Oracle In-Memory Logistics Command Center on Oracle Engineered Systems  
Maximize Performance of your Logistics Network
Disclaimer

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Overview</td>
<td>2</td>
</tr>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Oracle In-Memory Logistics Command Center Overview</td>
<td>3</td>
</tr>
<tr>
<td>Strategic Scenario Management</td>
<td>5</td>
</tr>
<tr>
<td>Operational Scenario Management</td>
<td>8</td>
</tr>
<tr>
<td>Introduction to Oracle Engineered Systems</td>
<td>9</td>
</tr>
<tr>
<td>Oracle Exalogic Elastic Cloud Introduction</td>
<td>10</td>
</tr>
<tr>
<td>Oracle Exadata Database Machine</td>
<td>10</td>
</tr>
<tr>
<td>SPARC SuperCluster</td>
<td>11</td>
</tr>
<tr>
<td>Oracle Engineered Systems and Oracle In-Memory Logistics Command Center</td>
<td>11</td>
</tr>
<tr>
<td>Benefits of Oracle In-Memory Logistics Command Center</td>
<td>13</td>
</tr>
<tr>
<td>Build a Resilient Supply Chain</td>
<td>13</td>
</tr>
<tr>
<td>Improve Supply Chain Agility</td>
<td>14</td>
</tr>
<tr>
<td>Maximize Business Advantage and Improve Competitiveness: Operational</td>
<td>15</td>
</tr>
<tr>
<td>Excellence</td>
<td></td>
</tr>
<tr>
<td>Build a Sustainable Supply Chain</td>
<td>15</td>
</tr>
<tr>
<td>Drive New Revenue and Improve the Top-line</td>
<td>16</td>
</tr>
<tr>
<td>Lower Total Cost of Ownership</td>
<td>16</td>
</tr>
<tr>
<td>Faster Time to Value</td>
<td>19</td>
</tr>
<tr>
<td>Conclusion</td>
<td>19</td>
</tr>
</tbody>
</table>
Executive Overview

Supply chains and their associated logistics networks are becoming increasingly complex with companies facing business challenges such as globalization, omni-channel commerce, supply chain risk mitigation as well as mergers and acquisitions. Many companies have deployed primarily point-based solutions to solve specific operational issues, generating ever more data that proves increasingly difficult to effectively consolidate and analyze from an overall network perspective. In this environment, strategic and operational scenario management is now central to creating a robust, resilient and profitable logistics network. Unfortunately, the tools that are currently available that are designed to address this challenge often prove inadequate for the complexities involved. These tools typically utilize simplified models of the logistics network and operate on estimated aggregate costs using historical data. Not surprisingly, this type of analysis usually results in policies that do not translate effectively to real-world conditions and are often simply not implementable.

Oracle’s solution is different. Architected to take advantage of the extreme performance of Oracle Engineered Systems, Oracle In-Memory Logistics Command Center (LCC) takes a unique and innovative approach to strategic and operational scenario management. Leveraging the best-in-class logistics platform of Oracle Transportation Management, Oracle In-Memory Logistics Command Center determines optimal execution strategies by simulating actual logistics operations using detailed operational data, including network infrastructure, costs, contracts, service levels, capacities and constraints. This allows for an accurate representation of the results of each scenario and for a realistic analysis that yields implementable response policies.

Oracle In-Memory Logistics Command Center allows customers to model multiple scenarios simultaneously and provides packaged analytics that capture and visualize key operational statistics in a rich analytics framework with side-by-side comparisons of the various scenarios.

In this whitepaper, we provide an overview of Oracle In-Memory Logistics Command Center’s capabilities and business value.
Introduction

The need for logistics network scenario management is not new, but recent events have brought a stark and urgent focus on it. For example, supply chain resilience is a topic that has surged in importance given the multiple threats to the supply chain in recent years. As recent events such as the Icelandic volcano, the earthquake in Japan and the Thailand flood have shown, sudden and unforeseen disruptions to the supply chain can seriously impact a company’s ability to meet demand and endanger its business operations. Indeed, such occurrences are becoming more frequent and more expensive.\(^1\) As companies have followed Lean manufacturing strategies, moving to “just-in-time” management and drastically cutting inventory, so the supply chain has become ever more vulnerable to disruption. Other threats such as port closures, workforce strikes, social unrest, terrorist attacks and highway shutdowns can have similar impacts. As a result, the ability to perform scenario analysis and determine possible impacts to the logistics network and plan for suitable responses has become an essential part of a company’s supply chain resilience strategy.

