Oracle E-Business Suite Warehouse Management System for Engineered Systems
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Executive Overview

This white paper describes the benefits of running Oracle Warehouse Management System (WMS) on engineered systems using Oracle Exalogic and Oracle Exadata. Oracle WMS adds advanced inventory management capabilities to the E-Business Suite and efficiently tackles the most difficult and intensive computational challenges of distribution systems. The following section describes the benefits achieved by running Oracle Warehouse Management System (WMS) with Oracle Exalogic and Oracle Exadata.

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-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 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 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 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.
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 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

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.
Oracle Supply Chain Management

Your supply chain operations and challenges are changing rapidly: globalization, sustainability initiatives, government regulations, and cost cutting measures exert constant pressure. These external challenges need to be balanced with internal growth such as warehouse openings/closings, new markets, an expanding list of suppliers and customers, and acquisition. The only thing certain is change, so you must be flexible and prepared to adapt quickly.

Oracle Value Chain Execution

Oracle Value Chain Execution (VCE) is an integrated suite that provides a single solution to your logistics needs. It provides warehousing and inventory management, tracking, transportation management, trade compliance and management, landed cost analysis and suite-wide analytics capabilities. Whether you have a domestic oriented business or a global operation spanning multiple countries, Oracle VCE has the capabilities to support your needs.

Oracle Warehouse Management

Oracle Warehouse Management enables companies to maximize their labor, space, and equipment investments by coordinating and optimizing resource usage and material flows. Oracle WMS provides a robust warehouse solutions platform to efficiently manage the flow of goods and the activities of warehouse resources across multiple business processes such as order fulfillment, manufacturing, field service, inbound logistics (receipt, inspection, and storage), counting, labeling, and replenishment.

WMS Delivers Value

Improving the speed at which inventory flows through your supply chain has a dramatic effect on your financial bottom line. Efficiency is achieved by reducing latency between the actual inventory transaction and reflecting that transaction within your system while simultaneously increasing inventory accuracy.

You can also increase efficiency by enforcing and following the best practices for your warehouse. One of the best ways to increase efficiency is to automate your supply chain tasks
such as the material allocation for picking and locator selection for putaway tasks (how replenishment is handled, and how tasks are dispatched to the workforce).

Although individual warehouses may differ due to a variety of factors—physical configurations, product line differences, shipping methods, and seasonal product lines—warehousing systems must adapt to these differences and perform dynamically without costly, time-consuming customizations. Global deployments may need additional requirements such as multi-lingual support, multiple currencies, and multiple units of measure classes (lbs and kg).

Increased Inventory Accuracy

Warehouse employees perform important warehouse tasks and functions that have a critical impact on customer service. These employee responsibilities range from pushing a cart or driving a lift truck to picking, packing, and shipping goods to your customers. Although employees must do their job well, it is essential that they can perform it efficiently. Oracle WMS delivers a mobile interface that can be configured to meet operational needs while maintaining the quality controls required for high customer service.

The picking process must be exact: locators, items, and lots must be verified quickly and accurately while barcodes and scanners must be reliable and equipped for rapid data entry. Wi-Fi data terminals provide real-time data verification so that each value entered is quickly validated by the WMS system. To maximize picking efficiency and increase productivity, users must spend as little time as possible with the user interface.

Improved Space Utilization

It makes a big difference where you store goods in the warehouse; for example, it’s probably not a good idea to store ice cream in cooler; or chocolate cookies on the top rack during the warm summer months; or fast moving items in the back of the warehouse far from the shipping dock.

While someone with warehouse experience typically knows that ice cream is always stored in the freezer, it may not be as obvious that chocolate ice cream is a high velocity item and tutti-frutti is not. Slotting products—so that those picked frequently are readily accessible and close to the shipping dock—saves time and money.

Sometimes selecting a storage location is straightforward, but as warehouse operations become more complex and exacting, the demands for warehouse optimization continue to
grow. It is no longer adequate to identify the correct storage zone or the closest empty bin. Many other factors must be considered: which partially filled bin makes the best use of available space? Will the product fit, considering its dimensions? Can multiple lots for an item be stored in the same bin? Are date codes relevant? If multiple items or lots are stored in the same bin, new material must not block or bury existing items. If an item is blocked or buried, additional time is required during picking.

These considerations must be analyzed for each and every putaway scheduled by the WMS. Carefully crafted putaway rules greatly enhance worker productivity by slotting items for efficient, accurate picking. These rules also increase the space utilized within the warehouse, which saves money in the long run. The analysis required to attain these benefits is considerable and the burden placed on hardware is significant. Therefore, it is very important to have adequate processing to enable WMS to run in a timely fashion.

