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Oracle Value Chain Planning on Oracle Engineered Systems

Optimized Performance and Business Value

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Executive Overview

Planning value chains has always been challenging and as these value chains have become more global and more complex, the degree of difficulty in managing them has also increased. Trends in business and economic conditions as well as emerging technology have added to the complexity. Planners are under increased pressure to plan these more complex value chains faster and more frequently, to a greater level of detail, and to make better decisions and share them with more decision makers in the company. Oracle Value Chain Planning is the leading solution of planning applications for the value chain, with brand name customers successfully running their complex value chains and achieving significant benefits. Oracle Value Chain Planning enables companies to sense demand quickly; shape it for revenue growth; improve value chain agility at strategic, tactical, and operational levels; supports a company-wide sales and operations planning process that incorporates risk mitigation and postponement strategies; enables profitable service operations and optimized planning for maintenance; and offers complete enterprise visibility and continuous monitoring of key value chain performance indicators.

As value chain networks grow in complexity, planners deal with increased data volumes, increased need for near-real time responsiveness to sudden problems in the supply chain, and simulate changing business models that continuously adapt to the competitive and customer landscape before they actually happen. Planning solutions must meet the highest standards of mission critical enterprise systems in terms of availability, performance, scalability, and security.

This whitepaper describes how Oracle Value Chain Planning in combination with Oracle Exadata Database Machine and Oracle Exalogic Elastic Cloud, will provide the optimal solution for today's planning challenges.

Oracle Value Chain Planning Introduction

Oracle Value Chain Planning enables companies to minimize costs, improve on-time delivery, reduce stock-outs, increase forecast accuracy, increase profit, and mitigate supply chain risk via flexible and comprehensive planning business processes. Designed to support the needs of manufacturers, distributors, and retailers, Oracle Value Chain Planning's unique single-platform design creates an information bridge across functional silos, geographic regions, and business units that enables companies to deploy an enterprise-wide planning solution. Combining ease of use with sophisticated and broad planning capabilities, Oracle Value Chain Planning supports customers with basic planning needs as well as those with highly complex planning requirements.
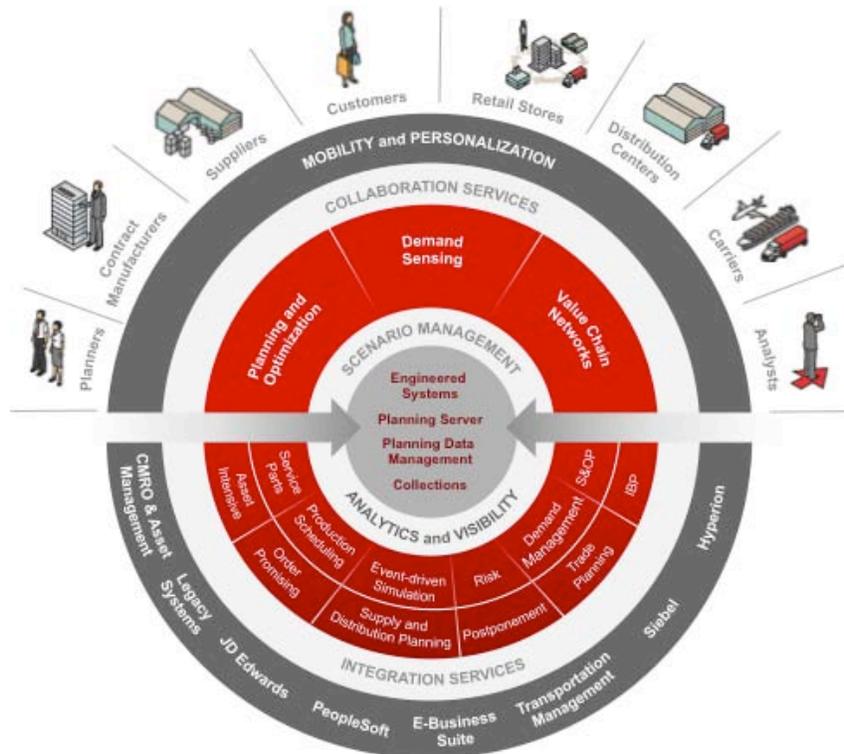

Figure 1 Oracle Value Chain Planning Solution

Global Control, Local Execution, Central Management

Oracle Value Chain Planning enables companies to manage their value chain networks on a global basis in terms of supply chain flows (outbound finished goods, inbound supplies, inter-facility and company shipments, service parts, reverse logistics, and so on), supporting mixed modes of manufacturing (discrete, configure-to-order, project, process, lean), and operating across geographic areas (regional and global). Oracle Value Chain Planning can simultaneously operate against variety of ERP back-ends systems, both Oracle and non-Oracle, and is the single source of truth for all planning decisions. As a result, companies can support the nuances of their global operations while reaping the efficiencies provided by a single planning solution.

Foundation for Value Chain Planning Best Practices

Oracle Value Chain Planning provides support for the following planning business functions:

- **Demand Sensing:** Integration with point-of-sale systems, syndicated data systems, retailer and distributor systems, and other systems for the purpose of sensing demand. Value Chain Planning can analyze demand data at various levels to understand the detailed behavior of demand. Such detailed understanding of origin and relative contribution of various demands improves the ability to predict the detailed behavior of the demand and enables demand-shaping activities – programs and events designed to stimulate sales and grow market share for individual products or groups of products.

- **Forecasting and Consensus Demand Management:** Better real time demand insight is only useful if you can translate it into a more accurate forecast. Oracle Value Chain Planning improves forecast accuracy by using industry-standard and best-in-class proprietary forecasting models. Causal correlations can be leveraged to model influencing factors and capture behavior in your demand data. It is key that all constituents in the demand management process agree on the demand number and have visibility to the associated accuracy metrics. Oracle Value Chain Planning provides a robust workflow driven collaboration paradigm across all constituents in the demand management process. Each participant receives the information tailored to their needs to enable them to make key decisions quickly. The system keeps an audit trail of all changes, planner notes that capture key decisions and assumptions, and generates exceptions where required by the process.

