tier, including an expansion in the size of the database table joins in business views, additional join types, and database operators. In this way, the JD Edwards EnterpriseOne product itself is transforming to capitalize on the extreme performance and scalability provided by Oracle Exadata and Oracle Exalogic.
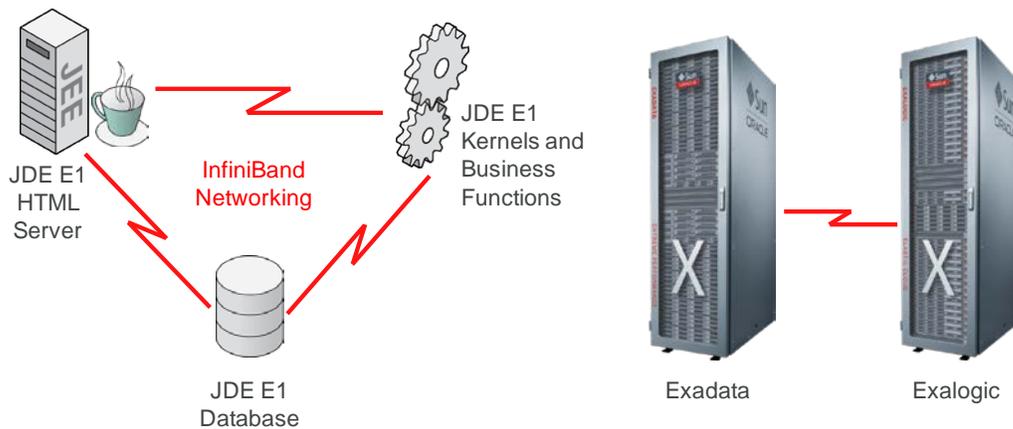
Figure 2. InfiniBand networking within Exadata and Exalogic accelerates communication among JD Edwards EnterpriseOne server components

Simplicity: Standardized, Consolidated Deployments Reduce Complexity

Oracle engineered systems offer a cost effective way of obtaining a purpose-built system, which provides a standardized set of hardware, network, storage and software components, all of which are prewired and tested, ready to run application workloads without change, and scale on demand. These engineered systems use best-of-class standardized components to provide maximum performance leveraging synergies between components. The systems are open, reliable, and scalable, which allows 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 business rather than on managing low-level infrastructure details.

The standardization within Oracle engineered systems returns dividends not only during installation and deployment, but throughout the entire life cycle of the systems. Because the components are standardized, monitoring, patching, and administration tasks can be automated and human intervention minimized. The systems scale with the capacity of many servers, but the TCO remains that of a single system.

Deploying JD Edwards EnterpriseOne on Exalogic and Exadata

The following illustration depicts a typical deployment scenario for JD Edwards EnterpriseOne on Exalogic and Exadata. Obviously the Exadata provides the database tier for JD Edwards EnterpriseOne business data and system control tables. The JD Edwards logic and web tiers are served by compute nodes within the Exalogic. JD Edwards EnterpriseOne's distributed architecture lends itself very well for deployment to Exalogic nodes. Discrete interactive logic and batch logic servers can be designated, providing scaled-out, parallelized processing at the JD Edwards EnterpriseOne logic tier giving the best of both physical isolation as well as consolidated management. Similarly the JD Edwards EnterpriseOne HTML server runs within Oracle WebLogic Server on other Exalogic nodes. The WebLogic domain can scale out to accommodate many thousands of interactive users. The deployment scenario can scale up or down depending on your capacity requirements, typically leaving

ample available capacity for other Oracle or third-party applications. For example, customers can design deployments of these components all coresident on a single Exalogic system:

- JD Edwards EnterpriseOne logic and web tiers running a multitude of JDE E1 applications

- Oracle WebCenter Sites, WebCenter Portal, and WebCenter Content Management providing end users with rich user interfaces and access to structured and unstructured content, including JD Edwards EnterpriseOne application portlets

- Oracle SOA Suite and the JD Edwards EnterpriseOne Business Services Server, providing a service-oriented architecture for resilient integrations to external systems and orchestration of complex business processes

- Oracle Application Development Framework and the Business Services Server, providing access to JD Edwards EnterpriseOne Mobile Applications

- Oracle Business Intelligence Publisher and BI Applications, providing advanced data analytics and visualization, and access to JD Edwards EnterpriseOne One View Reporting applications