Planning for supply chain resilience often goes beyond analyzing for logistics network disruptions and security, and includes other types of strategic network scenario analysis. In the logistics context, this can take the form of analyzing for scenarios such as a rise in fuel costs, change in rates from transportation service providers, exchange rate impact analysis, etc. These types of network design analyses ensure optimal operation in the face of anticipated or unanticipated changes in business conditions.

While scenario analysis has traditionally been limited to the strategic level, there is tremendous value and interest in performing scenario analyses even at the tactical or operational level. This could take the form of evaluating alternate solutions under different objective functions. For example, the objective may not always be to select the lowest cost transportation plan, it may be to select the plan that has the least environmental impact or the plan that leads to the highest customer service level. Another approach is to perform what-if scenario analysis to determine the impact of relaxing different constraints that may be impacting fulfillment ability. For example, evaluating the cost versus benefit of relaxing certain order pickup/delivery time windows or location shipping/receiving windows.

Operational scenario analysis can lead to tremendous cost savings and improved fulfillment levels with minimal impact to the current network configuration.

Oracle In-Memory Logistics Command Center Overview

The usual approach to scenario analysis has been to employ solvers that abstract the actual logistics network to a theoretical model consisting of nodes and links. Further, constraints are simplified to fit this linear, network model of the logistics network. Costs are estimated and simplified and do not

---

\(^1\) *Counting the Cost of Calamities*, The Economist, January 14, 2012, [www.economist.com/node/21542755](http://www.economist.com/node/21542755)
represent the true complex nature of transportation service provider contracts. These solvers then perform a flow analysis for the different scenarios by representing the set of discrete real-world shipments over different modes, carriers, etc., as a continuous flow over a node-link network. A common complaint with using such tools is that the results do not translate to the real world and the policies are often not implementable. Furthermore, these types of tools are incapable of performing operational scenario analysis with all the rich details of actual network configuration, transportation modes, rates and resources that it entails.

Oracle In-Memory Logistics Command Center (LCC) takes a completely new approach to performing scenario analysis. It leverages the acknowledged market-leading logistics platform of Oracle Transportation Management to determine the optimal fulfillment strategy under different scenarios based on operational solves against actual operational data. LCC uses real data from the logistics network and contains a copy of all the relevant operational data including actual network configuration, modes, carriers, rates, resources, constraints, etc. In order to analyze the impact of a particular scenario, it simulates the network’s operation by running the same transportation plans that are run in practice and collating the results to be analyzed in a user-friendly manner. This approach of simulating actual operations in full detail to determine the impact of the changes under each scenario provides a truly accurate representation of the results and allows for a realistic analysis leading to implementable response policies.

LCC enables analysis of multiple scenarios in real-time, and provides packaged analytics that capture and visualize key operational statistics in a rich analytics framework with side-by-side comparisons of the various scenarios.

The key capabilities of Oracle In-Memory Logistics Command Center are:

- Integration with Oracle Transportation Management to copy relevant operational data to the LCC environment and make it available for scenario analysis.
- Support for both strategic and operational scenarios. A number of packaged scenarios will be provided where the user can choose the scenario, provide relevant data inputs via simplified screens and then launch the analysis. Some of the key scenarios are discussed in greater detail in the next section.
- As part of the ongoing roadmap, additional packaged scenarios will be provided to cover an increasing variety of use cases which can be utilized out-of-the-box with minimal effort. Experienced users will also have the ability to perform custom scenario analysis.
- Analyze multiple variations in parallel to model a particular use case. For example, to model a network disruption the user may want to analyze different possible response strategies as independent scenarios, then compare the results simultaneously and select the most appropriate one.
- Specify key criteria such as the order sets, time duration, etc. to constrain and shape the analysis in order to better reflect the changing real-world operational conditions.
- Extract key metrics and visualize them using an advanced analytics framework to better understand and compare network performance for multiple scenarios side-by-side. LCC’s
analytical capabilities are delivered using Oracle Business Intelligence Enterprise Edition, Oracle’s best-in-class business intelligence technology.