- **Promotion Planning and Optimization:** Promotion planning and optimization helps companies understand the financial and operational impacts of promotions and marketing instruments. Oracle Value Chain Planning helps companies to interactively plan promotions and perform what-if analysis to understand the impact of varying promotional tactics; perform detailed analysis of their impacts and profitability; optimize the right promotion tactics for each product or product category along with detailed analysis of the promotion budget allocations; model the effect of price changes on demand and profits; simulate volume and profitability of future promotions and optimize promotional events.

- **Integrated Business Planning:** Sales and Operations Planning is often the first step to facilitate an enterprise-wide process that helps align the business objectives of Sales, Marketing, and Operations. Oracle Value Chain Planning supports a comprehensive S&OP process that enables monitoring of key S&OP metrics for demand, supply, product, and service. It drives demand-shaping decisions, enforces allocation and postponement strategies, and, when used effectively, provides scenarios to assess the risk in the supply chain and how to mitigate it. Best in class companies evolve from S&OP to Integrated Business Planning by seamlessly connecting Finance and Operations – Oracle Value Chain Planning support companies in the evolution through its comprehensive analytical capabilities.

- **Network Design:** Companies that deal with frequently changing supply networks, often as a result of mergers and acquisitions or as a result of global expansion, require network optimization tools to help them design the most agile value chain network.

- **Risk Management and Postponement:** When designing and optimizing value chain networks it is key to look at the risk and variability in that network. Oracle Value Chain Planning provides

comprehensive what-if scenario planning for planned and unplanned supply chain events, helping companies to assess how much "insurance" they need to buy to protect them from disruptions in their network. For example, the cost of having a contract for a secondary supplier of a critical component can be weighted against the loss of revenue when using a single source introduces potential risk. Postponement analyzes how demand, supply, manufacturing and lead time uncertainty impact service levels across the entire echelon and helps determine the most profitable channels, products, and customers while managing key commitments. The use of scenario planning and optimization helps companies determine the most optimal buffer stock needed to hedge against increased supply chain variability. Combined, risk management and postponement drive key strategic and tactical decisions in the value chain network and Oracle Value Chain Planning provides a unique value proposition for this.

- **Tactical Supply and Distribution Planning:** Oracle Value Chain Planning offers a comprehensive set of tools to plan the manufacturing, procurement, and movement of supplies across the value chain. To provide the best possible recommendations to planners, based on the input data from the ERP source systems, it uses constraint modeling and scenario simulation. For most companies this is the core process that ties forecasting and execution together, and it is the process where most critical disruptions can have an immediate impact on top and bottom line performance. Companies can decide to operate a holistic global plan, or break the problem up into multiple independent or dependent plans - for example, component manufacturing plans feeding end assembly and distribution plans. Either way, the amounts of data processed and number of decisions made are always large and planners continuously strive to provide answers in the shortest amount of time possible.

- **Event-driven Simulation:** No matter how well the above planning processes are executed, companies will always face sudden intra-day or intra planning cycle disruptions that need immediate resolution. In addition, with more pressures on financial quarterly performance, there's a need to evaluate options on how to improve business performance in the short term. This simulation requires similar complex constraints and large data sets, yet needs to complete in minutes to provide responsive actions that most positively impact the business. Oracle Value Chain Planning offers a complete set of best-in-class tools for this problem.

- **Trading Partner Collaboration:** Oracle Value Chain Planning also provides tools to facilitate collaboration with various trading partners (suppliers, contract manufacturers, customers). Collaboration with key trading partners translates into reduced planning cycle time as well as shared accountability, typically reducing cost in the value chain.

- **Business Performance Analysis:** Deploying the various planning tools is only as effective as they help key decision makers improve their supply chain metrics. Oracle Value Chain Planning offers a 360 degree view of key metrics that directly operate on the output of the planning tools and provides the unique combination of rear-mirror view and forward prediction while examining different business scenarios to deal with supply chain problems and seamless interaction with the underlying planning tools in near real-time.

- **Execute to Plan – Promise and Schedule:** After the tactical planning cycle has released its recommendations to the execution system, the operational phase of planning starts. Customer orders are booked and sophisticated order promising capabilities help quickly provide answers on availability; manufacturing orders are executed and comprehensive scheduling capabilities help resolve problems with bottleneck shop floor resources or unexpected material shortages.

- **Service Parts and Asset Intensive Planning:** Many companies that operate reverse supply chains face challenges in determining the most optimal replenishment and redistribution plan against set budgets for spare parts. When managing complex multi-level repair or maintenance operations, additional challenges rise in reducing downtime for critical production and maintenance equipment. Oracle Value Chain Planning offers a comprehensive solution for service parts and asset intensive planning, enabling customers to transform their service operations from cost to profit centers more effectively.

- **Store level Forecasting and Replenishment:** Oracle Value Chain Planning's newest offering, exclusively for Oracle's Engineered Systems, supports high volume retail operations that require daily or intra-day replenishments for large networks of retail stores. The granularity and volume of the consumption data that drives the store level forecasting and replenishment decisions, and the business need to run this process often multiple times per day in a short amount of time, offers unique challenges in terms of speed and scale. Optimizing Oracle Value Chain Planning for Oracle Engineered Systems solves these challenges.