Better Labor Productivity

Over the course of a day, pickers spend most of their time traveling from one task to the next. Travel time is a ‘necessary evil’ required to get product picked and shipped to customers. Fortunately, the WMS provides several features to minimize the allocated travel time and to raise productivity.

In addition to slotting high velocity items closer to the shipping dock, the WMS supports the use of optimal picks paths to minimize the distance traveled when order picking. The WMS automatically assigns tasks to operators to ensure the pick path is followed. This optimization is done in the WMS, freeing the picker to concentrate on the work at hand.

While automatic task assignment provides an optimal pick path, it also reduces the travel time between different types of equipment. It is frustrating when you try to complete a pick only to find that you do not have the necessary equipment. The WMS tracks the equipment in use and only assigns picks that can be completed by that type of equipment. Similarly, WMS tracks the skills of users and assigns picks only for qualified users.

To fully recognize the benefits of slotting, the WMS must calculate task assignments by balancing many variables such as order priority, order ID, current location, pick path, equipment type, user skills, and so on. Optimizing labor force effectiveness depends on the WMS being able to fully exploit this feature in a timely fashion.
Optimized Order Fulfillment

Customer service is the primary goal of every distribution organization. It is an ongoing challenge to get the right product to the right customer in the right quantity at the right time. Wave management delivers the tools necessary to initiate, monitor, and optimize the outbound flow of material.

Flexibility Driven Productivity

A wave consists of build criteria used for gathering conforming sales order lines together to form a wave. You can create a wave based on simple criteria such as all lines for a given carrier or define more complex criteria. For example, suppose you need to limit wave size to the available capacity (weight and cube) of an ocean-going container. The WMS can calculate and aggregate the weight and volume for each pick created until the container is filled. Wave building provides great flexibility to the user and tremendous cost savings for transportation.

Reduced Cycle Times

While the WMS is an execution system, planning plays an important role in determining which orders to process next. Multiple wave planning scenarios can be evaluated simultaneously because orders are not committed until the wave is released. The wave planning process provides insight into important warehouse resources such as inventory and labor; however, it is inefficient to release orders that cannot be filled, or if no one is available to pick them.

Wave planning provides expected fill rates and labor usage prior to pick release. On-hand inventory balances serve as the basis for a fill rate analysis of all order lines in the wave. Orders with one or more lines that cannot be filled can be automatically dropped from the wave or backordered. Wave planning also provides labor estimates for each pick area. A shipping supervisor can better orchestrate the pick release process and maximize workforce efficiency by comparing the labor estimates for new waves with labor estimates for picks already released. This planning leads to better decision making and lower costs.

Customer Compliance

Wave release generates the pick and replenishment tasks for preparing customer orders for shipment. User-defined allocation rules determine what inventory is allocated to each sales order line. These rules vary in complexity, but they can place heavy processing demands on system hardware resources. Engineered systems enable the warehouse to run customer-specific inventory allocation rules without impacting any other processes.
Consider an example in which lot-controlled goods are shipped to several customers on the same route:

- The first customer requests that all goods shipped have at least 15 days of shelf life remaining.
- The second customer requests that no more than one lot be shipped for any given order line.
- The third customer requests that all goods shipped have at least 30 days of shelf life remaining and that only one lot is shipped per line item.

All qualifying item / lot combinations must be evaluated and sorted to find the inventory that best fits the rule criteria for each line of every order. This ability to automatically ensure that customers’ needs are addressed is a significant competitive advantage, but it is also a demanding and potentially time-consuming process.

Improved Customer Service

The final step in the shipping process is very important because it is the final chance to confirm or modify your customer’s order requirements and make a positive impact before the order leaves your organization’s facility.

The ship confirmation process can be rather involved and demanding depending on your configuration. At a minimum, all sales order lines are processed for invoicing and the associated inventory is removed from the warehouse. You can also generate customer-specific shipping paperwork, and customer-specific and carrier-specific labels.

How the order is packed, the preparation of the paperwork, and even the placement of the labels reflect upon your business, your professionalism, and your relationship and attitude to the customer. This process is important to the customer, and essential to your business practices and reputation. Ship confirmation initiates the invoicing process and ensures continued cash flow.

Unfortunately, the ship confirmation process is typically run at the end of the day which is often the busiest and most hectic part of the day. Orders are packed and labeled, trips are loaded, drivers are waiting; the success of an entire day’s work comes down to this final step. You must run this process reliably and efficiently to ensure shipments depart on time.
Benefits of Running WMS on Engineered Systems

Improved Business Efficiency

The WMS system delivers advanced inventory management features using with an execution system that provides faster response time. The engineered system provides powerful performance to deliver the benefits of the WMS that maximizes productivity for mobile users on the floor picking orders or supervisors planning the next wave.