- Packaged support for a number of key performance metrics and associated dashboards that support a variety of slice-and-dice, drill-down and ad-hoc query mechanisms to provide a detailed understanding of network performance. In addition, the user has the ability to create custom metrics and visualizations.

- Integrate key network configurations back into the operational environment to enable easy implementation of the policies resulting from the scenario analyses. This two-way flow between the LCC and operational environments allows strategic scenario analyses to be performed easily and regularly with minimal set-up. Also, timely operational scenario analyses can be easily utilized as part of the regular daily operational planning process.

- Store scenario analyses indefinitely for future reference. This allows for past analyses to be referenced and utilized when similar risks or scenarios arise elsewhere in the network. Also, the implementation impact of policies in practice can be easily compared with the scenario analysis that drove them, allowing for continuous learning and improvement of strategies.

This approach of simulating actual logistics network operation using actual operational configuration will potentially involve, especially in the case of strategic scenarios, consideration of a large amount of data over long time horizons in computationally-intensive solves. To perform this in a timely and efficient manner, the Oracle In-Memory Logistics Command Center takes full advantage of the Oracle’s Engineered Systems which are engineered for extreme performance. As an application built on Oracle’s Engineered Systems, Oracle In-Memory Logistics Command Center combines best-of-breed hardware and software components with game-changing technical innovations. As a high-availability, extreme-performance, purpose-built solution, this approach delivers a sophisticated simplicity that is completely integrated throughout every layer of the technology stack. This is a simplicity that translates into less risk and lower costs to the business. In particular, LCC leverages the Oracle Exadata Database Machine and the Oracle Exalogic Elastic Cloud, both of which are described in more detail below.

Some of the key scenarios that the Oracle In-Memory Logistics Command Center enables are described briefly below. Note that these are just some examples of the variety of scenarios that can be analyzed using LCC. As described earlier, customers can also create their own custom scenarios. Oracle plans to build out these scenarios as a way of delivering continued added value to its customers on an ongoing basis.

**Strategic Scenario Management**

Strategic scenario management allows you to optimize your logistics operations for the long term. It typically involves modeling changes in key business conditions and then analyzing the impact to the network over the longer term. Resulting policies may require a network configuration change or a response strategy that could have a high impact to the network. This is balanced by the fact that they will often lead to significant and high-value changes resulting in considerable savings to the operation. Indeed, the high-impact, high-value nature of these scenarios makes it imperative that they be
conducted with due diligence and consideration of accurate and comprehensive real-world operational detail to generate implementable response policies. We view the ground-breaking approach taken by Oracle In-Memory Logistics Command Center of simulating the real-world operational network with all the associated detail as fundamental to generating accurate and implementable results.

We further categorize these types of scenarios below.

**Supply Chain Risk Management**

Some examples of these types of scenarios are:

- **Logistics Network Disruption**
  - This involves analyzing the impact of a significant disruption of a portion of the logistics network.
  - Examples are: a natural calamity (earthquake, hurricane, flood) strikes key portions of the network and impacts logistics in that part of the network such as port closures or highway closures which require alternate routing strategies, etc.
  - The aim of the analysis is to determine suitable response strategies. Indeed, multiple plans of action may be analyzed and prioritized so that they can be quickly and efficiently deployed when necessary.

- **Fuel Risk Modeling**
  - With the ever volatile price of fuel and its significant impact to transportation operations, it has become important to analyze and plan for its impact and derive suitable response strategies. LCC enables you to quantify the actual impact to your operations under different fuel cost conditions down to the full cost detail of each move and derive the optimal response to each.
  - For example, it may be that a suitable response is to shift to more fuel-efficient modes which may then imply a need for more capacity with certain carriers on certain lanes and/or more flexibility in delivery schedules, etc.

