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An Oracle White Paper
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JD Edwards EnterpriseOne Material Requirements Planning on Oracle Engineered Systems: The Value of a Faster Process

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Executive Overview

Material Requirements Planning (MRP) is at the heart of any manufacturing and distribution operation. The MRP process provides a snapshot of a company's product demand requirements versus its supply plan over a period of time. In today's dynamic business environment changes occur frequently. While a planner, buyer, or manager may be able to handle a single production or fulfillment emergency with direct action, exactly how that action ripples through the production plan often gets ignored because the time it takes to perform another MRP run. All too often, by the time the next planning snapshot is available, the ripple effect has become very costly and the ability to recover is very difficult. With the performance gains of Oracle Engineered Systems, this same enterprise can now run MRP with greater frequency, minimizing disruption to daily tasks and greatly reducing the costly ramifications of an unbalanced material requirements plan.

JD Edwards EnterpriseOne running on Oracle Engineered Systems is the culmination of Oracle's "Engineered to Work Together" strategy. Customers realize immediate business and technical benefit and set the foundation for the next generation of in-memory business applications. Outstanding performance and manageability offer immediate benefits for existing applications and business processes such as MRP.

For more information on JD Edwards EnterpriseOne and Oracle Engineered Systems, please see the *Benefits of Running JD Edwards EnterpriseOne on Oracle Engineered Systems* white paper.

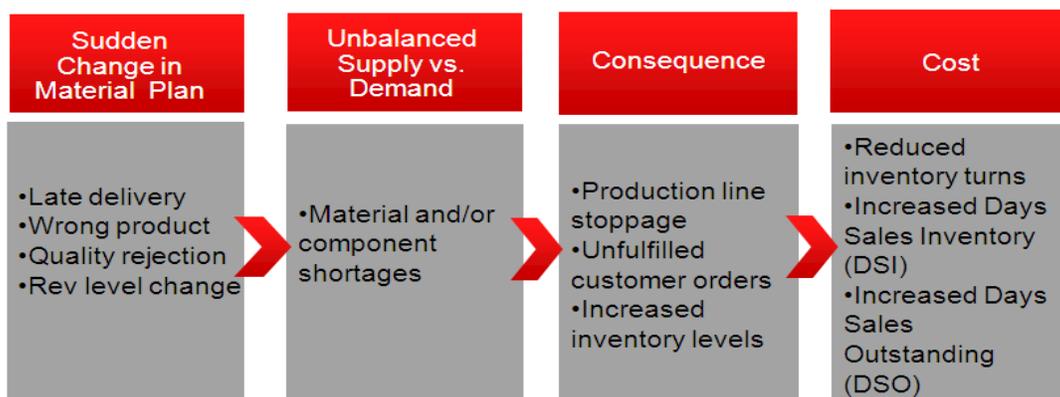
Introduction

Executives and business managers need to know the state of the business at anytime of the day or night. In today's economy, organizations are looking for a competitive advantage. Companies are finding ways to do more with less in the same timeframes to improve their bottom line. Efficiency in all aspects of the organization is extremely important. This spans everything from staffing and facilities to manufacturing and logistics. Global businesses must be able to operate across all time zones. The CFO in London should not have to wait for the ERP system in China to finish processing before viewing current information. Access to the most current and accurate information is vital for business managers to make timely and well informed decisions. Business processes along with IT and ERP systems must be optimized to support your organization's goals rather than causing a bottleneck.

Material Requirements Planning (MRP) is one of the many business processes that organizations must perform in a timely manner. It is at the heart of any manufacturing and distribution operation. The MRP process provides a snapshot of the company's product demand requirements versus its supply plan over a period of time. In today's dynamic business environment changes occur frequently, requiring managers, planners, and buyers to make informed decisions in a timely manner. More frequent material plan updates provide better visibility for these decisions resulting in a better balance of inventory, production, and order fulfillment.

The Ripple Effect

Untimely response to changes in Materials Plan



An enterprise operating in a changing environment may have never considered a fresh review of the materials plan due to the length of time that it takes to run, and disruption it causes to daily tasks weighed against the benefits. Software and hardware that is engineered to work together goes a long way to solve this issue. With the performance gains of Oracle Engineered Systems, this same enterprise can now run the process with greater frequency, minimizing disruption to daily tasks and greatly reducing the costly ramifications of an unbalanced material requirements plan.

