An Oracle White Paper
March 2013

Oracle Value Chain Planning on Oracle Engineered Systems

Performance Sensitive Applications
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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 the benefits of deploying your existing Oracle Value Chain Planning solution on Oracle Engineered Systems, and how that can provide the optimal solution for today’s planning challenges.
Oracle Value Chain Planning Solution

Oracle Value Chain Planning consists of many products that each has their own role in the planning process:

- **Demand Signal Repository**: Integration with point-of-sale systems, syndicated data systems, retailer and distributor systems, and other systems for the purpose of sensing demand. Oracle 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.

- **Demantra Demand Management**: Better real time demand insight is only useful if you can translate it into a more accurate forecast. Demantra Demand Management 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. It also 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.

- **Demantra Predictive Trade Planning and Trade Promotion 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.

- **Demantra Real-Time Sales and Operations Planning**: Sales and Operations Planning (S&OP) 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.

- **Strategic Network Optimization**: 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.

- **Inventory Optimization**: When designing and optimizing value chain networks it is key to look at the risk and variability in that network. Oracle Inventory Optimization 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 weighed 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 Inventory Optimization, combined with Oracle Strategic Network Optimization, provides a unique value proposition for this.

- **Advanced Supply Chain Planning and Rapid Planning**: Oracle Advanced Supply Chain Planning and Oracle Rapid Planning offer 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 the number of decisions made is always large and planners continuously strive to provide answers in the shortest amount of time possible.

- **Rapid Planning**: 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 is 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 Rapid Planning offers a complete set of best-in-class tools for this problem.

- **Collaborative Planning**: Oracle Collaborative 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.

- **Advanced Planning Command Center**: Deploying the various planning tools is only as effective as they help key decision makers improve their supply chain metrics. Oracle Advanced Planning Command Center offers a 360 degree view of key metrics that directly operate on the output of the planning tools. Only Oracle 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.
- **Global Order Promising and Production Scheduling:** 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 material shortages.

- **Service Parts Planning:** Many companies that operate reverse supply chains face challenges in determining the most optimal replenishment and redistribution against set budgets for spare parts. Oracle Service Parts Planning, combined with Oracle Demantra Demand Management and Oracle Inventory Optimization, offers a comprehensive solution for service parts planning, enabling customers to transform their service operations from cost to profit centers more effectively.

![Figure 1 Oracle Value Chain Planning Solution](image_url)
Introduction to Oracle 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 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. 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.

![Exalogic and Exadata Diagram](image)

**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.

Additional reference materials:

Oracle Exadata Database Machine Brochures and Data Sheets
Oracle Tech Network Oracle Exadata Database Machine
Oracle Exalogic Elastic Cloud Overview
Oracle Engineered Systems for Oracle Value Chain Planning Solutions

Oracle Exadata Database Machine, Oracle Exalogic and Oracle SPARC SuperCluster provide the optimal platform for Oracle Value Chain Planning. Let’s look at some examples.

Example #1: Supply Planning on Oracle Engineered Systems

Oracle Value Chain Planning’s supply planning applications such as Oracle Advanced Supply Chain Planning and Oracle Rapid Planning tremendously leverage the power of the Oracle Engineered Systems, as proven with existing Oracle Value Chain Planning customers that run their operations on the Oracle Engineered Systems. To better understand the benefits a company can gain with Oracle Value Chain Planning’s supply planning tools, it is important to understand the 3 main stages of the planning process where data processing and the time consumed play the most important part. This is commonly referred to as end-to-end planning cycle time:

1. Collections (from source) – 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, with 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 the 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 particularly engineered to support the Oracle Exadata RAC architecture, resulting into 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. The 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 plan needs to be calculated. The plan run times 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 opportunities of improvement. 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 Advanced Supply Chain Planning and Oracle Rapid 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 a 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 isn’t 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 time to complete the planning cycles. By 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, enabling 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 Exalogic system, our planning applications can coordinate hundreds of cores of computing power for planning operations, critical when running large-scale simulations.

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 Oracle Advanced Supply Chain Planning and Oracle Rapid 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 planned 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.