Additional reference materials:

Oracle Value Chain Planning

Introduction to Oracle 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 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. They are then configured as a complete system and are 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 the performance of Oracle Applications, Fusion Middleware and third party applications without requiring code changes and reduces costs across the application lifecycle, from initial set-up to on-going maintenance, as compared to conventional hardware platforms. Oracle has made unique optimizations and enhancements in Exalogic firmware, Exalogic software, and in Oracle Fusion Middleware and Oracle 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. There are templates available to simplify install, deployment and configuration of Applications on Exalogic.

Oracle WebLogic Optimizations on Exalogic

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

Oracle jRockit Optimizations on Exalogic

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

Oracle 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 database tier on Exadata, Exabus delivers faster I/O, reduces CPU usage on both the mid-tier and DB-tier and provides higher connection pooling efficiency.

Oracle VM for Exalogic

Exalogic Oracle VM can be used to 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. Oracle Value Chain Planning and Oracle Value Chain Planning Demantra are available as Oracle VMs today.

Oracle Exadata Database Machine

Oracle 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. Oracle Exadata is a pre-configured, pre-tuned, and pre-tested integrated system of servers, networking and storage all optimized around the Oracle Database. Because Oracle Exadata is an integrated system, it offers superior price-performance, availability and supportability. Oracle Exadata frees users from the need to build, test and maintain systems and allows them to focus on higher value business problems.

Oracle 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 to best 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 Oracle Exadata Database Machine. In addition to a high performance architecture and design, Oracle Exadata offers the industry's best data compression to provide a dramatic reduction in storage needs.
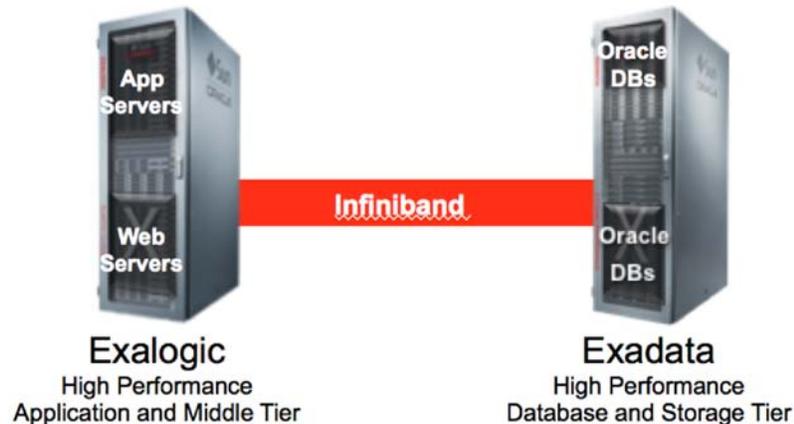

**Figure 2 Engineered Systems: Exalogic, Exadata; Applications, and Database.
The fastest, easiest path to unbeatable application performance**

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.
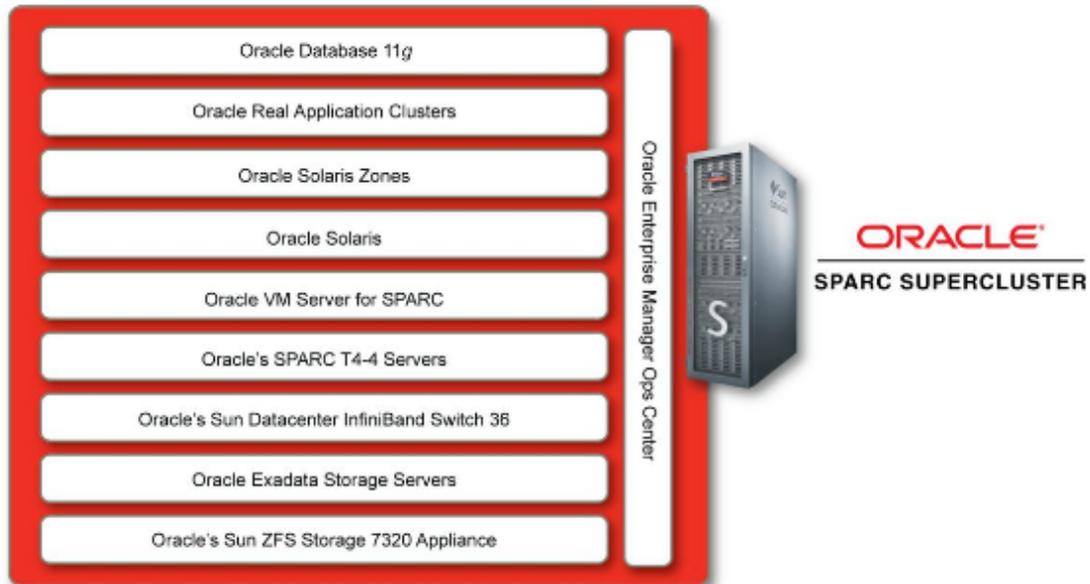

Figure 3 Oracle Sparc SuperCluster Architecture

Additional reference materials:

Oracle Exadata Database Machine Brochures and Data Sheets

Oracle Tech Network Oracle Exadata Database Machine

Oracle Exalogic Elastic Cloud Overview

Engineered Systems for Value Chain Planning Solutions

Oracle Exadata Database Machine, Oracle Exalogic and Oracle's SPARC SuperCluster provide the optimal platforms for Oracle Value Chain Planning. Let's look at some of the business benefits.

Benefit #1: Reduced Planning Cycle Time and Data Latency

The planning process consists of 3 time critical stages that make up the end-to-end planning cycle time:

1. **Collections** (from source) – Value Chain Planning can operate against one or more source systems. The source systems provide the actual state of the value chain represented by supplies (purchase orders, inventory movements, manufacturing orders, flow manufacturing schedules, and so on), demands (forecasts, sales orders, demand schedules, usages, and so on), and constraints (item parameters, supply network definition, bills of materials, routings, engineering changes, configure-to-order models, and so on). Collecting data from source system to Planning needs to happen with read-consistency, the least amount of required data, and the fastest way possible.