Improved End-User Response Time Performance

Most WMS users work on the warehouse floor using mobile data terminals to complete their tasks. A busy facility may complete thousands of tasks per hour requiring thousands of data entries and validations. These processes are fundamental to a well-run operation and are carefully tailored to enhance speed and accuracy. Barcodes and scanners enable almost instantaneous data entry--WMS orchestrates this activity through the mobile user interface by guiding users from one task to the next.

Industry standards typically recommend sub-second response time for mobile warehouse applications. Engineered systems provide the power necessary to minimize the time required for data validation. Slower response times reduce productivity: for example, if response time doubles to just a second or two, the lost time quickly adds up. If pickers spend 10 percent of their time on data entry, picking efficiency is decreased, worker productivity would drop by five percent, and costs would increase accordingly.

Improved Batch Processing Performance

Although WMS is fundamentally an execution system, some features requiring a considerable amount of batch processing. Three of these features are central to any warehouse or distribution center: wave planning and pick release; ship confirmation; and intercompany invoicing.

Wave planning and pick release drive the outbound flow of material. Wave planning provides fill rate analysis so that short orders can be identified and addressed before picking. Labor estimates provide visibility to potential bottlenecks, allowing for better work flow throughout the day. These planning simulations help determine the most efficient picking strategies for a particular mix of orders. Engineered systems ensure that these simulations are completed in a timely manner and minimize impact on other operations.
The Benefits of Running E-Business Suite WMS on Oracle’s Engineered Systems

The pick release process allocates items to the sales orders and creates pick tasks for the operators on the warehouse floor. In a busy facility, this is a demanding process under the best of conditions. As customers continue to place smaller orders more frequently, the demands on the system increase. Customer-specific allocation rules greatly improve customer service, but they also increase demands on the system. For complex and demanding processes like wave planning and pick release, the benefits of engineered systems are significant. The following chart shows how release order processing more than doubles¹.

Order Management Forms Response

Order shipment processing is a complex and demanding process that represents the last step in getting the order to the customer. This step triggers shipping paperwork and labels and initiates the invoicing process. To complicate matters, order shipment processing often happens during a short time at the end of a long day. There is no time for delays. As the preceding graphic shows, engineered systems provide significant benefits to the order shipment process, improving performance by almost 50 percent.

Intercompany invoicing is crucial for those companies that have intercompany transactions. As the graphic shows, engineered systems provide the most benefit to the creating invoice process, improving performance by over 100 percent. Intercompany invoicing should achieve the same benefits.

Enhanced Scalability

As successful businesses add new customers and process increased order volumes, they may need to expand by moving into new geographies and opening additional facilities. As an enterprise grows, so too must its business applications. Engineered systems offer the scalability necessary to support that growth. The following graph shows the advantage of engineered systems over commodity hardware and database systems\(^2\).

Exadata and Exalogic Tier Users per Core for Order Management

In the following graphics, the Order Management (Forms) transactions are shown as a proxy for WMS scalability. Increases in order management volume typically result in comparable increases for the WMS.

The following graphs demonstrate the scalability of Exalogic and Exadata engineered systems for various workload levels. Enterprise management depends upon responsive predictable performance over a range of workloads. In tests with 700, 1,400 and 2,100 concurrent users, Exalogic and Exadata metrics scaled smoothly. Response-time increased imperceptibly while the CPU and memory usage rose predictably.

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The Benefits of Running E-Business Suite WMS on Oracle’s Engineered Systems

Reducing the Total Cost of Ownership

Customers operating in high volume order environments with resulting high SKU proliferation will accumulate millions of data records in fairly short periods of time. The material movement records generated by the WMS to handle high order counts are considerable. Engineered systems are specifically designed to deal with these storage challenges. For instance, Exadata Hybrid Columnar Compression will reduce the size of WMS tables providing significant cost savings over time. Additional business benefits include less frequent archiving and longer access to historical data.

The WMS benefits from faster and easier deployment on engineered systems. Some businesses prefer hosting the WMS at the facility that it manages to ensure that operations will continue even if communications to the data center are lost. In a distributed deployment mode, the WMS can be run as a “stand-alone” application in a separate database instance. Engineered systems foster this approach based on their fast, easy deployment. Garmin benefitted from Exadata's pre-configured engineered systems and support model--its Exadata Database Machines were installed and ready to load and test within seven days of arriving on site.

Conclusion

Your warehouse operations are greatly enhanced by leveraging the operational efficiency and cost benefits provided by Oracle. Many of the advanced inventory management features are

complex and place significant demands on the hardware platform. Hardware should not be the limiting factor when you want to maximize the power provided by Oracle WMS. Engineered systems from Oracle provide the power, convenience, and economy to make your value chain a world class operation.

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