   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 Oracle Engineered Systems, Value Chain Planning products can enable planners to do more comprehensive analysis and simulation quicker. Event-driven simulation, as enabled by 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. Benchmarks have shown up to 10x improvements for large data sets (reducing simulation from minutes to much less).

   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 the same data.

5. **Enable new business processes** - Another example is the desire 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 (S&OP) 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 continuing to drill down to lower level information for detailed analysis.

6. **Improve planner productivity** – Another benefit of using the Engineered Systems is the improved speed in data queries. Planners typically navigate a spider web of [high volume] plan input and output data and as they are focusing their attention on solving their many problems, they need the data to be presented in the fastest way possible, whether at aggregate or detailed level. 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.

To summarize, any of these factors can be utilized to drive improved value in customers’ supply 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 enable 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 areas and optimize their value chains while staying in control of the process all the way.

**Example #2: Demantra Applications**

Oracle Value Chain Planning offers a state-of-the-art solution for demand and promotion management via our Demantra applications: Demantra Demand Management (DM) and Demantra Advanced Forecasting and Demand Modeling (AFDM), Demantra Real-Time Sales and Operations Planning, Demantra Predictive Trade Planning, Demantra Trade Promotion Optimization, and Demantra Deductions and Settlement Management.

Demantra has been engineered to automatically take advantage of the raw processing power and scalability of the Oracle Engineered Systems, whether solving a demand management or promotion management problem. Similar to the supply planning applications, Demantra benefits from the ability to scale to more users, more data (shipment data, forecast data, usages), more complex forecasting models (causal factors, new product introductions, demand shaping profiles), and increased forecast scope (number of time buckets) and granularity.
More source data

Demand and promotion planning typically results into more accurate results when having the ability to look at more source data – more refined usage and shipment history data can help with improved detection of outliers, definition of causal factors, and smoothing of accuracy and error trends. When forecasting products with a high degree of intermittent demand over long periods of time, as often the case in service parts forecasting, companies see a dramatic increase in source data. Similarly, when deploying point-of-sale, syndicated data, or demand signal management systems, such as Oracle Demand Signal Repository, companies want to take advantage of the additional detailed demand and promotion source data provided rather than rely on summarized aggregate level data.

More granular models

In demand management, granular data can be used to attain improved visibility into customer demand by loading more details regarding customer or geographic detail. 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 enable the forecasting engine to utilize the scale-out compute power of Oracle Exalogic by distributing the forecast across all the cores of Exalogic, rather than limiting the model to a sharply reduced number of SKULs.

In discrete manufacturing industries, companies that 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.

Improved work sheet performance

Demand planners and promotions planners most often define complex measures that operate on a large set of demand and promotion plan input and output records, sometimes as many as billions. 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 Demantra 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 demand planners to rapidly evaluate multiple different model scenarios and improve forecast accuracy.

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

- Demantra 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 new set-based data processing algorithms allow Oracle Exadata to take advantage of its In-memory architecture by enabling the server to drive manage CPIU and memory between the multiple parallel threads per algorithm;
- The Demantra Forecasting Engine Cluster has been aligned with the Exalogic cluster and OVM deployment to enable maximal advantage of Exalogic scale-out capabilities;

- The Demantra Forecasting Engine framework has been extended to enable new processes to be configured within the Demand Management and Predictive Trade Planning solution to scale-out on Exalogic and run in parallel across the planning cluster;

- User actions such as a Forecast simulation, Promotion Optimization and Planning Logic Modules can be executed across the cluster using the new enhanced Demantra Planning Cluster;

- Large installations of Demantra such as fast-food, restaurant chains, and retail store-demand planning systems, where the number of active planning entities can be 10 million and more, can take advantage of the extreme performance of Exalogic and Oracle Exadata and shorten batch and user processing times dramatically. It also enables customers to consolidate separate instances of Demantra into a single planning instance;

- Demantra 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.