2. **Plan run and analysis** – Planners define and run one or more plans, related to the type of problem they need to solve (demand plan/forecast, promotion plan, supply plan, distribution plan, production schedule, sales and operations plan, and so on). The planners define the planning constraints and rules on the planning system and together with the collected source data they form the input of the planning run. The planning run loads this data in parallel from the database for fast in-memory processing and when done flushes the data back to the database to make it available for plan analysis. The parallel loads, as supported in our new Oracle In-Memory Performance Driven Planning application are exclusively engineered to support the Exadata RAC architecture, resulting in a higher degree of overall throughput. In addition, planning engines take advantage of the local file system for storage of plan input data in the form of flat files and binary files for increased performance and saving database round-trips. Oracle Engineered Systems provide a superior Zfs file system that mitigates key I/O bottlenecks in this process and results in faster overall cycle times. Plan run time is influenced by the size and complexity of the input data, the duration of the planning horizon, and the granularity of the plan that needs to be calculated. The plan run time can vary from minutes to hours. Plan analysis provides the planners with comprehensive tools to analyze the vast output of plan runs. Planners typically start at aggregate level and compare to a previous state of the plan, they examine fluctuations in key metrics and exceptions, and then drill down to specifics. When they detect conditions that need fixing, beyond what the plan already was able to fix, they simulate possible alternatives (planning scenarios) to arrive at the best possible solution. It is extremely important that plan run and simulation times are short, as it provides the planners more time to look for improvement opportunities. Oracle Value Chain Planning helps each planner by automating a lot of the decisions and by providing the tools to analyze large amounts of data in the most effective way through very dense pivot table worksheets and graphical analysis. Last but not least, plans can be archived to provide scenario comparisons as part of the business performance analytics. The duration of the archival process is directly correlated to the amount of data being processed in the plan.

3. **Release** (to source) – As planners complete their analysis, they release order recommendations back to the source system (reschedules, creation of cancellation of orders, transfers, and so on). During Release, large amounts of data are pushed back to the source system and this needs to happen in the shortest time possible. The source system processes the plan output via high volume tuned bulk processing APIs.

By deploying Oracle Value Chain Planning on Oracle Engineered Systems, customers can experience improvement across all phases of this end-to-end planning process. Existing benchmarks often show up to 70% reduction in collections, release, and plan run times, as well as dramatic increases in user interface response times, and in some specific functions it translates into 10-16x improvement.

The improved performance and scalability translates into tangible business benefits in several ways:

1. **Reduce batch-processing time** – Batch processing is critical for planning applications. Whether it is an intra-day, daily or weekly batch process, there is always a critical time constraint in a planning system. For example, the forecast or supply plan for "Asia" needs to complete within a certain time window before the "Europe" plan starts (24x7 business operations). Or, the forecast run and component planning need to finish before the finished good planning can start. The number of hours available in the batch window is not getting larger but the amount of data processed continues to grow as the business grows. Oracle Engineered Systems are designed to scale the business without the worry of running out of time to complete the planning cycles. Taking advantage of the new performance characteristics of set-based operations available on Oracle Exadata, data processing operations can be achieved in minutes instead of hours. This enables customers to reduce their batch cycle times or at the same time expand their data set to more granular data, or execute multiple planning runs within the same time window. Using the massive scale-out capabilities of the Oracle Exalogic systems, our planning applications can coordinate hundreds of cores of computing power for planning operations.

2. **Move to more frequent planning cycles** – The highly improved performance from Oracle Engineered Systems and subsequent reduced batch processing time when applied to memory and I/O intensive processes in Value Chain Planning enables companies to change their planning operations. Planners can now think about moving from weekly to daily planning, from daily to intra-day (shift, store replenishment frequency), enabling them to examine changing conditions in the value chain network faster and solve problems much faster.

3. **Increase the planning scope** – Planning scope can be defined as the product of planning horizon (how many time buckets to plan in the future) and planning and data granularity (product versus category level, customer versus demand channel). Batch processing times continue to grow as companies expand their solution to new areas of the business or decide to improve accuracy by examining more granular data.

   For example, in demand management, more granular visibility into the customer demand can be attained by loading more detailed customer or geographic data. It can also mean moving to more detail in the inter-day or intra-day buying patterns. Also, the total number of SKULs (SKUs X distribution sites X sales channels) directly drives the processing time of forecast

operations. The larger the SKUL count the more independent time series that need to be modeled. Large systems can have millions of SKULs being managed. Oracle Engineered Systems allow the planning engines to utilize the scale-out compute power of Oracle Exalogic Elastic Compute Cloud by distributing the process to generate the forecast across all the cores of Oracle Exalogic Cloud, rather than reducing the number of SKULs modeled in the system. In discrete manufacturing industries, companies who model both end-item forecasts as well as product-option forecasts greatly increase the number of managed time series in the system, this gives these companies improved forecast accuracy of their overall product portfolio including the optional components selected by their customers.

In supply planning, for example, it can translate into increasing the horizon of the plan and the number of detailed versus aggregate time buckets. The number of buckets and their granularity is directly correlated to the plan output and calculation time, so often planners are forced to reduce the number of detailed and aggregate buckets along with the level of detail they calculate for each. Allowing planners to increase both the number and the details of the planning horizon can enable them to make better decisions that are critical to make now rather than 3 months from now, as it increases overall global visibility.