- **Carrier Rate Change Modeling**
  - The recent global recession has had a significant impact to carrier capacities and rates. It is anticipated that as economic growth occurs, these will change again. The need to anticipate and plan for such changes is important to all who ship goods, especially those with a core-carrier program that concentrates volumes over a limited set of service providers. A logistics service provider, by contrast, may be interested in gauging the impact of raising rates on certain customers and hence determine the best strategy to change rate structures.

- **Exchange Rate Risk Management**
Global shippers are especially sensitive to exchange rate changes. Indeed, it is not only important to understand the impact of changing exchange rates, but also to derive suitable logistics strategies to minimize their impact to the bottom-line.

With its detailed representation of how goods are actually shipped over the global network, LCC quantifies the financial impact of changing exchange rates in accurate detail and helps determine the optimal logistics response.

**Transportation Service Provider Risk Management**

- The recent severe recession adversely impacted many service providers, even driving some of them out of business. It is important to understand and quantify the risk to fulfillment ability if a key service provider is impaired or fails.
- LCC assists in the quantification of the impact of such an event and identification of suitable contingency plans to minimize the resulting impact on service.

**Logistics Network Design**

Some examples of these types of scenarios are:

- **Strategic Network Route Evaluation**
  - The concept is to perform a strategic analysis to design the operational network to execute efficiently without having to model all the possibilities within the operational environment.
  - For example, customers may want to determine the top two or three paths through the network for each lane and use those in daily operations, rather than dynamically select from all possible permutations each time. This will not only lead to more efficient daily plans but also could deliver more streamlined operations throughout the network resulting in other operational efficiencies and savings.

- **New Customer/Line of Business Analysis**
  - Supply chains evolve – a company may make acquisitions, sign up new customers, expand operations in new geographic areas, etc. It is important to understand the impact on the logistics network of any such activity. In the case of a logistics service provider, they may want to quantify the impact of adding a new customer to their network.
  - In addition to understanding the impact of the new flows on the existing network, customers may want to quantify the synergies with the existing flows in the network. By understanding both the cost impact of the new addition and also the value or revenue generated by the new business, customers can determine the best, most profitable way to incorporate the new volumes.
  - Furthermore, this analysis is also important to determining the optimum service level and cost model for the new addition. A logistics service provider will want to use this
analysis to determine the best offering (price and service) to make to the new customer.

- Sustainable Network Design
  - LCC enables the simulation of operations and analysis of current environmental impact, helping to determine policies to improve the sustainability of the supply chain.
  - Both the cost and the environmental impact of different network configurations, such as alternate route and transportation mode options, can be evaluated. Appropriate policies to improve sustainability can be determined and incrementally introduced in the operational environment as appropriate.

**Predictive Analysis**

The need to better understand and design the logistics network for the future evolution of the network is important to most organizations. This can be achieved using LCC in two ways. One approach is to use forecasted demand to analyze the network operations. Another is to use predictive analytics techniques to project future volumes, network capacities, costs, etc, and conduct the analysis on this basis. Logistics-specific predictive techniques will be delivered as part of the array of tools available in LCC.

Another consideration is to use this type of scenario analysis to shape and set future budgets. An accurate picture of actual network operations can be gained using predictive scenarios which can then form the basis of a reasoned budgetary analysis. By taking the ongoing operational data from Oracle Transportation Management, LCC can then be used to compare budgeted versus actual costs.

**Operational Scenario Management**

Operational scenario management involves analyzing multiple transportation options for the current logistics demand and determining the optimal approach. Typically, operational systems present the user with a single shipment plan based on a single objective – usually to minimize costs. Oracle In-Memory Logistics Command Center allows analysis, within the context of the daily business process, of different logistics strategies simultaneously for the same operational data to determine what the best strategy is today. This provides a new way to optimize operations that is simply not available from any other vendor. Executing the resulting solution typically requires little to no network change while providing significant savings over current operations.

