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Oracle E-Business Suite Human Capital Management for Engineered Systems
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Executive Summary

Leading enterprises acknowledge that their employees are their best assets. This makes it obvious that Human Capital Management (HCM) systems are mission critical from a strategic and operational perspective. Starting from hiring the best candidates and developing talented workers to paying them, Human Capital Management systems help organizations to manage and service their employees. They also help enterprises ensure compliance with local rules and regulations around the globe. Data from Human Capital Management has to be passed on to other systems like General Ledger and Projects to ensure those dependent processes are executed on time.

Over a period of time the operational aspects of maintaining Human Capital Management systems become complex with exponential growth of data and technical issues like aging infrastructure can add risk and complexity to an already challenging process. Mergers and acquisitions and/or implementation of additional modules will mean the applications database should be fine tuned; other infrastructure like servers, networking and storage management must also be configured.

Oracle’s Engineered Systems like Exadata Database Machine and Exalogic offers extreme performance with its fully integrated package of high-performance servers, low-latency storage, high-speed InfiniBand networking and software that is secure, scalable and requires very little additional tuning for the E-Business Suite HCM applications.

This white paper describes the significant benefits customers would achieve when they run E-Business Suite HCM applications on Oracle’s Engineered Systems.
Introduction to Engineered Systems

Oracle’s Engineered Systems combine best-of-breed hardware and software components with game-changing technical innovations. Designed, engineered, and tested to work best together, Oracle’s Engineered Systems can power your cloud-based solutions, either private or public, or streamline your data center operations to make traditional deployments even more efficient. The components of Oracle’s 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.

1. Oracle Exalogic

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-nine availability, with fault tolerance and zero-down-time maintenance.

Exalogic dramatically improves performance of Oracle Applications, Fusion Middleware and 3rd 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 Oracle’s 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 install, deployment and configuration of Applications on Exalogic are available.

2. 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 writes 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.

3. Oracle SPARC SuperCluster

Similar to Engineered Systems such as Exadata, Exalogic, Oracle E-Business Suite can be deployed on Oracle’s SPARC SuperCluster to achieve high availability, performance, scalability and environment consolidations. Here is a brief description of Oracle’s SPARC SuperCluster’s technical capabilities.

Oracle’s SPARC SuperCluster is the world’s most efficient multi-purpose engineered system, delivering extreme efficiency, cost savings, and performance for consolidating mission critical applications and rapidly deploying cloud services. Oracle’s SPARC 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’s SPARC SuperCluster provides both the capacity for growth, as well as the fine-grained server virtualization needed to isolate individual application components. Deployment speed, application performance, and availability can all be optimized with the multiple layers of enterprise application infrastructure consolidated onto a high-performance, highly available SPARC SuperCluster system. Designed as a pre-configured, pre-tested, and ready-to-deploy SPARC SuperCluster Engineered System, the solution 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 SPARC 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 Oracle E-Business Suite environments with minimum disruption, without fear of performance degradation, and the ability to achieve required service levels.
Technical Benefits of Oracle’s Engineered Systems

Internal benchmarking indicates that Oracle E-Business Suite running on Oracle’s Engineered Systems performs 3 to 10 times faster for forms and self service applications depending upon the concurrency load profile. And linear scaling allows for very large deployments and multiple applications to run simultaneously while maintaining consistent response times. Oracle’s Engineered Systems are architected to deliver maximum availability, high performance, and scalability helping Oracle E-Business Suite customers to consolidate environments, and reduce server footprint resulting in an overall reduction in cost of application ownership.

Here are some of the technical benefits delivered by Engineered Systems:

- Oracle E-Business Suite applications consists of many batch processing programs that create large workloads. These workloads are highly CPU intensive. High concurrency of these workloads requires systems with large memory capacity with large Systems global area (SGA) and Program global area (PGA) capable of processing high speed disk input/output (I/O). Oracle’s Engineered Systems are architected to deliver these superior technical capabilities to manage such large workloads.

- Engineered Systems can handle twice as many users per core compared to other servers delivering the scalability required to add more application users during growth and expansion.

- Linear Scaling easily supports very large deployments.

- Resource Manager can help consolidation of database and application environments by controlling CPU usage, managing CPU contention via instance caging, controlling disk I/O usage, and managing contention via IORM’s inter-database resource plans. Customers can achieve higher throughputs as more transactions can be processed using single Exadata core compared to other servers.

- Exalogic has been engineered to leverage a technique known as Single-Root I/O Virtualization to eliminate virtualization overhead and deliver maximum performance and scalability. 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 associated cost.

- Oracle VM template for Exalogic reduces installation and configuration time and allows rapid deployment of Oracle E-Business Suite applications.

- Oracle E-Business Suite customers can load balance web and forms servers, configure parallel concurrent processing and configure Oracle RAC and Oracle Data Guard for high availability.