4. **Increase the number of planning simulations** – When working with large data sets that consume large amounts of memory, planners are being subjected to the limitations of the hardware. If they want to run more simulations for comparison, it might not be possible to accomplish this either because of plan simulation run time, or because of the inability to scale the memory footprint to access more planning data simultaneously. Leveraging the capabilities offered by the Oracle Engineered Systems, it can enable planners to do more comprehensive analysis and simulation quicker. With our new Oracle In-Memory Performance Driven Planning product, planners can not only simulate more frequently, but also decide to archive the results more frequently because of better run times and lower storage costs – this directly contributed to the hybrid columnar compression (HCC) of Exadata. It essentially costs less and takes less time to have more archives for comparisons. This enables planners to perform more comprehensive analysis and spot opportunities for cost savings and revenue improvements.

5. **Enable new business processes** - The increase in scalability also enables new business processes that previously were not feasible. For example, many companies are also investing in their service divisions to drive better efficiencies. Spare parts forecasting and replenishment can significantly improve the service operations but also expands the size of planning systems. For each end-item, there can be many spare-parts. Although some parts are shared across end-items, the spare parts demand tend to be just as complex if not more complex than the end-item demand requirements; the number of replenishment and redistribution recommendations often match or exceed those of forward supply chains. Top and bottom line performance improvements can be achieved by connecting the forward supply chain and service operations as it yields benefits in global part visibility and reduced procurement cost.

Another example is our newest offering, only available on Oracle Engineered Systems, Oracle In-Memory Consumption Driven Planning. It supports high-volume intra-day store level

forecasting and replenishment processes as often required in single echelon replenishment for distributors and retail operations. Traditionally these types of systems are separated from the core unit-forecasting processes at a company to ensure that both processes can leverage the available capacity in memory and I/O to complete within the desired times. Typically separate databases would be configured and tuned to handle the loads. With Oracle Engineered Systems, companies can now operate a single model and bring all data together for enterprise-wide analysis and decision-making.

Another example, enabled via Oracle In-Memory Performance Driven Planning, is the idea to combine the supply planning across all business units into a single holistic plan. Prior to this, such a process would have been impossible at large implementations due to size, memory and performance considerations, and would force companies to run their supply chain plans locally for a subset of the enterprise and chain them together using a hub-and-spoke planning model. Such restrictions can now be eliminated, providing immense benefits in terms of reduced latency and coordination among planners, improved global visibility and improved exception visibility across the entire supply network.

The direct impact of running global holistic supply plans and demand management is the enablement of a corporate-wide Sales and Operations Planning process. Rather than sub-optimal S&OP at the local level with manual coordination at the corporate level, companies can now expand the span of control of S&OP while continue to drill down to lower level information for detailed analysis.

To summarize, any of these factors can be utilized to drive improved value in customers planning systems. The improvements in granularity provide critical visibility to the nature of the business and give insight to planning engines and end-users to drive efficiencies in inventory, customer service and increased sales. Oracle Engineered Systems allow companies to move into these new planning directions while at the same time taking the risk out of larger scale planning implementations that in the past have been fraught with high complexity, high cost, and low return on investment. Oracle Engineered Systems deliver value to the business allowing them to expand into these new insights and optimize their value chains while staying in control of the process all the way.

Benefit #2: Increased Application Availability, Transaction Scalability

As companies grow, either organically or via acquisitions, the planning processes need to scale up to handle the increased size. Leveraging Oracle Engineered Systems, Oracle Value Chain Planning customers have experienced up to 2.75x faster plan runs for large plans, enabling them to better scale their planning processes.

With the new Oracle In-Memory Performance Driven Planning, only available on Oracle Engineered Systems, customers get the full benefit of horizontal scalability and high reliability of Oracle Real Application Clusters (RAC) when running Oracle Value Chain Planning. Key planning processes like

Collections, Snapshot, and so on, now utilize the full processing power of all the nodes in the cluster (instead of being pinned to one node) and thus will perform that much faster. With this dramatic improvement in performance, customers can schedule their collection runs much more frequently and get much closer to real time visibility and response to source system (execution) changes.

The value proposition is also in being able to use a single hardware platform to support a larger volume of transactions and end users. Companies continue to transition from multiple disconnected planning systems to more consolidated corporate planning solutions. Whether this is an upgrade of older planning systems or a rollout of a new planning process across multiple regions or business units, such initiatives drive cost saving in managing infrastructure, alignment of business processes, corporate visibility to the overall supply chain, and synergies across the business units to optimize the global supply chain. Oracle Engineered Systems are designed to handle the scalability required for such planning systems. Other business requirements can drive the value of being able to scale, for example:

- For companies in high growth industries (i.e. mobile or e-commerce) or rapid market expansion (i.e. emerging markets) growth in the volume of transactions associated with growth in a company's business can mean the need to plan for larger planning footprints

- Growth in the volume of transactions can also result from a specific business event such as an acquisition, restructuring or merger of company divisions

- Large systems become more complex and the need for simplicity provided by Oracle Engineered Systems enables a company to scale to meet their needs without the growth in complexity of managed systems or having to replace hardware as limitations are reached.

Oracle Value Chain Planning applications have been enhanced in several areas to take advantage of Oracle Engineered Systems in the following ways:

- Demand Management and Predictive Trade Planning Forecasting processes have been optimized with Oracle Exadata using optimized data processing approaches. Set-based SQL methods have been applied throughout the data processing steps;

- The Forecasting Engine Cluster has been aligned with the Exalogic cluster and OVM deployment to enable maximum advantage of Exalogic scale-out capabilities;

- The VCP Forecasting engine framework has been extended to enable new processes to be configured within the Demand Management solution to scale-out on Oracle Exalogic and run in parallel across the planning cluster;

- User actions such as a Forecast simulation or Logic Engine runs can be executed across the cluster using the new enhancements to the VCP Planning Cluster;

- Event-driven simulation, as enabled by VCP's Oracle Rapid Planning, was built from the ground up to have a horizontally scale out architecture to facilitate large numbers of parallel simulations, which leverages the capabilities of the Oracle Engineered Systems architecture directly, resulting in substantial improvements in overall planning run time and I/O performance;