We describe some of these scenarios below.

**Constraint Analysis**

Not all constraints in the network are necessarily hard constraints, and yet, they could restrict the resulting solution in a significant manner. For example, an order time window could be violated by a few minutes and, as a result, a much better consolidated shipment would be possible. Similarly, extending a location’s receiving or shipping window, if flexible, may lead to a much better solution. Typical operational systems however will view these constraints as fixed and thereby produce a sub-
optimal solution as a result. Similar opportunities exist with other constraints such as carrier capacity, mode compatibility constraints, etc.

What if the customer instead had the power to evaluate multiple solutions side by side, flexing some of these constraints on-the-fly, and could then decide how to enforce these constraints to yield the best solution? Better yet, what if the system could actually tell you which of the constraints should be flexed, and in what sequence, and how much could be saved as a result? The computational power Oracle Engineered Systems enables the users of LCC to simultaneously evaluate multiple strategies and, having selected the best one, to deploy it into the operational environment for execution.

Planning Algorithm Evaluation

In a typical implementation, the planning approach, with its associated algorithm choices and parameter settings, is tuned based on a sample data set. Once a suitable set of choices are made, they often stay constant over the life of the deployment, even if the operational environment has evolved. As a result, these settings quickly become stale as the network changes, as demand fluctuates and as business conditions evolve. By contrast, LCC can run and evaluate multiple algorithm choices and settings simultaneously to determine which are optimal for today’s operation. Furthermore, multiple solutions can be analyzed using different objectives – least cost versus best service versus maximum vehicle utilization versus minimal environmental impact, etc – to determine which logistics strategy should be executed today. The simultaneous optimization of scenarios based on different objectives would be infeasible without the extreme performance of Oracle Engineered Systems.

Operational Network Choice Evaluation

These scenarios involve evaluating multiple network choices during the operational process to determine what strategy is best for today’s demand. The power of LCC can be used to determine the impact of choosing one network path over the other, for example:

- Routing certain orders through non-standard/optional sea ports and/or airports
- Dynamically evaluating the results of preferring certain modes or carriers
- Changing certain order priorities on-the-fly to impact shipment consolidation

While there are some similarities with the strategic network design scenarios, the concept here is to evaluate multiple network choices at the operational level based on today’s data and within the confines of the operational flexibility provided within the current network. This approach allows for the simultaneous dynamic evaluation of multiple operational scenarios, determining the optimal solution for what will work best today. This contrasts with tools available from other vendors where multiple network choices are evaluated and only one, potentially sub-optimal, solution is provided.

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

Oracle Exalogic Elastic Cloud Introduction

Oracle Exalogic Elastic Cloud is an Oracle Engineered System on which enterprises deploy Oracle business applications, Oracle Fusion Middleware or third-party software products. Exalogic comes pre-built with compute nodes, memory, flash storage and centralized storage, all connected using InfiniBand in a high redundancy architecture delivering five-nines availability, with fault tolerance and zero-down-time maintenance.

Exalogic dramatically improves performance of Oracle Applications, Fusion Middleware and 3rd party applications without requiring code changes and reduces costs across the application lifecycle, from initial set-up to on-going maintenance, as compared to conventional hardware platforms. Oracle has made unique optimizations and enhancements in Exalogic firmware, Exalogic software, and in Oracle’s middleware and Oracle applications. These include on-chip network virtualization based on near zero latency InfiniBand fabric, high-performance Remote Direct Memory Access, workload management in Oracle Weblogic server and optimizations in Oracle Coherence and Oracle Traffic Director. Exalogic includes support for a highly optimized version of the Oracle VM, which significantly outperforms comparable virtualization solutions and is an ideal consolidation platform for Oracle Applications. Templates to simplify install, deployment and configuration of Applications on Exalogic are available.