Example #3: Service Parts Planning and Forecasting

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. In addition, the number of replenishment and redistribution recommendations often match or exceed those of forward supply chains. The planning phases that we discussed in Example #1 apply in the same way to Oracle Service Parts Planning, with the addition of the Service Parts Forecasting, Inventory Optimization, and Advanced Planning Command Center elements. The combined solution for service parts management involves large scale plans with a lot of intermittent demand across a huge amount of SKUs, global plan coverage, contractual customer and channel commitments that need to be met in terms of response and repair time, and a planning process sequence that needs to execute in the shortest possible time. For large-scale systems, Oracle Service Parts Planning and Forecasting fully leverage the benefits of Oracle Engineered Systems.

When deploying Service Parts Planning and Forecasting, often the traditional approach of segregating the forward and reverse supply chains is implemented. We believe however that 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 costs by combining procurement for parts that are common. Until now combining both systems to have a unified view has
not be often feasible when both are very large in scale. Oracle Engineered Systems can provide that scale and improve performance for both to enable this unification effectively. Oracle-Sun’s internal operations are a proven example of such a deployment and its related benefits.

Example #4: Advanced Planning Command Center

As mentioned in the introduction of the Oracle Value Chain Planning solution, Oracle Advanced Planning Command Center exposes key planning information from the different planning applications at summary level in the form of trends and performance indicators for planners. It also provides key planning information for other key decision makers in a company, those who rely on correlated and summarized data to make decisions and propose further actions. This is often as part of their Integrated Business Planning process. Companies need to make that business data available as quickly as possible especially when there is a need to evaluate and compare different business scenarios in terms of cost and benefits.

Shorter planning cycles and more comprehensive real time analytics can translate into the desire to execute 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 the company’s knowledge workers spend more time analyzing and driving business results instead of waiting for planning processes or trying to compile the data required to make informed decisions.

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, as well as other key decision makers’, analysis. The Oracle Engineered Systems enable significant improvements in several areas. First, it substantially reduces the archival process between the end of a plan or simulation run, and the availability for viewing and reporting in the dashboards. Second, one of the most powerful capabilities of Oracle’s 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 by Oracle for optimal performance, the response time is noticeably less than the seeded reports. Oracle Exadata’s smart in-memory caching, which learns from which database queries are used most frequently or run the longest time, consistently improves the user experience through improved response times. Besides improving the performance of existing reports and dashboards, this enables users to create even more complex reports that previously would not be rendered with acceptable performance, especially when accessing millions of planning facts at the same time.
Example #5: In-Memory Consumption Driven Planning (IMCDP)

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 type 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 demand management and consumption driven planning model and bring all data together for enterprise-wide analysis and decision-making. The In-Memory consumption-driven planning solution was tailored to take advantage of the Oracle Engineered Systems’ capabilities and deliver highly scalable processing and planning for store-level data and consumption driven planning processing. Critical to the design of IMCDP was allowing a large consumption driven solution to be part of the enterprise demand management footprint. Maintaining separation of store-level data and processes while being a cohesive part of their overall demand management solution enables customers to uptake IMCDP without impact to the enterprise Demand Management footprint and improve their DM processes by becoming consumption-driven.

Oracle IMCDP offers a complete solution for consumption-driven planning including managing the forecast, safety stock, and replenishment. The complete cycle is illustrated in figure below.

![Figure 4 In-Memory Consumption Driven Planning Process Flow](image)

IMCDP offers flexible hierarchies and configurability that enable consumption-driven planning for heterogeneous distribution channels, in which companies are distributing products through multiple channels. IMCDP is designed to accommodate such multi-channel distribution networks as shown below.
Oracle IMCDP enables companies to move into these new consumption driven planning directions while at the same time taking the risk out of larger scale implementations that in the past have been fraught with high complexity, high cost, and quite often low return on investment.

Whether it is an intra-day, daily or weekly process, there is always a critical time constraint in a planning system. Taking advantage of the new performance characteristics Oracle Exadata and Exalogic, the data processing and planning operations can be achieved in minutes instead of hours, enabling customer to reduce their batch cycle times, run plans more frequently, expand data.

The improved performance and scalability of IMCDP translates into tangible business benefits. Consumption driven planning provides critical visibility to consumption data and demand patterns that improve forecast accuracy. IMCDP enables planning processes such as store-level replenishment to improve on-shelf availability, increase sales by better product placement, reduced inventories, and lower supply chain costs. With the resulting visibility to demand and replenishment, companies can make better supply chain decisions and improve company performance.

