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Oracle Exalytics In-Memory Machine: Enterprise Planning without Constraints
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Executive Overview

Global recession, erratic growth and recovery, and market volatility all make accurate planning and forecasting extremely challenging. In response, organizations are adopting several best practices to help meet their planning challenges, including enterprise planning across all lines of business, dynamic planning and the use of rolling forecasts, and aligning financial and operational planning. Two way flows are created between the financial targets and operational metrics, for example, to ensure alignment. The result of these practices is a large volume of users using large amounts of information demanding high performance.

However, traditional planning systems often impose constraints on these processes and create problems around data volumes and granularity, responsiveness, and dynamic scenario modeling. This paper reviews how Oracle Exalytics In-Memory Machine combined with Oracle Hyperion Planning changes the game and delivers on today’s planning realities. Consider the following results from early customer benchmarks:

- 5X to 100X faster interactivity, leading to better decisions and accuracy
- 6X to 10X faster planning cycles
- 5X reduction in server footprint, resulting in lower TCO

Deploying Oracle Hyperion Planning on the Oracle Exalytics In-Memory Machine allows organizations to address a new range of planning and forecasting challenges. The Oracle Exalytics In-Memory Machine provides the ability to increase the velocity of planning and forecasting processes, while enabling planning in more detail and for more users across the organization. This solution enables organizations to extend planning beyond Finance, run more complex planning models, and significantly improves business agility.

Oracle Exalytics In Memory Machine also simplifies IT system infrastructure. Where complex and enterprise-wide planning deployments can require multiple platforms and many servers, Oracle Exalytics In-Memory Machine can support a large user footprint across one or several planning applications on a single server platform – saving IT costs and resources.
Oracle Engineered Systems

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

The Oracle Exadata Database Machine is purpose built to run the Oracle Database. It is engineered to be the highest performance and most available platform for running the Oracle Database. Built using industry-standard hardware from Sun, and intelligent database and storage software from Oracle, the Exadata Database Machine delivers extreme performance for all types of database workloads including Online Transaction Processing (OLTP), Data Warehousing (DW) and consolidation of mixed workloads. The Exadata Database Machine is an easy to deploy system that includes all the hardware needed for running the Oracle Database. The database servers, storage servers and network are pre-configured, pre-tuned, and pre-tested by Oracle. All Exadata Database Machines are identically configured so customers benefit from the experience of thousands of other users that have deployed the Exadata Database Machine for their mission critical applications. The Oracle Exadata Database Machine runs the standard Oracle Database. Therefore, any application that runs with the Oracle Database today can be seamlessly migrated to the Exadata Database Machine with no changes to the application.

Oracle Exalogic Elastic Cloud

Oracle Exalogic Elastic Cloud is a datacenter building block designed to allow enterprises to rapidly deploy and provision mission-critical, high performance private and public clouds. Exalogic is an Engineered System, integrating compute, networking and storage hardware with virtualization, operating system and management software. Exalogic provides breakthrough performance, reliability, availability, scalability and investment protection for the widest possible range of business application workloads, from middleware and custom applications to packaged applications from Oracle and hundreds of third party vendors.

Oracle 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 Exalytics

Oracle Exalytics is an engineered system for analytics delivering speed of thought performance and best visual analysis with no limits. It consists of a combination of a powerful hardware platform, Oracle BI Foundation Suite (OBI EE & Essbase) and In-memory Analytics software (Times Ten for Exalytics and Adaptive In-memory Tools). OBI EE, Essbase and Times Ten for Exalytics have all been adapted from their standalone state, and enhanced to run faster, more effectively and more efficiently upon the Exalytics platform.

The New Reality of Enterprise Planning

Handling Higher Market Volatility

The planning environment has changed considerably for most organizations in today’s global economy. Global recession, erratic growth and recovery, market volatility all make accurate planning and forecasting a challenging process. In fact, in a 2010 survey by CFO Research Services, 40% of respondents indicated they could only reliably forecast results 1 – 3 months in advance. This is a key sign that market volatility is impacting the ability of businesses to forecast and plan their resource allocations more than a quarter into the future.
Delivering Predictable Performance

The volatile business environment is causing corporations worldwide to refocus on their business processes and reinvent the role that finance teams play within organizations. Much of this refocus is on making better and more agile business decisions driven by actionable, accurate and timely information, with the intent to create more predictable results and measurable business value.

While organizations cannot control the macro-economic attributes influencing their decisions, they are certainly focused on reinventing their planning and forecasting process to be more responsive, anticipating uncertainty and hedging against risks. By embedding more accurate information and creating agility within their core operational and financial processes, businesses can improve their ability to execute on critical decisions across the enterprise.

Exploiting the ‘Wisdom of Crowds’

One way organizations are achieving agility is to get more business users involved in their planning processes and building financial plans based on operational intelligence from various lines of business (LOBs). It is widely recognized that LOB managers and operational staff need to be actively involved in planning and forecasting, as they have the knowledge and a detailed understanding of what is actually happening in the markets where they operate. Such operational plan information is vital if organizations are to develop financial plans and forecasts that they can predictably deliver on. This practice is often described as tapping into ‘the wisdom of crowds’. The resulting scenario is a large volume of users across many LOBs developing financial plans based on detailed operational plans, using large amounts of information, and thus demanding higher performance and scalability from the planning systems.

Figure 1: Expanding Planning and Forecasting Across the Enterprise
Adopting Driver Based Rolling Forecasts

To be truly agile, organizations need to be able to ‘plan @ the speed of business’ which means they always need to be ready to re-forecast, and they need to be able to develop the new forecasts very quickly. Many organizations are reducing reliance on the annual budget, and are leveraging best practice methodologies like driver based rolling forecasts to keep pace with their business. Key operational metrics relevant for the operational plans are used as drivers to quickly calculate and allocate financial values, thereby reducing the need for time consuming, detailed input based plans.