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- 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 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. For Value Chain Planning this translates in queries which used to run in minutes to now running in a few seconds or less, which is important for snapshot of data into memory as well as user interface queries;

- Exadata's hybrid columnar compression feature allows for multiple versions of the plans to be loaded simultaneously for comparison without incurring a significant memory overhead. Customers can now view historical plan trends even as far as 1-2 years back and identify whether the key metrics are trending in the right direction or not. In addition, compression will allow for storing more plans with less space, often yielding a 10x reduction in storage space for same data;

- Planning applications typically require high memory and significant volumes of data transportation. The combination of Oracle Weblogic, tuned to run faster on Exalogic and communicating via the Exabus to the database residing on Exadata, yields unprecedented performance gains and eliminates I/O bottlenecks;

- With VCP's new Oracle In-Memory Performance Driven Planning product we enable Exadata RAC support for planning applications such as Oracle Advanced Supply Chain Planning, Oracle Inventory Optimization, and Oracle Service Parts Planning. This, together with capabilities such as the "External Table" feature to read directly from files outside the database and perform a direct path load into the database using parallel SQL and full leverage of the processing power of the Oracle Engineered Systems, increases performance of planning snapshot and other database intensive planning processes such as flush, copy, and archive up to 10x;

- Oracle In-Memory Performance Driven Planning leverages an improved Value Chain Planning data model that has been tuned to enable parallelism so that all SQLs that fetch large amounts of data execute in parallel to utilize the multiple CPUs and I/O resources. This makes all batch processes, such as snapshot, that read large amounts of data extremely fast;

- The database resident architecture of VCP's Global Order Promising product also increases throughput dramatically when run on Oracle Engineered Systems.

Benefit #3: Increased User Satisfaction via Improved Response

End user response times are critical in planning applications. Planners work with large data sets and execute large data transactions. This is not similar to traditional OLTP processes (with noted exceptions like "month-end" processing) that support a very large numbers of users executing smaller transactions. Instead, planning systems have the opposite profile a smaller number of users executing a very large number of transactions for analysis or [summary] reporting. In planning systems the transactions can be massive, requiring the processing of millions of rows for a user's operations.

Most Value Chain Planning products benefit from the performance of Oracle Engineered Systems. There are two key factors to keep in mind that are impacted by improved user response times:

1. **Reduction in operating costs** – Improvement in employee productivity as a result of reduced planning cycle time and a reduced number of plans can improve operational efficiency and lead to reductions in operational costs.

2. **Improvement in top line revenue** – For example, improved response times allow planners to review and audit more forecasts, assimilate more feedback on the forecast from product and sales managers and evaluate more forecast model scenarios. This leads to improved forecast accuracy, which drives improved inventories, higher order fulfillment and improved sales.

For example, a simple forecast change for a product group in an account could translate into an update of 100K rows for each time period, even though the user is looking at a single row. With the power of Oracle Exadata, Oracle Value Chain Planning's demand management worksheets can load and refresh up to 10 times faster. User updates can be 10 times faster. Forecast simulations can be 10 times faster. This enables planners to rapidly evaluate multiple different model scenarios and improve forecast accuracy.

Another example is planning business performance analysis. Oracle Value Chain Planning's Advanced Planning Command Center provides a significant amount of pre-aggregation and transformation of raw plan output from the various Oracle Value Chain Planning modules to optimize the performance and interactivity of the seeded reports and dashboards delivered out-of-the-box with the product. Creating the pre-aggregation however takes time and delays the planner's analysis. The new Oracle Value Chain Planning In-Memory Performance Driven Planning application, designed uniquely to take advantage of Oracle Engineered Systems, enables significant improvements in several areas. First, it dramatically reduces the archival process between the end of a plan or simulation run, and the availability for viewing and reporting in the dashboards, as discussed above. Second, one of the most powerful capabilities of VCP's Oracle Advanced Planning Command Center is the configurability and the ease by which users can create their own complex measures and analyses. Often however, as these personalized analyses have not been pre-engineered for optimal performance, the response time is noticeably less than the seeded reports. Oracle In-Memory Performance Driven Planning has been engineered to take advantage of Oracle Exadata's smart in-memory caching, which learns from which database queries are used most frequently or run the longest time, to consistently improve the user experience. Besides improving the performance of existing report, this also enables users to create even more complex reports that previously would not be rendered with acceptable performance.

Benefit #4: Improved Decision Making with Planning Analytics

One indirect benefit, which may have the most profound impact on business performance, is improved decision making. Shorter planning cycles and more comprehensive real time analytics can translate into more what-if scenarios or business alternatives evaluated for any given business decision and a more comprehensive analysis of which specific alternative has the most significant impact on the strategic objectives of the company. Increasing the productivity of planners and business analysts translates into having your knowledge workers spending more time analyzing and driving business results instead of waiting for planning processes or trying to compile the data required to make informed decisions.

Deployed on Oracle Engineered Systems, Oracle Value Chain Planning's In-Memory Performance Driven Planning enables users to take advantage of the new capability to create a personalized "watch list" of key performance indicators with configurable thresholds so that planners can get notified when certain specific exception conditions occur. Planners can then react immediately to specific events that they care about and not have to spend a lot of time to view the full plan results to find the needle in the haystack. Operational planners can now get immediate alerts when the plan results deviate from the enterprise targets or from the previous plan by a significant amount, greatly reducing the time to analyze and execute their supply chain plans. The new in-memory architecture of enables the planning system to calculate these complex performance indicators like average weeks on hand, and so on, and generate the exception alerts very quickly by doing the processing completely in-memory.

