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Executive Overview

Procurement applications and processes are an integral part of the organizational DNA today with procurement professionals gaining increasing visibility in the organization as champions of operational excellence and global competitiveness. Although cost reduction remains a key metric for the CPO’s office, trends of driving innovation and performance improvement at the organization level signal a broader, more strategic intent. The procurement office has taken the lead in initiatives such as supplier collaboration, risk management, spends analysis, predictive sourcing planning, and compliance monitoring - all of which are key drivers for the organization’s success. Along with all of this, is the tremendous expectation to perform. For example, for a Fortune 500 company, the expected Return on Investment on procurement applications is often $1 billion or more worth of savings.

In today’s networked business landscape, organizations are increasingly looking at their extended ecosystem to drive innovation. The suppliers not only represent a very significant portion of the annual spend of the company, but collaborate to improve process efficiency and drive business results. Procurement applications and processes have evolved to effectively manage the supply base.

Timely and fast execution of procurement operations is necessary for the desired efficiency. An effective procurement business user must be supported by systems that provide real-time information, are robust and resilient to maintain data quality and hygiene, and are able to handle fluctuating usage loads.

In this whitepaper, we will look at how today's businesses demand performance improvement in the execution of traditional procure-to-pay processes and how Oracle’s Engineered Systems is uniquely positioned to address all these opportunities.
Overview of 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 the cloud or streamline 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.

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-nines 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 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 install, 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 Exalytics

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 were not 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 lightening fast scan speed of up to 100 million rows/second and up to 10x columnar compression, TimesTen for in-memory analytics delivers faster reports & dashboards for departmental as well as enterprise wide consumption.

Figure 1: Engineered Systems: Exalogic, Exadata, Exalytics: Applications, Database and Analytics. The fastest, easiest path to unbeatable application performance
Technical Benefits of Oracle's Engineered Systems

Summary

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.

Oracle E-Business Suite customers will benefit from using following unique features of Exadata Database Machine:

**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 benchmarks 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

**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

**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.

Oracle E-Business Suite customers benefit from using following unique features of Exalogic:

**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.

**Technical Benefits of Oracle’s SPARC SuperClusters**

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.
Benefits of Deploying Oracle Procurement on Engineered Systems

A typical procure-to-pay process involves flow of transactional data across multiple application modules involving different users with various roles and responsibilities. In the following sections, we explore instances where procurement applications deployed on an engineered system improves the overall execution performance. This not only frees up time for the business users to focus on more strategic initiatives, but research has shown that delays in execution time has a magnified negative impact on productivity. For example, an analyst may deemphasize analysis of historical patterns if the reports take an extended time to run. Also, focusing on smaller data groups such as decreasing the period under contention, rules out the discovery of long-term trends. An employee creating a requisition that has an easy, quick experience is less likely to seek alternative, maverick channels to obtain goods or services.

Improve End User Response Times

Quickly creating a release against an agreement or run a complex search through millions of contract records is something that all business users want, as faster response means greater productivity and more efficient task completion. Here we look at some of those processes in a standard procure-to-pay flow, which when executed on Engineered Systems provide the necessary performance to enable the procurement business users and their connected suppliers to focus on efficiency and meeting the organizational requirements. In internal benchmark tests, E-Business Suite applications runs 3X faster on Engineered Systems as compared to Commodity hardware.

Spreadsheet Import in Sourcing

A number of organizations use Oracle Sourcing to publish a Request for Quote (RFQ) and receive the best bids from suppliers. Many customers in the high technology space would have all the individual sub-components in a single RFQ, which can be as large as 5000 individual line items. The spreadsheet based line import process enables buyers to upload the lines via the interface table. However, for a large number of records (without concurrent processing) this process might take a substantial amount of time to execute successfully. For a Sourcing Buyer, the time taken to publish an RFQ document is a key metric and often a buyer works under stringent deadlines to publish the document. Often there are parallel activities that require focus from the buyer, such as vendor management for the RFQ, budgeting and approvals. The buyer may also be required to perform the import process more than once, as there can be changes in the demand, lotting strategies, and so on. From a supplier
perspective, supplier users often use the spreadsheets to upload their offers into the system. The spreadsheets not only contain the prices, but also other information about the bid. There might be hundreds of suppliers responding to an RFQ. Degradation in performance may lead to confusion and manual intervention, which in turn may jeopardize the RFQ timelines.