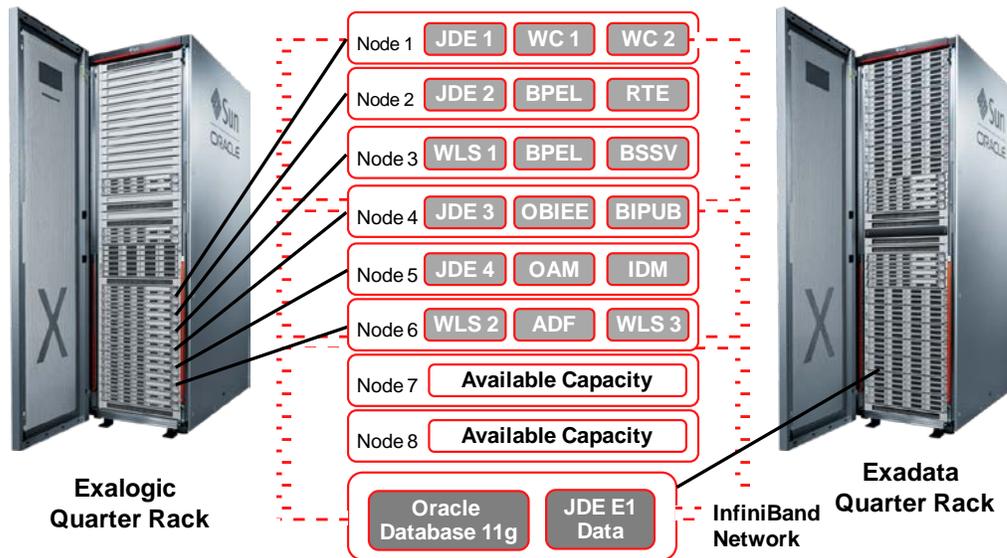- Oracle Identity Management, providing access management, account provisioning, and security governance

Figure 3. A typical topology for deploying JD Edwards EnterpriseOne with other products on Exalogic and Exadata.

Consolidated Infrastructure Reduces Server Sprawl

Many JD Edwards EnterpriseOne production deployments will require only a portion of the capacity provided by Exadata and Exalogic. Therefore, Exadata and Exalogic make the ideal platform for consolidating several JD Edwards EnterpriseOne instances—perhaps for multiple business units or multiple geographies, or perhaps for lifecycle management of production, development, test, and "sandbox" systems. Of course JD Edwards EnterpriseOne's distributed, multitier architecture enables

this same approach on traditional computing architectures; however, with such distribution comes "server sprawl" and the commensurate cost and effort of maintaining many disparate servers.
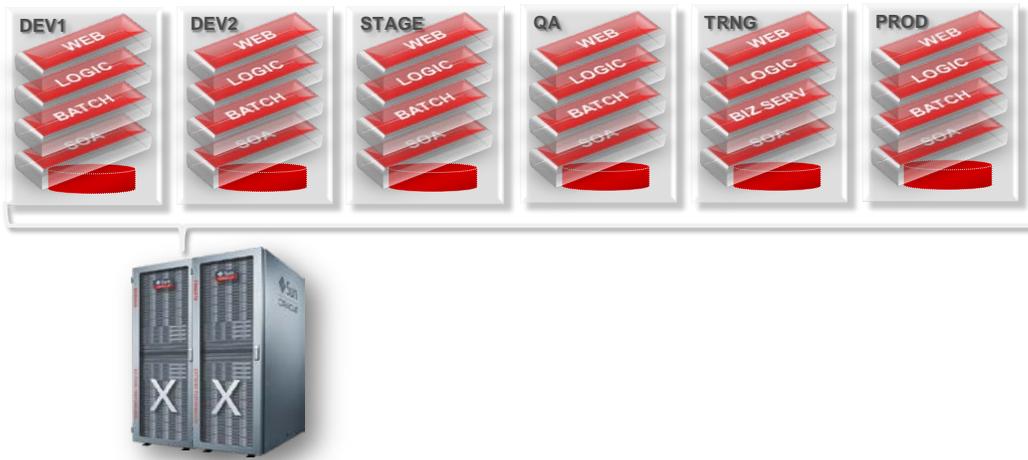

Figure 4. The dense computing capacity of Exadata and Exalogic allows consolidation of several JD Edwards EnterpriseOne instances, as well as consolidation with other Oracle or third-party applications

Agility: JD Edwards EnterpriseOne Deploys Quickly on Engineered Systems

Business users demand stable, well-performing production systems, but often the demands of the business extend beyond the boundaries of the production system itself. Acquisition of new business units, requirements for application upgrades, and rollout of new functionality put pressure on IT support organizations to deploy new instances of enterprise software and the systems it runs on.