Oracle In-Memory Performance Driven Planning combined with Oracle Engineered Systems also provides completely new visualization capabilities that eliminate a lot of manual steps in a typical planner's day. For example users can create reports using the new pivot table heat-map to immediately highlight visually where important areas of concern are with guided navigation to the underlying issues. This enables planners to easily identify variations from plan to plan with configurable thresholds and get to the deviations very quickly avoiding all the manual comparison steps. Or reports using the tree-map enable users to better understand bottlenecks like part shortages or resource overloads at a plan level, but also provide drill downs and visibility to the most constraining parts of the supply chain very quickly. The micro trellis charts let users spot the outliers in terms of things like inventory trends or demand variations easily. Oracle Exadata hardware has proven to execute such complex reports with multiple queries in parallel and fetch results much faster, making these type of reports feasible to be offered to our customers with real-time interactivity instead of cached-only.
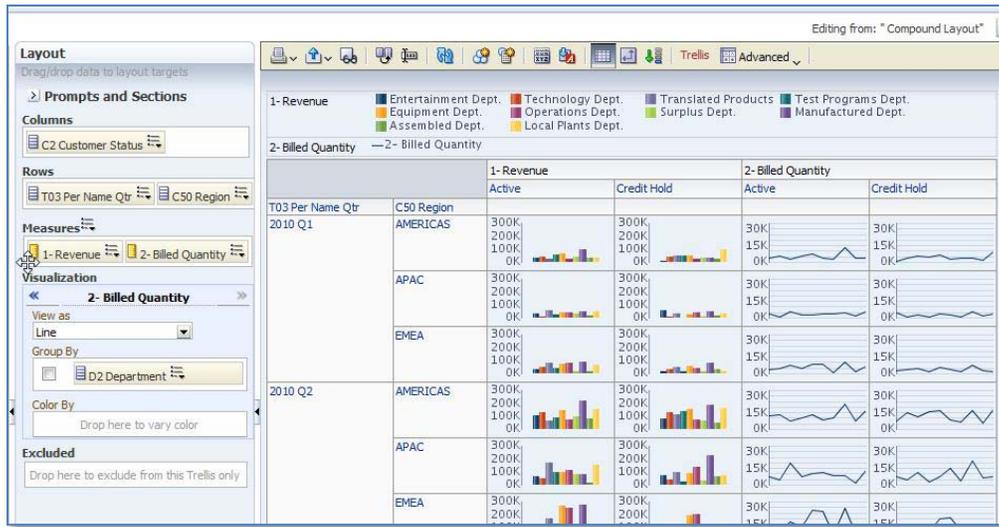
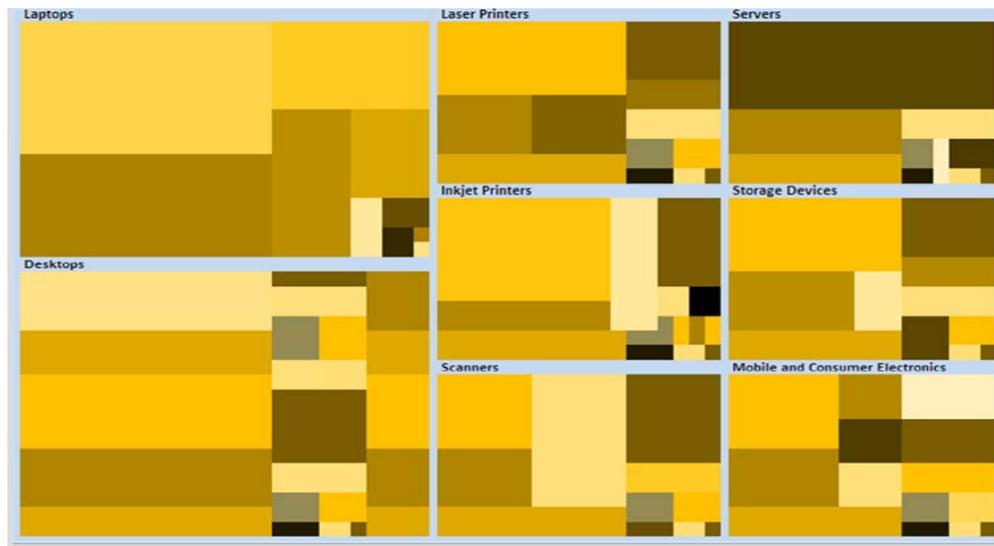**Figure 4 Dense Micro-Trellis charts for trend analysis**

Figure 5 Heat-Map for value-based problem analysis

Oracle In-Memory Performance Driven Planning enables a real-time analytics paradigm by using a fundamentally different architecture. It not only reduces run times of some key batch processes by 5 times or more, but also totally eliminates many batch processes altogether. Instead of requiring the complete plan to be written out, it has a new capability to quickly surface just the key incremental changes to let planners complete a "simulate-then-analyze" cycle in seconds instead of hours. This is achieved by elevating most of the processing from disk to memory by leveraging the architecture of Oracle Engineered Systems. This enables planners to make better and more informed decisions by evaluating more scenarios with more comprehensive analysis and taking advantage of complex analytics and visualization.

Benefit #5: Lower Total Cost of Ownership, Faster Time to Value

In more traditional implementations Oracle Applications are developed to support a myriad of different hardware options and possible configurations. The Oracle software is installed and configured on a customer selected hardware system. Our standard applications provide many features for tailoring the setup to take advantage of the specific hardware characteristics that the customer is using. The time taken to install, tune and tailor our solutions for a customer's hardware can be time consuming and costly, requiring expertise on the application, expertise on the hardware, and the knowledge of the proper alignment between these. This time delay itself has a cost to the business, as well as the work and its cost. Add to that the risk of not achieving the optimal configuration and also the risk of revising hardware in cases where the hardware components (compute, transform, storage) were unbalanced for the planning profiles targeted. Oracle Engineered Systems provide a highly valuable alternative.