Oracle In-Memory Consumption-Driven Planning offers the breakthrough in computing performance needed for addressing the most challenging demand and replenishment planning applications. This is the result of bringing together hardware and software engineered together to provide extreme data throughput performance while maintaining the production reliability for large data transactions that planning systems thrive on. Oracle In-Memory Consumption-Driven Planning is thus helping to bring manufacturers and retailers closer to achieving the vision of the demand-driven value chain.

For additional information, please review the “Oracle In-Memory Consumption Driven Planning” white paper.
Example #6: Oracle In-Memory Performance Driven Planning (IMPDP)

With the new Oracle In-Memory Performance Driven Planning, only available on Oracle Engineered Systems, customers get two important benefits:

1. Improved scalability for supply planning applications (RAC, parallel plan runs, and more)
2. Improved user experience and content for business performance analysis

Improved scalability

Oracle In-Memory Performance Driven Planning enables the full advantage of the horizontal scalability and high reliability of Oracle Real Application Clusters (RAC) when running Oracle Value Chain Planning applications like Oracle Advanced Supply Chain Planning, Rapid Planning, Service Parts Planning, and Inventory Optimization on Oracle Engineered Systems. 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.

The planning run loads the source data in parallel from the [Planning Server] database, for fast in-memory processing and, when completed, 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 particularly engineered to support the Oracle Exadata RAC architecture, resulting into a higher degree of overall throughput. 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, increases performance of planning snapshot and other database intensive planning processes such as flush, copy, and archive up to 10 times.

Oracle In-Memory Performance Driven Planning also leverages an improved Oracle 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.

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.

Improved user experience

Oracle IMPDP 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 they do not have to spend a lot of time to view the full plan results to find the needle in the haystack. Operational planners now get immediate alerts when the plan results deviate from the enterprise targets or from the previous plan by a significant amount. This greatly reduces the time to analyze and execute their supply chain plans. The new in-memory architecture 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 IMPDP also provides new visualization capabilities that eliminate a lot of manual analysis steps in a typical planner's day. For example, planners and business analysts can create reports using the new pivot table heatmap 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, they can leverage reports using the tree-map enable to better understand bottlenecks like part shortages or resource overloads at a plan level. They can also drill down and get visibility to the most constraining parts of the supply chain very quickly. The micro trellis charts lets 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.

![Dense Micro-Trellis charts for trend analysis](image1)

![Heat-Map for value-based problem analysis](image2)
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 it also eliminates many batch processes altogether. Instead of requiring the complete plan to be written out, it has new capability to quickly surface just the key incremental changes to let planners complete a simulate-then-analyze cycle in minutes instead of hours. This is achieved by elevating most of the processing from disk to memory by leveraging the Oracle Engineered Systems’ architecture. This enables planners to make better and more informed decisions by evaluating more scenarios with more comprehensive analysis and by taking advantage of complex analytics and visualization.

For additional information, please review the “Oracle In-Memory Performance Driven Planning” white paper.

Key Benefits: Increased User Satisfaction, Lower Total Cost of Ownership, Faster Time to Value, Increased Application Availability and Transaction Scalability

Deploying Oracle Value Chain Planning applications on Oracle Engineered Systems provide several key benefits that span all the applications.

Lower total cost of ownership

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 systems. 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 your 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.

Faster time to value

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. They contain a full computing configuration pre-installed including Oracle Enterprise Linux, Oracle Weblogic Server, Oracle 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.

Oracle’s unique offerings for Oracle 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 allows 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 the overall cost of deployment and ownership.

Increased user satisfaction

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 Oracle 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 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 enable 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.

Increased Application Availability and Transaction Scalability

Companies can now use Oracle to support a larger volume of transactions and end users and use a single hardware platform. 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 infrastructure management, alignment of business processes, corporate visibility to the overall supply chain, and synergies across the business units to optimize the global supply chain. The 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 or 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.

Conclusion

Oracle 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. Only Oracle Value Chain Planning has been designed, built, scaled, and tested from the ground-up as a hardware and software package specifically and exclusively for Oracle Engineered Systems.