Can your IT staff say "yes" to requests like these?

"Hi, this is Frank in Global Distribution. We just saw a demo of the latest JD Edwards EnterpriseOne release and it's fantastic. We want to go live with it this year. Can we get a sandbox environment set up by Monday?"

Such projects have traditionally carried the stigma of consuming many months and many IT resources. That's not exactly the definition of "agile." But deploying JD Edwards EnterpriseOne on Oracle engineered systems can shatter that stigma. Here's why:

Begin by considering the acquisition, installation, and deployment of the Oracle engineered systems themselves. Oracle engineered systems simply eliminate many of the non-value-add tasks that plague IT organizations. The systems are delivered to customers as tightly integrated systems in which the CPU, memory, disk, and networking are predetermined in optimal balance. A finite number of variants allow customers some degree of flexibility in acquiring the capacity they need, yet the components can be racked and cabled quickly according to rigorously standard models. And because the system configuration is so well known, the operating systems, virtualization software, database, and middleware are deployed just as efficiently. Customers have reported complete Exadata and Exalogic systems up and running on their premises in a matter of days.

In this way Oracle engineered systems deploy as standard data-center building blocks of integrated compute, storage, and network components designed to provide an out-of-the-box platform for a broad range of enterprise application workloads such as JD Edwards EnterpriseOne, other Oracle enterprise applications and middleware, and even third-party products.

After the Oracle engineered systems are in place and ready to accept application deployments, we can turn our attention to provisioning JD Edwards EnterpriseOne environments. Again, this is an activity that historically carries a stigma of requiring many days or weeks of effort and many IT resources. However, because of the nature of engineered systems, many of the tedious tasks that are prerequisite to a JD Edwards EnterpriseOne installation—or any software installation for that matter—are tasks that are virtually eliminated:

- The hardware is known and certified.

- The operating system is known, certified, and patched to the appropriate level.

- The database is known, certified, patched, and configured optimally.

- The web-tier and Java servers are known, certified, patched and configured optimally.

On such a well-known and stable system, software installation can begin immediately, accelerating past much of the design, preparation, and administration work that is necessary on traditional systems.

The story gets even more interesting with Oracle VM templates for JD Edwards EnterpriseOne. Oracle VM templates are preconfigured images of JD Edwards EnterpriseOne server components, such as the enterprise server and HTML server, that are built and tested at Oracle, packaged into virtual machine images, and provided to customers for direct deployment into their Oracle VM systems. This deployment methodology results in a functional JD Edwards EnterpriseOne environment deployed on engineered systems, conceivably in hours, which is updated with JD Edwards EnterpriseOne Tools and Application patches, and is a virtual replica of the system built and tested by Oracle engineers. Using Oracle VM templates, customers can deploy fully functional JD Edwards EnterpriseOne systems in less than one day compared to traditional installation methods that may take many days. That's an improvement of 5X or more.
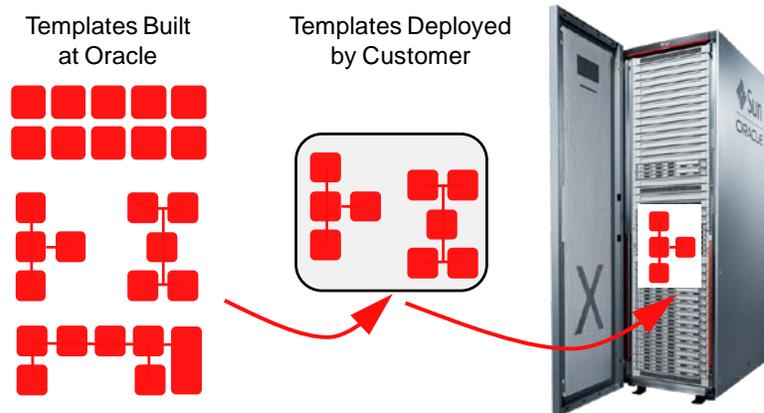

Figure 5. JD Edwards EnterpriseOne deploys quickly to Exalogic using Oracle VM Templates.