This white paper will explore the MRP process, why nightly runs may not be optimal, how to make the process faster, and the benefits of running MRP with greater frequency.

Introduction to Engineered Systems

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

Oracle Exalogic

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 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.

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 read 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.

SPARC SuperCluster

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. With multiple layers of enterprise application infrastructure consolidated onto a high-performance, highly available SPARC SuperCluster system, deployment speed, application performance, and availability can all be optimized. 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 environments with minimum disruption, without fear of performance degradation, and the ability to achieve required service levels.

JD Edwards EnterpriseOne Material Requirements Planning (MRP)

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

MRP is time intensive because of how it processes based on general industry practices. The key to JD Edwards EnterpriseOne MRP is the *Low Level Code*: A number that identifies the lowest level in any bill of material (BOM) at which a particular component may appear.

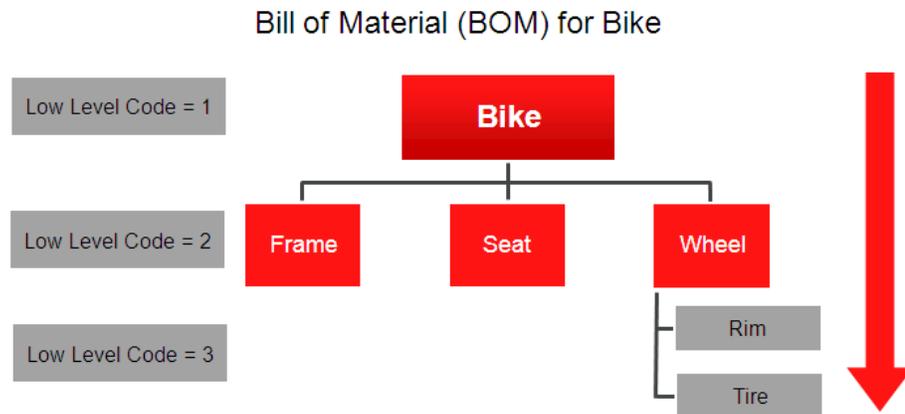


Figure 1. JD Edwards EnterpriseOne MRP Process

Planning is performed from the finished goods “level” down through all of its “lower level” components using the low level code assigned in the bill of material, along with other data in the sort sequence.

MRP plans one item record at a time based on report data selection.

Items are processed starting with Low Level Code = 1.

“BIKE” will be planned first.

All items at the current level are processed before any items at the level (Current Level + 1) are processed.

Low Level Code 2 items (Frame, Seat, and Wheel) will be planned before planning Low Level Code 3 items (Rim and Tire).

This process is repeated until all items have been processed.

There are three outputs:

Action Messages: Messages suggest what needs to be done to balance supply versus demand.

Pegging: Records that track where the demand came from for components.

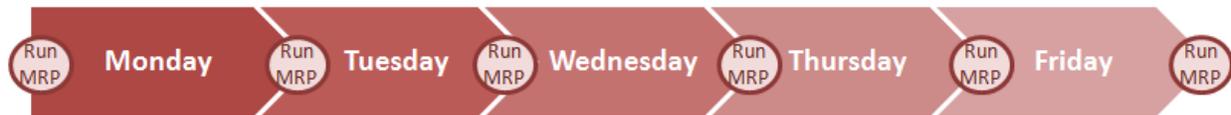
Time Series: Records which give a time phased view of the planning.

Factor in the amount of data to be processed, for example; thousands of sales orders, forecast records that often run into the millions, purchase orders, and the depth of the bills of material, and you should come away with a better understanding of why MRP might take so much time to process.

Faster MRP

A traditional requirements planning process entails having the batch MRP processes run periodically (mainly overnight), and reaction to the output occurs during the planners and buyers normal workday. This is usually done due to the amount of time it takes to process the large amounts of data. In a perfect world, this works fine. Now enter into the picture an unexpected material delay, production mix change, or expedited fulfillment request and its effect on the plan. Often the best case would be to run the MRP generation again and see the effects. Or, even better, run MRP with several different changes to see “what if?”. Unfortunately, due to the complex nature of the MRP run and the amount of data most companies have this is not possible. This type of processing cycle is a costly bottleneck to rapid adjustments of the materials plan.