- Oracle Enterprise Manager Cloud Control (EM) helps with Exadata manageability and provides a composite view of all health indicators of a cell or cell group to diagnose and troubleshoot performance problems efficiently.
Exadata Unique Features

Oracle E-Business Suite customers will benefit from using following unique features of Oracle’s Engineered Systems:

**Exadata Smart Flash Cache**

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.

Internal bench marks for Oracle E-Business Suite have shown following results as a result of Smart Flash Cache:

- Average I/O latency reduced by 58% and no special tuning is required to achieve I/O performance improvement.
- Log file sync events improved by 5% and no special tuning is required to achieve log file sync event improvements

**Exadata Smart Scan**

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 often complete 10 times faster than conventional systems.

**InfiniBand**

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 from InfiniBand. Oracle E-Business Suite benefits resulting from InfiniBand are:

- 30-40% lower CPU utilization and 100% or more throughput compared to Gigabit Ethernet
- 20% improvement in online transactions response times
- Easier scaling of E-Business Suite online transactional processing through low latency

**I/O Resource Manager (IORM)**

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. As a result, customers can consolidate database and application environments without worrying about resource contention and performance degradation.
Exadata Scale-Out Storage
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. As a result,

- Backups and Clones can be executed at a rate of 20TB/hour
- Faster incremental backups can be performed

Exalogic Unique Features

**Exalogic Exabus**
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. Applications components are typically deployed in more than one 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 the database tier on Exadata, Exabus delivers faster I/O, reduces CPU usage on both the mid-tier and DB-tier and providing higher connection pooling efficiency.

**Oracle VM for Exalogic**
Exalogic Oracle VM can sub-divide 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.
Business Benefits of deploying HCM on Engineered Systems

1. Improvements in batch processing

HCM has many batch processes and reports that are very critical in nature. Any reduction in time taken by these processes helps the enterprise in many different ways as highlighted below.

- **A) Faster Payroll cycle**

  The Payroll cycle consists of the following processes:
  
  - Executing Payroll run.
  - Pre-payments – Distributes net pay across various payment methods for each employee.
  - Archiver – Archives the payroll data for online pay slip and other reports.
  - Executing Validation reports like Payroll register (each employee’s gross pay, deductions and net pay).
  - CheckWriter/Deposit Advice – Printing checks or deposit advice.
  - Nacha – Direct deposit process for US.
  - Costing – Associates the payroll data to the General Ledger accounts before transfer to General Ledger or Projects.

Most organizations have multiple payrolls like weekly, bi-weekly and monthly. Each payroll cycle should be completed in a fixed window in order to accommodate other Payrolls and processes. Complex legislative and business processes in fast formulas could mean taking anywhere from 5-20 hours to process the payroll for large enterprises. Any potential issues whether late entry of time cards or errors in the payroll should be corrected and re-processed on time to avoid delays in the bank remittance timeframes. The inability to pay a person on time could result in legal issues; hence the Payroll department is always under pressure to complete payroll on time and without delay due to system issues.

Events like a salary increase for all employees might require a retro payroll run, which means the payroll run is executed for each period that needs to be corrected. The amount of time taken to execute the retro payroll is directly proportional to the number of payroll periods that needs to be recalculated.

A corporate bonus for all employees might mean a supplemental payroll run be squeezed in between the regular Payroll runs. Each of these additional activities requires precious time and performance bottlenecks cannot be used as an excuse.

Once the payroll is completed, the cost associated with each assignment needs to be recorded for accounting purposes in General Ledger. Any delay in this transfer process can potentially delay the production of the internal and external financial reporting.

Data intensive batch processes like Payroll require high IO bandwidth and low latency. Oracle’s Engineered Systems have fast processors, large memory, smart flash cache and fast IO capabilities,
Benefits of running Oracle E-Business Suite HCM Applications for Oracle's Engineered Systems

thereby reducing the Payroll cycle time. There is no tuning required for the applications in these Engineered Systems.

For example, a customer running Payroll for 42 thousand US employees was taking about 7 hours and 50 minutes to complete the payroll run. The same payroll in an Engineered System completed nearly in half the time of 4 hours and 10 minutes. Even if you don’t see dramatic improvements as this example, the benefits of the Engineered Systems are quite evident.

A faster payroll cycle helps in compliance, avoids legal issues, saves the enterprise from potential fines of thousands of dollars, keeps employees motivated and reduces cost associated with additional staff.

- **B) Benefits Participation Process (BENMNGLE)**

  The Oracle Advanced Benefits (O-AB) enrollment process manages changes in benefit design and enrollment events. It supports all types of enrollment processing: on demand, automatic, life changes and scheduled/open enrollment. Generally customers define complex rules to determine elections that can be made like coverage start dates, default enrollments, required communications etc along with coverage and cost amounts.