Oracle Exadata Database Machine

Oracle Exadata Database Machine is Oracle’s database platform delivering extreme performance for database applications including Online Transaction Processing, Data Warehousing, Reporting, Batch Processing, or Consolidation of mixed database workloads. Exadata is a pre-configured, pre-tuned, and pre-tested integrated system of servers, networking and storage all optimized around the Oracle database. Because Exadata is an integrated system, it offers superior price-performance, availability and supportability. Exadata frees users from the need to build, test and maintain systems and allows them to focus on higher value business problems.

Exadata uses a scale out architecture for database servers and storage. This architecture maintains an optimal storage hierarchy from memory to flash to disk. Smart Scan query offload has been added to the storage cells to offload database processing. Exadata implements Smart Flash Cache as part of the storage hierarchy. Exadata software determines how and when to use the Flash storage for reads and write as well as how best to incorporate Flash into the database as part of a coordinated data caching strategy. A high-bandwidth low-latency InfiniBand network running specialized database networking protocols connects all the components inside an Exadata Database Machine. In addition to a high performance architecture and design, Exadata offers the industry’s best data compression to provide a dramatic reduction in storage needs.
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.

Oracle Engineered Systems and Oracle In-Memory Logistics Command Center

As noted previously, unlike other network solvers that operate on aggregated and simplified models of the logistics network and employ high-level estimates of cost, Oracle In-Memory Logistics Command Center (LCC) simulates the impact of scenario changes on the logistics network by using a detailed representation of the operational environment complete with the actual network configuration, actual constraints and actual costs. It does this by running the same operational solves that are employed in the operating environment. This presents special challenges for both strategic and operational scenario management.

Strategic scenario management entails analyzing the impact of scenario changes over long horizons—typically over months and years. Indeed, multiple scenarios and response strategies will need to be tested simultaneously to determine the optimal response policies. Each such scenario will require running many daily or weekly operational plans over long time horizons and collating the results into appropriate analytics for easy analysis by the user. There are several challenges here. First, each
scenario will have different changes to the network configuration and will need to be represented accurately in its own workspace so that the appropriate operational solves can be run. Also, multiple scenarios will need to be executed simultaneously requiring many different computationally-intensive algorithms to be executed in parallel. Further, analytics involving summarizing the solution into visual representations of multiple metrics needs to run in near real-time.

Operations scenarios management requires that for each daily or weekly operational demand, or set of orders requiring a logistic plan, multiple scenarios involving changes to network configurations or plan-objectives need to be analyzed simultaneously and the resulting solution presented in proper detail for the user or the system to determine the optimal one and deploy for execution. While the time horizons here are shorter, there may very well be more detailed scenario changes and possibly multiple iterations before the appropriate solution to deploy is chosen. Also, the need for extreme performance enabling seamless integration into the daily operational process is crucial.

All this requires both extreme memory and data management and extreme performance to execute the analysis in appropriate timeframes. Only Oracle Engineered Systems provide a unique platform for these requirements.

The powerful combination of Oracle WebLogic, tuned to run faster on Exalogic, communicating via InfiniBand to the Oracle In-Memory Logistics Command Center database on Exadata, using the Smart Scan and Flash Cache capabilities, yields unprecedented performance gains in runtime for these operational solves. Oracle Exalogic and Exadata enable this industry-leading performance through vertical integration between hardware and software and the elimination of I/O bottlenecks through Exabus technology.

The use of InfiniBand as the networking fabric within Exadata ensures the lowest latency for messages and the highest bandwidth for data transfers. The Exadata Smart Scan capability speeds up the data-intensive queries of the transportation planning process by leveraging the processing power of Exadata Storage Servers to scan and filter out results. By moving queries to storage instead of moving the data to the database servers, long-running order, rate and itinerary queries often complete 10 times faster than on conventional systems.

The Exadata Smart Flash Cache capability uses Flash memory to dramatically reduce the time to read and write database records. The intelligence in Smart Flash Cache transparently moves active database blocks from disk to Flash in real time, thus ensuring that "hot" data, such as rates and itineraries, is in Flash memory when the next access occurs. Blocks that should not be in Flash are similarly recognized, which maximizes the amount of space in Flash for active data.