Traditional MRP relies on nightly runs.



During the day many changes can happen to both Supply and Demand which will not be planned until the next nightly MRP run.

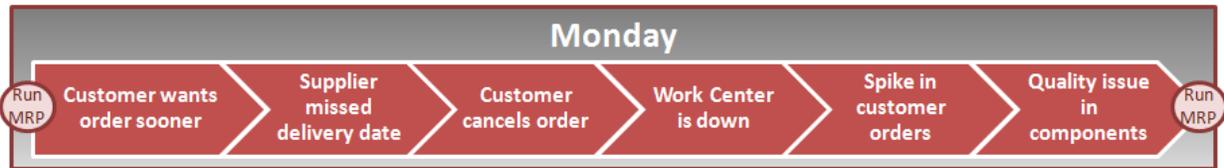


Figure 2. Requirements Planning Process with Traditional Infrastructure

Speed is the key. Consider the time intensive standard MRP process (by low level code) described on page 6. What if your systems were capable of processing the large amounts of data and MRP calculations quickly? In an organization where traditionally the risks of additional requirements planning generations outweigh the benefits due to processing time, critical decisions are delayed. What if frequent changes and unexpected delays could be acted on within minutes or hours rather than days and weeks? The result would be optimum inventory balance and less cost wasted on unused materials. In addition, planning could occur using “what if?” scenarios when making changes to the production plan resulting in increased customer service levels.

Being able to run MRP after major changes in Supply and Demand provides the ability to plan iteratively throughout the day.

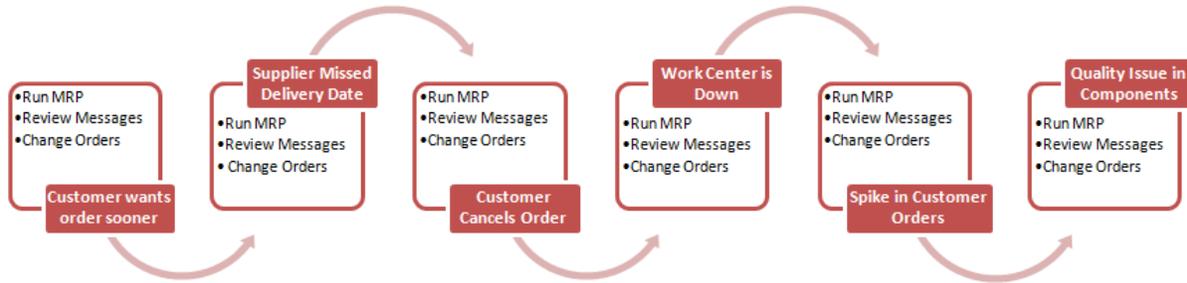


Figure 3. Iterative Requirements Planning Process with Oracle Engineered Systems

As you can see in the above diagrams, Oracle Engineered Systems utilizing Exadata and Exalogic will improve the performance of your system dramatically. Performance testing results show significant increase in speed for JD Edwards EnterpriseOne running on Oracle Engineered Systems. For example: In an environment under full ERP load with volume intensive processes in areas such as Financials, Human Capital Management and Supply Chain Management processing simultaneously, a Multi-plant MRP run of more than 50,000 sales orders completed in under 15 minutes. Perhaps most impressive is the fact that there was no response time degradation for interactive users. Batch processes can run as needed throughout the day without any performance impact on interactive or other batch processes. The bottleneck of nightly batch runs and daily reaction has been removed allowing your staff to iterate through the MRP process quickly for a faster planning cycle resulting in better financial results.

Why Does JD Edwards EnterpriseOne MRP Run Faster on Oracle Engineered Systems?

Skeptics will remind us that benchmark testing described above is conducted in a laboratory “perfect world” environment and that such performance metrics might seem too good to be true. An objective look at some of the innovations engineered into Oracle Exadata and Oracle Exalogic will provide some insight into how and why JD Edwards EnterpriseOne runs so well on these systems enabling MRP to be completed much quicker.