  The enrollment process uses a hierarchy structure to define the benefit offerings. The rules for determining enrollment method, eligibility, defaults, start dates and coverage/rate amounts can be applied at different levels of the hierarchy. This means the participation process needs to cascade through a multitude of 'levels' of the benefit hierarchy to determine which set of rules to apply to each possible benefit election. In addition, these rules may vary within the hierarchy based on what type of benefit enrollment event the person experienced. As the number of data items to be analyzed based on the defined rules is huge, performance of the process is very critical for the organization.

  Data intensive batch processes like Benefits Participation process require high IO bandwidth and low latency. Oracle’s Engineered Systems with its smart flash cache and fast IO capabilities reduce the participation processing time. Internal testing to measure the Exadata Smart Flash Cache found the flash cache hit ratio above 72%. The hit ratio is calculated as the ratio between two instance activity statistics; cell flash cache read hits and physical read total IO requests. The expectation is to see a higher flash cache hit rate in a production scenario with a matured cache as opposed to the constant flushing carried out in the testing for each scenario. A secondary benefit of high IO request rates is seen in faster backups, up to 12TB per hour in full rack tests.

  Bottom line, when running large volumes such as for Open enrollment, any performance gain gives the Benefits administrator more time to test and a better opportunity to correct errors before the communicated enrollment period commences. This indirectly helps to streamline the process with faster data integration with the carriers and vendors. It also reduces load on the support staff and provide opportunities to reduce cost on additional manpower.

- **C) Statutory Compliance Reporting**

  Organizations have to periodically report Payroll data for Federal and State authorities. An example in the United States is the Employer's Federal quarterly report (941), having the federal tax withheld
information along with the Social Security and Medicare tax information for each employee. Similar information needs to be filed in each of the states where employees were paid in the form of State Quarterly Wage Listings. Each of the reporting processes is complex and time consuming. Any delay in reporting could mean hefty fines levied by the authorities.

On a similar note, Statutory reporting for Payroll year-end is a major exercise by itself due to the amount of data that needs to be processed and reported on time. In the United States for example, customers need to send a year-end summary (W2) to each employee by the end of January and submit the magnetic tapes to Federal and State authorities by March. Data should be validated and corrected before submitting. The issue compounds when the same resources need to be shared with the normal payroll cycle and other activities.

Each of these processes (for example, Year-end Archiver to archive data) need to process a year’s worth of data for reporting and the generation of these magnetic reports are resource intensive operations. With Oracle’s Engineered Systems, there is no need to allocate specific hardware resources during this reporting and many benefits are derived from the faster servers and IO capabilities. Completing and submitting the data on time means savings on potential fines of thousands of dollars. Issues and corrections can be handled as day to day operations instead of a fire drill due to time crunch.

- **D) Upload of Oracle Time cards to Payroll using Batch Element entry (BEE)**

Transfer of time cards from Time and Labor timestore to BEE interface tables is one of the most frequently run concurrent programs dealing with huge amounts of data. The details about the number of hours the employee worked is entered and stored on the timecard. Once this timecard is submitted, it follows the defined approval process and is retrieved by Payroll application for Payroll processing.

As part of this transfer process all new entries on the timecard along with any retro changes to the timecard are transferred in batches to BEE interface. If Rules evaluation is enabled, the hours entered go thru a Timecard explosion process, wherein the number of hours entered gets transformed into Overtime hours, double time hours or gets premiums applied based on the Earning Policy setup rules. Needless to say, execution time and optimal performance are of paramount importance in this process. A performance benefit due to Engineered Systems ensures that applications downstream like the Payroll run is not delayed.

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 countless hours for administrators and data center staff.

2. Improvements in End User Response Times

It is important that organizations use robust and highly performing applications to manage and service their workers. Unlike some specialized systems, HCM Applications are possibly used by every employee in the organization.
Benefits of running Oracle E-Business Suite HCM Applications for Oracle's Engineered Systems

For all internal facing applications, when thousands of employees are trying to access the system you want a reliable, scalable and consistent user experience. By completing mandatory activities on time, employees become more productive in their regular duties and the employee satisfaction and morale goes up.

Below are example scenarios where Oracle’s Engineered Systems can provide significant value addition.

- **A) Recruitment**: The key to any organization is the ability to attract new talent. You would want to provide a positive experience to the candidates applying online for opportunities in your organization and the last thing you want is to drive them away to competitors due to unavailability or poor performance of your Recruitment solution. Studies have shown that candidates spend very little time in a particular website searching for open positions and potential issues in the application could mean a missed opportunity to hire a great talent. Lowering time to hire will help enterprise reduce costs and improve the execution process.