So what does agility mean to the business? It means that IT can respond quickly to planned or unplanned spikes in capacity. Bottlenecks at critical-path business processes can be eliminated. It means that IT can respond quickly to requests from the business to quickly deploy new instances of JD Edwards EnterpriseOne for testing and evaluation, or to bring on new acquisitions or global expansion. With traditional systems such requests might be deemed unreasonable, impractical, or perhaps even impossible. But with JD Edwards EnterpriseOne running on Oracle engineered systems, such agility can be standard operating procedure as IT helps to accelerate business.

Introduction to Engineered Systems

Oracle engineered systems combine best-of-breed hardware and software components with game-changing technical innovations. Designed, engineered, and tested to work best together, Oracle engineered systems can power the cloud or streamline data center operations to make traditional deployments even more efficient. The components of Oracle engineered systems are preassembled for targeted functionality and then—as a complete system—optimized for extreme performance. By taking the guesswork out of these highly available, purpose-built solutions, Oracle delivers a solution that is integrated across every layer of the technology stack—a simplicity that translates into less risk and lower costs for your business. Only Oracle can innovate and optimize at every layer of the stack to simplify data center operations, drive down costs, and accelerate business innovation.

Oracle Exalogic Elastic Cloud

Oracle Exalogic is an Engineered System on which enterprises deploy Oracle business applications, Oracle Fusion Middleware or third-party software products. Exalogic comes pre-built with compute nodes, memory, flash storage and centralized storage, all connected using InfiniBand in a high-redundancy architecture delivering five-nines availability, with fault tolerance and zero-down-time maintenance.

Exalogic dramatically improves performance of Oracle Applications, Fusion Middleware and third-party applications without requiring code changes and reduces costs across the application lifecycle, from initial set-up to on-going maintenance, as compared to conventional hardware platforms. Oracle has made unique optimizations and enhancements in Exalogic firmware, Exalogic software, and in Oracle's middleware and Oracles applications. These include on-chip network virtualization based on near-zero latency InfiniBand fabric, high-performance Remote Direct Memory Access, workload management in Oracle WebLogic server and optimizations in Oracle Coherence and Oracle Traffic Director. Exalogic includes support for a highly optimized version of the Oracle VM, which significantly outperforms comparable virtualization solutions and is an ideal consolidation platform for Oracle Applications. Templates to simplify installation, deployment, and configuration of Applications on Exalogic are available.

Oracle Exadata Database Machine

Oracle's Exadata Database Machine is Oracle's database platform delivering extreme performance for database applications including Online Transaction Processing, Data Warehousing, Reporting, Batch Processing, or Consolidation of mixed database workloads. Exadata is a pre-configured, pre-tuned, and pre-tested integrated system of servers, networking, and storage all optimized around the Oracle database. Because Exadata is an integrated system, it offers superior price-performance, availability and supportability. Exadata frees users from the need to build, test, and maintain systems, and allows them to focus on higher value business problems.

Exadata uses a scale-out architecture for database servers and storage.   This architecture maintains an optimal storage hierarchy from memory to flash to disk. Smart Scan query offload has been added to the storage cells to offload database processing. Exadata implements Smart Flash Cache as part of the

storage hierarchy. Exadata software determines how and when to use the Flash storage for reads and write as well as how best to incorporate Flash into the database as part of a coordinated data caching strategy. A high-bandwidth low-latency InfiniBand network running specialized database networking protocols connects all the components inside an Exadata Database Machine. In addition to a high performance architecture and design, Exadata offers the industry's best data compression to provide a dramatic reduction in storage needs.

Oracle SuperCluster

Oracle SuperCluster is the world's most efficient multipurpose engineered system, delivering extreme efficiency, cost savings, and performance for consolidating mission critical applications and rapidly deploying cloud services. Oracle SuperCluster represents a complete, pre-engineered, and pre-tested high-performance enterprise infrastructure solution that is faster and easier to deploy than a collection of individual database and application servers. The system combines innovative Oracle technology— the computing power of Oracle's SPARC servers, the performance and scalability of Oracle Solaris, the Sun ZFS Storage Appliance, the optimized database performance of Oracle Database accelerated by Oracle Exadata Storage Servers, and a high-bandwidth, low-latency InfiniBand network fabric—into a scalable, engineered system that is optimized and tuned for consolidating mission-critical enterprise applications.