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

- Exadata Smart Flash Cache transparently caches “hot” reads, and writes data to fast solid-state storage, improving query response times and throughput. In fact, Exadata configurations can often be delivered with enough Flash Cache to contain an entire JD Edwards EnterpriseOne database. MRP focuses on key tables with large volumes of data such as the Bill of Material (F3002) Forecast (F3460) and Purchase Order Detail (F4311) tables. With these tables being in Exadata Smart Flash Cache, the executed MRP batch process reads and writes data to solid-state storage which greatly reduces processing times without impacting end users.
- Exadata Smart Scan improves query performance by offloading intensive query processing and data mining scoring to scalable intelligent storage servers. An iterative MRP process might be done for specific data sets. Exadata Smart Scan is leveraged by MRP when users execute MRP for a subset of the data such as for a specific planning family, planning code, or business unit.

- Exabus I/O and InfiniBand networking provide fast, high-bandwidth networking among Exadata database servers and storage cells and between Exadata and Exalogic. MRP is comprised of I/O and logic intensive processes to generate output to the Message (F3411), Pegging (F3412) and Time Series (F3413) Tables. Exabus I/O and InfiniBand networking allows batch process on the Enterprise Server to retrieve large data sets from the database, process the data and then perform updates back to the database at extreme speeds.
- Advanced Compression reduces the footprint of data on disk. Independent partner testing has shown compression rates of up to 75% for JD Edwards EnterpriseOne data. Exadata systems are designed for high-volume data—hundreds of terabytes of usable disk—plus available expansion units and multi-rack systems. Advanced Compression allows historical data such as Item/Location/Lot records to be maintained without a negative performance impact on daily processes.

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

- Oracle WebLogic Server and the Java virtual machine are optimized for fast processing of Java workloads, such as the JD Edwards EnterpriseOne HTML server and metadata kernel. The Enterprise Server batch processes interact with the metadata kernel (Java process). With the Java optimization, hundreds of batch processes can execute concurrently to complete key business processes without queuing for the metadata kernel.
- The same Exabus I/O and InfiniBand networking provide fast, high-bandwidth networking among JD Edwards EnterpriseOne server components within Exalogic, such as the HTML server and Enterprise server, and between Exalogic and Exadata. Similar to batch processing on the Enterprise server, interactive users on the HTML server retrieve and review large data sets in typical daily processes. Exabus I/O and InfiniBand networking optimizes the transport of the data sets from the database to the HTML server.
- Single Root I/O Virtualization (SR-IOV) streamlines the I/O of the virtual machines running on the hypervisor, resulting in negligible impact due to virtualization. This allows virtual instances of the Enterprise server to be added to the JD Edwards EnterpriseOne environment during complex processes to handle the additional workload without impacting the performance of interactive users of other key manufacturing and supply chain business processes.

Benefits of a Faster MRP Process

The benefits of a faster Material Requirements Planning process are many:

- Faster, more frequent MRP generations.
- Quicker runs, means more accurate planning information. Rapid adjustments to changes and material delays. Optimum inventory balance, less cost wasted on expediting materials and unused inventory.
 - Less production down time
 - Increased customer order fulfillment rates
 - Increased Inventory Turns
 - Decreased DSI
 - Decreased DSO
- Less disruption to daily tasks.
- More accurate order promising and better customer service levels.

Conclusion

Material requirement planning processing by general standards is complex in nature. Add large amounts of data in the form of supply detail records, demand detail records, and bills of material that extend many levels deep, and the expectation is that the practice of freezing the materials plan for review and action will be a lengthy one. Businesses build their internal processes around this lengthy expectation. In many ways they accept a compromise that will provide less than the optimal number of MRP runs in return for the daily tasks of review and adjustment of the material planning output. Factor in delays in materials, expediting fulfillment, and production mix changes with the ripple effect this has on the materials plan, and companies are exposed to great risk and added cost due to inventory imbalance and decreased customer service levels.

Oracle Engineered Systems offers unequalled performance gains and time reduction for complex processes like MRP that are at the heart of manufacturing and distribution operations. Companies can re-think their internal expectations and do away with the compromise and associated risks. Quicker runs, more accurate information, and better decision making is the outcome. This results in; timely response to change, better customer service, and less money tied up in unused inventory and material shortages.



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