- **B) Employee Benefits Open Enrollment**: In most organizations a short window is provided to employees to complete their benefit choices for Medical, Dental and other company provided benefits. Typically a large number of employees would concurrently access and submit their enrollments within that window. Poor availability or performance issues can result in loss of morale and increases call volumes to the help desk.

- **C) Appraisal**: The employee goal-setting and appraisal process provides the organization the ability to rank, monitor and coach the employees to perform better. Managing performance has direct impact on the chances of achieving organization goals. In many enterprises, these are done within well defined time periods and probably multiple times within a year. High availability and ease of use with better user response times will motivate the employees and managers to make the best use of the system for overall growth.

- **D) Time Entry Process**: Generally for weekly or bi-weekly payrolls, getting the timecards on time is critical for the payroll process to complete. Any performance issues or unavailability leads to employee dissatisfaction, late submissions, supervisory overheads and delay for the Payroll department or to pay the vendors.

- **E) Managers allocating compensation**: When new pay raises or corporate bonus is budgeted, there is a pressure for the managers to complete the compensation allocations on time using Compensation Workbench. Any performance issues or non-availability of the system takes precious time away from more critical issues.

High concurrency workloads benefit from large Exadata memory capacity. Internal testing on an Oracle internal single instance database deployed on Exadata and Exalogic has shown an improvement of 2X to 8X for all self-service applications. For example, accessing an employee pay slip was three times faster when compared to a comparable hardware without any specific tuning on the systems.

A similar test on scalability showed predictable performance over a range of workloads. In tests with 700, 1400 and 2100 concurrent users, Exalogic and Exadata metrics scaled smoothly. Response-
increased imperceptibly while the CPU and memory utilization rose predictably. Actual response time stayed below 0.5 seconds while users were ramped up from 700 to 2100.

This provides a great advantage to organizations as no system changes are required while quickly rolling out mandatory activities like Appraisals, Benefits enrollment or Compensation workbench. The more employees and managers are able to leverage the self-service capabilities, the lesser need for administrators or help desk professionals.

3) Reduce Storage Cost

Record retention rules and policies in most countries mandate storing information for 8-10 years. Applications like Oracle Payroll generate huge volumes of data in the run results, assignment actions and archive tables. Retail customers having seasonal employees or high turnover will have large amounts of assignment data. Older enterprises could have average employee tenure of over 25 years resulting in large volumes of HR data. Over the years, performance degradation creeps in affecting online performance as well as batch processing times. Adding to this, many copies of the production instance are maintained for backup, pre-production testing, debugging issues etc. leading to storage issues.

Using Oracle’s Advanced Compression helps reduce the storage cost. As the payroll and assignment tables do not have any attachments or BLOB’s, the compression ratio is as much as 3X thereby directly leading to immediate cost savings with the Engineered Systems.

4) Global Single Instance

When you take the complexities of HR and Payroll into the Global footprint, then the importance of Exadata’s scale-out architecture becomes even more critical for mass, volume and benchmarking on global scale. Single Instances as an applications strategy, particularly for ERP is something that Oracle has advocated for more than 10 years now. The concept has become broadly popular in the IT industry as customers consolidate their systems in search of greater efficiency, flexibility, and of course, lower costs.

Most global organizations have operations in dozens of countries and some continue to have Human Resource systems in multiple countries. Over a period of time as systems age, upgrading to keep up with the compliance issues and general maintenance of the systems grow exponentially. Mergers and Acquisitions add to the complexities due to volume and redundancy of the systems.

Oracle internal IT moved from 70 application instances to one and from 40 data centers to 2. Apart from IT cost benefits, Oracle was able to have global standard processes to reduce complexity, increased efficiency, consistent data of having one source of truth and global business intelligence along with centralized decision making. Consolidating all these systems into a single Global Instance has huge cost benefits and is best done using the Engineered Systems given the scale and size of such a consolidated system.
Customers save 1000’s of hours in researching and building a system to scale to the needs of Oracle E-Business Suite due to the limited variation in end-user configurations of these pre-assembled Engineered Systems. This also allows Oracle to replicate customer issues easily and hence faster problem resolution. Oracle also offers Platinum Services 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.

Conclusion

Ability to manage and analyze growing HR data and ensuring that business processes are optimally performing against these data sets will continue to be the critical areas of focus for HCM IT. Fine tuning certain aspects of the infrastructure to meet these demands will only provide limited relief. It is essential for enterprises to look at the holistic picture of IT systems that can support these growing business needs. Oracle’s comprehensive E-Business Suite HCM applications have been fine tuned and engineered to scale the best when run on Oracle’s Engineered Systems and provide significant business benefits to the end users that traditional hardware systems fail to deliver. Addition of Platinum services at no extra cost to Oracle Premier Support customers and the availability of Oracle Enterprise Manager that provides a single tool to manage the entire stack from Applications to Disk saves hours, reduce downtime and improve staff productivity.
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