Oracle SuperCluster provides both the capacity for growth, as well as the fine-grained server virtualization needed to isolate individual application components. With multiple layers of enterprise application infrastructure consolidated onto a high-performance, highly available Oracle SuperCluster system, deployment speed, application performance, and availability can all be optimized. Designed as a preconfigured, pretested, and ready-to-deploy engineered system, the Oracle SuperCluster provides a complete and optimized infrastructure solution for applications, built around robust compute, networking, storage, virtualization, and management resources. The result is a system that is orders of magnitude easier to manage, and up to five times faster to deploy than alternatives, all while occupying considerably less real estate requiring less power. Furthermore, the Oracle SuperCluster system provides full built-in redundancy resulting in a highly reliable infrastructure without single point of failure. An issue with one component will not impact other components of the system offering true isolation. Customers can consolidate multiple environments with minimum disruption, without fear of performance degradation, and the ability to achieve required service levels.

Oracle Exalytics In-Memory Machine

As analytic applications become more sophisticated and calculation-intensive, the use of mobile BI expands, user adoption increases, and data volumes explode making the need for speed and efficiency more important than ever. In-memory technology can dramatically accelerate analytic performance. Oracle Exalytics In-Memory Machine is the industry's first engineered system for analytics that combines market leading BI foundation, in-memory analytics software, and best-in-class hardware engineered and optimized to work together to deliver extreme performance for Business Intelligence and Enterprise Performance Management applications. As a result, users can visually navigate and drill into information at the speed of thought, without limits on the complexity of their questions or the volume of the underlying data. Exalytics drives a new class of smarter and more powerful analytic

applications that simply weren't possible using conventional BI software and generic hardware configurations.

Oracle Business Intelligence Foundation running on Oracle Exalytics has been specially enhanced to take advantage of large memory, processors, concurrency, storage, networking, operating system, kernel, and system configuration afforded by the Oracle Exalytics hardware. Oracle TimesTen for Exalytics has been specially enhanced for analytical processing at in-memory speeds. With lightning fast scan speed of up to 100 million rows/second and up to 10x columnar compression, TimesTen for in-memory analytics delivers faster reports and dashboards for departmental as well as enterprise wide consumption.
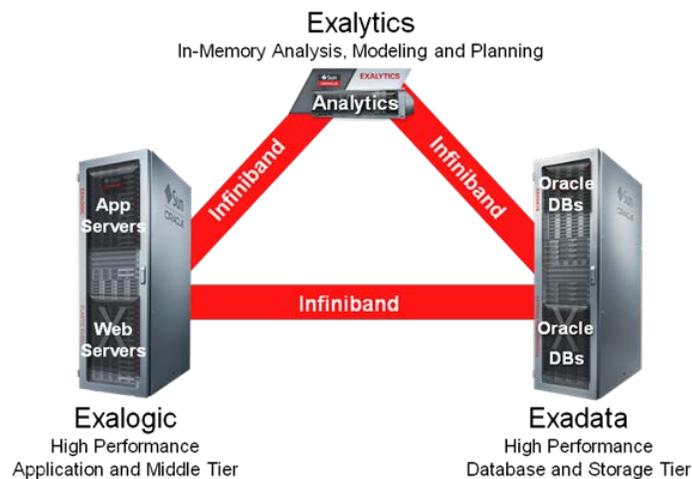
Figure 6: Engineered Systems: Exalogic, Exadata, Exalytics; Applications, Database and Analytics. The fastest, easiest path to unbeatable application performance

References

- Oracle Exadata Database Machine Brochures and Data Sheets

- Oracle Exalogic Elastic Cloud Brochures and Data Sheets

- Oracle SuperCluster Brochures and Data Sheets

Conclusion

Today's enterprises face challenges that are difficult—or impossible—to meet with traditional software systems. Massive volumes of data, disparity of systems, and rising demands for extreme performance call for a generational evolution of systems. That generational evolution is in-memory computing.

Key business processes such as Order to Cash, Financial Close and MRP are generally complex in nature. Add large amounts of data, and the expectation for the enterprise is that practice of these key but critical processes will be lengthy. Businesses build their internal procedures around this expectation and in many ways accept a compromise that results in less than optimal information in return for the time required for daily tasks of review and adjustment of the output. Factor in the common unforeseen disruptions with the ripple effect, and your enterprise is exposed to great risk and added cost due to delayed decision making.

Oracle engineered systems offer JD Edwards customers extreme performance gains and time reduction for complex processes that are at the heart of the enterprise. Companies can re-think their internal expectations and do away with the compromise and associated risks. Quicker runs, more accurate information, and better decision making is the outcome, resulting in timely response to change, better customer service, and reduced costs.

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Oracle Exadata and Oracle Exalogic
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