Supplier Order Search in iSupplier Portal
The search and display of orders issued to a supplier in the orders tab might take longer than expected to execute, especially when there is a large number of orders spread over a very long time period. Often supplier users are forced to restrict the search period for better performance - however, this is restrictive from an efficient decision making perspective. This often results in suppliers’ reaching out to the buyers and unnecessary delays in offline clarifications.

Creation of Releases against Blanket Agreements
The creation of releases against blanket agreements often requires the validation of the agreement amount. If a maximum agreement amount is specified and there are a large number of releases against it, then the creation of a new release requires the search and identification of all the earlier releases and verification whether the current release amount is less than the balance amount on the agreement. With the increasing focus on eliminating off-contract spend - the application enables the buyer to efficiently use agreements to service demand.

Optimization of Sourcing Award Decision
The Sourcing flow enables buyers to use a sophisticated online optimization tool to compare offers across different parameters. The buyer identifies the key attributes of the RFQ, assigns relative priority to them, and evaluates the offers based on these attributes. The optimization engine enables the buyer to quickly compare across offers and create multiple such scenarios. This improves the productivity by eliminating unnecessary offline analysis of the award; however, the efficiency is only realized when the buyers can quickly run numerous complex scenarios, compare across the different scenarios for RFQs with a large number of lines and many active offers.
Clause Analysis and Text Search in Contracts
The clause analysis features enables the user to search for the usage of a particular clause in different transaction documents, such as Purchase Orders, RFQs, Auctions, and so on - in all stages of their lifecycle. In addition, customers using the Secure Enterprise Search can search for the occurrence of individual clause text. This is very critical for monitoring clause usage, tracking compliance and identifying contracts at risk. The legal administrator can quickly ascertain the extent of usage of a certain clause and suggest preventive or corrective actions. For example, payment terms that require updates, changes to the company’s policies on green procurement, usage of hazardous materials, and so on. These involve extensive data processing and require the infrastructural support to provide the desired efficiency to the end users.

Contract Expert
A number of customers leverage the contract expert engine to associate the right clauses to a transaction document like Purchase Order or RFx (RFQ, RFI). Some customers in the Healthcare and Public Sector space have relied exclusively upon the usage of Contract Expert. Instead of adding the clauses via the template, they present a large set of questions to the buyers and add the clauses based on their responses. In such cases, the contract templates may contain hundreds of rules. The system must process the responses and retrieve the right set of clauses based on the pre-defined rules. The execution of this rules-based engine must happen fast enough to have minimal business impact. Further, in the course of creation of a transaction document, the buyer may invoke the engine many times, as some changes to the document may translate into changes in the response to some of the questions.

Live Monitoring of Sourcing Auctions
Monitoring of Auctions is a critical component of the Sourcing process and a buyer must keep a close watch on the bids coming in, both from a price and frequency perspective, with respect to the time remaining. The buyer can then take the necessary steps to ensure the best value from the auction. However, with a large number of suppliers bidding for an auction with a large number of lines and with bids being updated very frequently, the system must be very efficient in order to render the changes in real-time for informed decision-making.
Improve Batch Processing Time

Procurement involves a number of processes that involve transfer of large volumes of data with requisite validations. Organizational mergers or de-commissioning of legacy systems often require bulk loading of data into the current system. Often with a single global instance serving users across different geographies, the paradigm of scheduling batch processes at night no longer holds true. It is often critical that these transactions are completed within a stipulated period of time, as there can be other business events dependant on this information.

Import Price Catalogs

The import catalog process is used to upload large item catalogs into the system. The items are available in the internal stores, which enables the requesters across the company to browse and purchase items through the company’s online shopping application. The catalogs require regular updates, as they must reflect the changes in the price and item attributes. The process needs to be executed as soon as possible to avoid presentation of stale data to the requesters – which also would require a lot of rework during the downstream processing.