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

LCC uniquely provides the ability to configure the application components to use one thread or hundreds of threads. On traditional platforms, scaling applications to this high level of threading typically exposes the bottlenecks in the infrastructure. Networks become flooded, disk access grinds
the system to a halt, and thread context switching overhead is exposed. This is not the case on the Oracle Exalogic and Exadata platform. When Oracle developers tested LCC performance on the Oracle Exalogic and Exadata platform, the multi-threaded processing did not expose any bottlenecks in the infrastructure, but instead pointed to contention in java and application code. Oracle developers made some code improvements to LCC and to jRockit as a result of this performance testing on the Oracle Exalogic and Exadata platform. They eliminated contention from these highly threaded conditions, bringing simultaneous operational solve performance on the Oracle Exalogic and Exadata platform to levels never achieved before on other platforms.

Benefits of Oracle In-Memory Logistics Command Center

At the macro level, Oracle In-Memory Logistics Command Center (LCC) provides companies with a means to quickly analyze and improve logistics network performance, both in the short term and in the long run. From a benefit quantification standpoint, this could translate into higher EBIT margin, improved delivery performance (On-time and In-full), and increased inventory turns. In “Next-Generation Supply Chains: Efficient, Fast and Tailored”, PwC summarizes the results of their 2013 Global Supply Chain Survey. Based on the responses from over 500 executives across the globe, they documented the potential benefit improvement percentages by being a “supply chain leader” in the graphic below (see figure 2)

![Figure 1: Companies that focus on improving their supply chain performance consistently outperform their peers financially](chart)

To drive these improvements in profit, service and costs, the following are examples of specific benefit levers enabled by LCC.

Build a Resilient Supply Chain

---

The ability of LCC to analyze a variety of supply chain risk management scenarios allows the customer to build resilience into their supply chain. Whether planning for network disruptions, fuel or cost risks, supplier or service provider risk or any of the other risk management scenarios (see figure 3 below from a recent Booz Allen Hamilton study⁴), LCC can determine the impact on the logistics network of each of these risks and determine the optimal response strategies to minimize disruption.

A critically important aspect of the approach employed by LCC is to analyze the impact using real-world data and operational solves, leading to strategies that are readily implementable when needed. Even more important is the ability to perform this multi-scenario analysis in a rapid manner. The more high-quality scenarios that can be reviewed in a rapid manner, the better the likelihood of minimizing disruptions.

The ability to prepare for and respond quicker to supply chain disruptions will go a long way towards increasing profit and customer service, while minimizing non-value-add logistics costs.

Figure 2: Greatest supply chain risks to organizations

Improve Supply Chain Agility

The ability LCC provides to simulate network performance under various strategic and operational scenarios helps determine the best way to adapt the supply chain to these potential changes. This results in improved operational agility, responsiveness, and quicker time to market. For example, imagine if the output of a monthly sales and operations planning process reveals a 20% increase in demand next quarter due to a new product introduction. Wouldn’t it be advantageous to analyze the impacts of the demand increase across your logistics network to identify and adapt to anticipated carrier capacity bottlenecks, cost spikes and service level issues? Another example would be changes to your key supplier base locations and/or off-shore vs. near-shore manufacturing evaluations.

With its various capabilities for scenario management and logistics-specific predictive analytics, LCC can assist in the design and structure of the logistics network for future evolution of the network. This

---

can be a particularly useful benefit when determining future budget impacts, evaluating merger/acquisition opportunities, or customer/channel profitability.

Maximize Business Advantage and Improve Competitiveness: Operational Excellence

Determining the best logistics strategy – based on both strategic network design and by evaluating multiple strategies during daily execution – can ensure that the logistics network always operates in a manner designed to maximize business advantage, whether that be to reduce cost, maximize profit, optimize service, or meet some other business objective. Imagine the potential of being able to take tomorrow’s logistics/transportation requests, create multiple plans based on cost minimization or service maximization, and make actionable decisions based on corporate objectives (both long and short term). Examples include:

- Relaxation of logistics constraints (such as equipment capacities or delivery windows) in a transportation plan in order to lower overall costs at the end of a fiscal reporting period
- Creation of transportation plans that focus on customer service levels and on-time delivery, instead of costs, after a new high-value customer has been added to the supply chain.