Oracle Engineered Systems reduce the time-to-value and implementation cost for the business. Oracle Value Chain Planning applications drive shorter deployment and configuration times when using Oracle Engineered Systems as they are available as Oracle Virtual Machine Templates (OVM Templates). These OVMs are ready to be deployed on Oracle Engineered Systems as preconfigured certified application instances ready to run and contain a full computing configuration pre-installed including Oracle Enterprise Linux, Oracle Weblogic Server, Value Chain Planning Applications, combined with settings, configuration and tuning already done. These OVMs can also be deployed automatically to an Oracle Exalogic machine using Oracle VServer that manages the OVM instances on an Exalogic Machine.

Our unique offerings for Value Chain Planning, such as Oracle In-Memory Performance Driven Planning and In-Memory Consumption Driven Planning, go beyond this. They have been designed, built, scaled, and tested from the ground-up as a hardware and software package specifically and exclusively for Oracle Engineered Systems. This enables us to provide highly accelerated implementations because it was built only for the targeted platform and takes advantage of unique capabilities of the stack throughout the product design including development, testing, and performance tuning. When customers deploy the system, the software and hardware are deployed in unison and operate as a designed cohesive solution, reducing overall cost of deployment and ownership.

Oracle Exalogic and Exadata provide dramatically reduced total cost of ownership by reducing the amount of work that people have to do. This enables organizations to focus their limited resources on activities that contribute to the top-line revenue.

Oracle Exalogic and Exadata reduce the total cost of ownership in the following three ways:

- The systems are pre-built so there is no need to design, procure, assemble, deploy, and tune each one;
- The systems are easier to manage because of the holistic management approach that is taken with Oracle Enterprise Manager;

- Oracle also provides Platinum Services, which is a free support entitlement under standard hardware support for Exalogic and Exadata.

Instead of being a collection of individual components, Oracle Exalogic and Exadata are single cohesive systems providing all the benefits of being single systems. Oracle Exalogic and Exadata are maintained, managed, monitored, deployed and tested as one system.
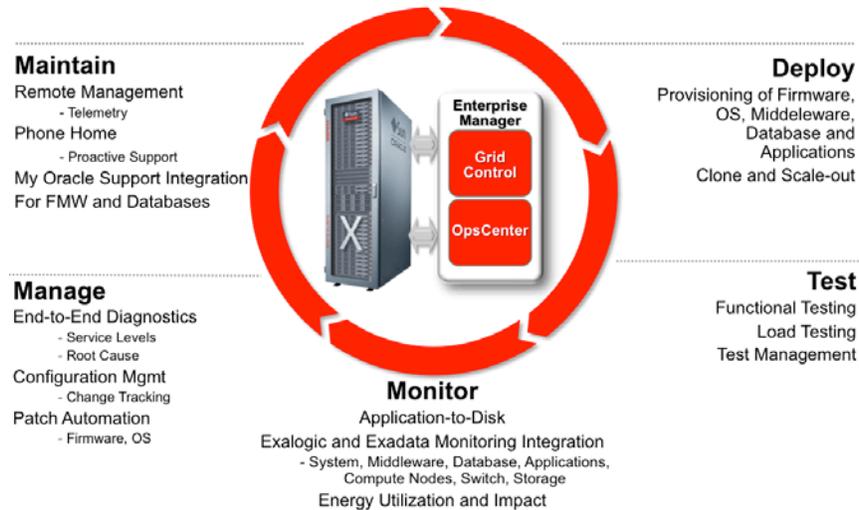

Figure 6: Comprehensive Lifecycle Management with Oracle Engineered Systems

The components of Oracle Exalogic and Exadata are engineered to work well together, leading to such benefits as single file patches and storage to application management through Oracle Enterprise Manager. Oracle Enterprise Manager has even been modified to work better with Oracle Exalogic and Exadata.

In addition to providing management and monitoring capabilities, Oracle Enterprise Manager 12c supports static (self-service) and dynamic (real-time load-based) provisioning. When it is used in this capacity, Oracle Exalogic is used as a pool of hardware resources that can be either statically or dynamically provisioned for different uses. For example, hardware in a single Oracle Exalogic system could be provisioned to a preproduction environment for testing, a production environment for the primary transportation operations, and then finally to a 'what-if' development environment as a test bed for new transportation capabilities. Provisioning in this manner is scaling out an environment. This drives up resource utilization, which allows for a greater return on investment.

Finally, Oracle also provides Platinum Services, which is a free support entitlement under standard hardware support for Oracle Exalogic and Exadata. Platinum Services provides comprehensive proactive monitoring, a specialized support team, "Phone Home" capabilities for automated service requests, free quarterly patching from the operating system down, and SLAs as follows: 1) 5 minute fault notification, 2) 15 minute restoration or escalation to development, and 3) 30 minute joint debugging with development. This reduces the long-term total cost of ownership.

The integrated nature of Oracle Exalogic and Exadata, the quality of the products on their own, and the value of the integrations between these best-of-breed products allow for unparalleled management, consolidation and time-to-market, leading to a reduced total cost of ownership.

Conclusion

Value Chain Planning is a critical opportunity area for many companies as they look to improve the efficiency and reliability of their global supply chains. Significant supply chain inventory cost reduction, increased on-time delivery, and business performance analysis are three primary areas of business value. Oracle Value Chain Planning is a best-in-class solution that enables companies to capitalize on these business value opportunities. Oracle Value Chain Planning in combination with Oracle Engineered Systems provides a unique value proposition for many companies in terms of reduced planning cycle time and data latency; increased application availability and transaction scalability; increased user satisfaction via improved response time; improved decision making with improved planning analytics; and, lower total cost of ownership and faster time to value.

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Hardware and Software, Engineered to Work Together