Mass Import of Requisition Data

Typical mass import of requisition data might contain a large number of records (in excess of 10,000 records). Often this is used in organizations where some or all of the employees are using a different application for creating the requisitions. The business users often have very stringent need-by-dates on these requisitions. The automatic creation of purchase orders against these requisitions is also performance intensive, as the right source selection, approvals, etc. have to be handled properly for all the records.

iProcurement Catalog Search

The Oracle iProcurement catalog search enabled via Oracle Endeca, provides a very user-friendly interface and advanced search capabilities. This is not restricted to the internal catalogs only but also extends to the supplier managed punchout content. This results in a significant volume of data that is extracted from the Oracle iProcurement (ICX) tables and loaded onto the Oracle Endeca tables. This bulk ETL process requires infrastructural support, especially when the ETL is scheduled to run very frequently to maintain near real-time data.
Import Purchase Orders Program
Customers use the existing purchase order import program (PDOI: Purchase Document Open Interface) to import contract data into the Oracle E-Business Suite instance. This is often used to import a large number of records ranging from 2000 – 5000 records and up to 40,000 records. This can be from a legacy system or offline transactions being uploaded into the procurement instance. This process is very critical as the records are needed for spend analysis, providing references during future transactions, audit requirements, and so on.

Supplier Mass Import Process
The supplier mass import process involves a large amount of records – often in excess of a million records. This is typically used during the initial provisioning process, when any legacy supplier system is de-commissioned or when the organization goes through a merger or acquisition process. In addition, customers would like the import process to maintain the quality of the data and handle duplicate records.

Data Security for Sensitive Procurement Information
Exadata machines provide the ability to fully encrypt all database data and run queries against fully encrypted databases with near zero overhead. The Procurement data – especially supplier contracts, active auction and RFP bid information is very sensitive. Unauthorized access to such critical data may amount to millions of dollar of loss for the company. Exadata systems provide this essential additional layer of data security.

Reduction of Storage Costs
The procurement systems must keep the history of older transactions from an audit, reference and legal perspective. In addition, older data is referenced in newer transactions – re-negotiating an earlier contract, copying RFx information or re-using legal terms. Over time, this results in substantial volumes of data – certain tables like PO lines may contain several million records. Often there are mandatory legal requirements to retain data for a stipulated number of years. Customers might resort to offline archiving, however, the need to access and refer to the data in current transactions, necessitates the data to reside in the system’s storage with fast search and retrieval. This often results in spiraling storage costs for the ever-growing data. Engineered Systems, with the advanced compression technology enables the customers to manage the data better and substantially reduce their storage costs.
Solution: Oracle’s Engineered Solution for EBS Procurement

Oracle E-Business Suite Advanced Procurement deployed to Oracle Engineered Systems enables organizations to effectively address the scenarios discussed here. The solution footprint includes the following:

- **Oracle Exadata Database Machine:** This includes database server nodes, Exadata Storage Server Cells, and a high bandwidth InfiniBand network.

- **Oracle Exalogic:** This has pre-built with compute nodes, memory, flash storage and centralized storage, all connected using InfiniBand and is typically used to deploy Oracle Applications, Oracle Fusion Middleware or third-party software products.

- **Oracle E-Business Suite Advanced Procurement:** This includes different procurement application modules such as Oracle Purchasing, Oracle Sourcing, Oracle Procurement Contracts, Oracle iProcurement, Oracle iSupplier Portal, Oracle Supplier Lifecycle Management, Oracle Services Procurement and Oracle Supplier Network

- **Oracle Procurement and Spend Analytics:** Provide pre-defined performance indicators that display pre-built reports, which provide comprehensive visibility into every aspect of the company’s procurement, including raw materials procurement, supplier performance, and spend.

Conclusion

Oracle EBS Advanced Procurement deployed on Oracle’s Engineered Systems provide faster response time, efficient batch processing and additional data security. These are very critical to the Procurement applications users’ community as they impact the efficiency and productivity directly. A fast responsive system improves compliance, reduces off-contract spend and manages risk by eliminating manual interventions and offline processing. Time saved in these transactional processes can be utilized for strategic initiatives.

References

- Oracle Exadata Database Machine Brochures and Data Sheets
- Oracle Tech Network Oracle Exadata Database Machine
- Oracle Exalogic Elastic Cloud Overview