With this unique approach, LCC enables the logistics network to be structured such that it operates in the most efficient manner possible, leading to strongly differentiated capability and distinct competitive advantage.

Build a Sustainable Supply Chain

By accurately simulating logistics network operations under different scenarios, LCC allows the quantification of the environmental impact of logistics operations and aids in the determination of strategies to build a sustainable supply chain. This allows companies to identify suitable sustainability policies that can be implemented and incrementally introduced into the operational environment as needed.

Not only does sustainability help protect the environment, it also enables brand protection, introduction into new markets with eco-friendly goods, cost reductions, and the ability to comply with increasing government regulations. In the graphic below, from an October 2012 Accenture Outlook article4 called “Why a sustainable supply chain is good business”, both short-term and long-term value from improved sustainability programs have been identified.

---

The sustainability payoff

By working with their suppliers to develop a more sustainable supply chain, companies can cut costs, manage risks better, generate new sources of revenue and boost the value of their brand.

Drive New Revenue and Improve the Top-line

By employing LCC to analyze how best to leverage synergies with the existing network, companies can determine the business impact of adding new customers and new businesses to the network. Also, adding incremental demand and volume, may present opportunities to expand current distribution networks, introduce new modes, establish new service lead-time policies, or create supplier backhaul programs, all while evaluating the impact to customer service and the bottom line. This ability to analyze the impact of new customers and identify which ones would be profitable helps expand revenue sources and positively impacts the top-line.

Lower Total Cost of Ownership

Gartner attributes 71% of a system’s total cost of ownership to staffing (people who maintain systems) and implementation (people who build and deploy systems). Oracle Exalogic and Exadata provide dramatically reduced total cost of ownership by reducing the amount of work that people have to do. This allows organizations to focus their limited resources on activities that contribute to the top-line revenue.

---

5 Philip Winslow, “Dr. Exalove: How I Learned to Stop Worrying (about Sun) and Love Exalogic Too,” Credit Suisse, Nov. 23 2010
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.
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.

Faster Time to Value

LCC has 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 highly accelerated implementations because the In-Memory products were built only for the targeted platform and take 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 cohesive solution, reducing overall cost of deployment and ownership.

In traditional implementations, Oracle software applications are installed and configured on a customer selected hardware system, and the time taken to install, tune and tailor the solution 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 two solution elements. This time delay has a direct cost in terms of the required work effort to “tune” the hardware-software solution in addition to an opportunity cost in terms of delayed benefit realization. In addition, there is the risk of not achieving the optimal hardware-software configuration, which may result in subpar performance and additional costs and time delays associated with revising the hardware components. Deploying LCC on Oracle Engineered Systems provide a highly valuable alternative.

Oracle Engineered Systems reduce the time-to-value and implementation cost for the business. LCC requires shorter deployment and configuration times when using Oracle Engineered Systems since it will be available as an Oracle Virtual Machine (OVM) template. These OVM templates 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, LCC, 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.

Conclusion

Strategic and operational scenario management is central to creating a robust, resilient and profitable logistics network. Unlike other solutions that utilize highly simplified models of the network, Oracle In-Memory Logistics Command Center takes a powerful and more effective approach to strategic and operational scenario management. Oracle In-Memory Logistics Command Center (LCC) is the only product available that utilizes the power of Oracle’s Engineered Systems and leverages the best-in-class logistics platform of Oracle Transportation Management. LCC uniquely determines optimal logistics strategies by simulating actual operations using detailed operational data about the network. This allows for an accurate representation of the results of each scenario and for a realistic analysis that yields implementable response policies. The benefits of this new approach to logistics networks scenario
management include: increased supply chain resiliency and agility, cost and service improvements through operational excellence, improved profitability, and achievement of higher levels of supply chain sustainability.