Performing rolling forecasts on a monthly basis, with large numbers of users across the enterprise is almost impossible with spreadsheets, and can often stretch the limits of many planning and budgeting applications.

Figure 2: Adopting Planning Best Practice – Rolling Forecasts

Traditional Planning Systems Impose Constraints

Traditional planning processes and systems are not delivering on these new realities of enterprise planning. The results from the Dynamic Markets study for Oracle in 2011 show this clearly with respondents’ answers to problems they encounter with their current planning processes and systems. In fact a staggering 95% said they encountered problems, especially around data, timeliness and analyzing different scenarios.
Figure 3: The Problems Encountered with Planning

These types of issues can often be traced back to systems and software constraints, specifically the lack of scalability which leads to fragmentation of both systems and processes.

When organizations try to extend the reach of planning to more users, and create more detailed driver based rolling forecasts, the cracks start to appear. Without a truly scalable, centralized approach, the tendency is to fragment systems even more to ensure performance for the larger numbers of users and to support the increased complexity of planning models. While this may provide some performance relief, it creates a raft of new problems around standardization of data and integration of disparate systems to enable the overall planning process across the enterprise. Each time an update to the forecast is required, the results need to be calculated and consolidated across multiple applications. This result is delay and errors – exactly the opposite of what is required.

Source: Performance Management: An Incomplete Picture. Study carried out by Dynamic Markets for Oracle Corporation, April 2011
Figure 4: For most Organizations Planning is a Fragmented Process

As can be seen from the results of the study previously discussed, a fragmented approach to planning prevails with only 11% of the respondents having specialized planning software that covers all the aspects of planning. Fragmentation typically leads to wasted resources in terms of hardware investments and IT staffing, and results in substantially higher costs of ownership.

While some organizations deal with fragmented approaches, others choose to oversimplify their planning processes in order to stay within the constraints imposed by their systems. They limit participation in the planning process just to finance users, for example, to stay within the user scalability limits of the system. Or, defer the adoption of best practices such as driver based planning or scenario modeling, in order to avoid the increased complexity. Such trade-offs lead to sub-par business performance over time.

Planning at the Speed of Business with Oracle Exalytics

What’s needed to deal with today’s more rigorous requirements is a centralized solution that addresses corporate planning and forecasting, as well as the unique needs of the individual lines of business. This solution needs to be responsive, scale to thousands of users, and deliver rapid time to value.

As analytic applications become more sophisticated and calculation-intensive, the use of mobile BI expands, user adoption increases, and data volumes explode, making the need for speed and efficiency more important than ever. In-memory technology can dramatically accelerate analytic performance. Oracle Exalytics In-Memory Machine is the industry’s first engineered system for analytics that combines market leading BI foundation, in-memory analytics software, and best-in class hardware engineered and optimized to work together to deliver extreme performance for Business Intelligence.
and Enterprise Performance Management applications. As a result, users can visually navigate and drill into information at the speed of thought, without limits on the complexity of their questions or the volume of the underlying data. Exalytics drives a new class of smarter and more powerful analytic applications that simply weren’t possible using conventional BI software and generic hardware configurations.

Oracle Business Intelligence Foundation running on Oracle Exalytics has been specially enhanced to take advantage of large memory, processors, concurrency, storage, networking, operating system, kernel, and system configuration afforded by the Oracle Exalytics hardware. Oracle TimesTen for Exalytics has been specially enhanced for analytical processing at in-memory speeds. With lightening fast scan speed of up to 100 million rows/second and up to 10x columnar compression, TimesTen for in-memory analytics delivers faster reports & dashboards for departmental as well as enterprise wide consumption.

This provides the unique ability to offer organizations a single, complete hardware and software solution for enterprise-wide planning and forecasting. The Oracle solution is centered around two key components; the Oracle Exalytics In-memory Machine and Oracle’s Hyperion Planning solution.

Oracle Hyperion Planning leverages the capabilities of the Oracle Exalytics In-Memory Machine and provides an integrated solution for financial and operational planning processes. Leveraging the power of Oracle Essbase, the market-leading OLAP server, Oracle Hyperion Planning solution provides many pre-built features, as well as a common web interface, workflow and process management to help streamline the planning, budgeting and forecasting process.

Oracle Hyperion Planning includes core financial budgeting and planning functionality as well as purpose-built modules for workforce planning, capital expense planning and project financial planning. The modules can be easily configured to address specific planning requirements and integrated with
operational planning applications like Oracle Value Chain Planning, as well as third party sales and operations planning systems.

Taking advantage of the capabilities of Oracle Exalytics In-memory Machine, Oracle Hyperion Planning provides a number of unique capabilities and value for customers:

Financial Planning at the Speed of Business

With Oracle Exalytics In-memory Machine, financial planning “at the speed of business” becomes a reality. Speed of business refers to the agility of the solution being in line with the fast business decision needs. Early adopter customers have seen 6X to 10X faster planning cycles, with huge gains in response time. Faster Oracle Essbase query time and Oracle Exalytics In-Memory Machine focused optimization of parallel and concurrent operations, combined with enhanced MDX syntax have been shown to deliver 16x faster query execution and 6x reductions in write-back and calculation operations, including batch processes. This brings significant throughput benefits for agile modeling, planning and forecasting using Oracle Hyperion Planning.

Moreover, with grids retrieving data and finishing calculations so rapidly that they refresh new data even while the user feeds the next filter criteria, Exalytics provides a lightning-fast actionable forecasting framework for users of the planning solution.

![Figure 6: Oracle Exalytics In-Memory Machine User Loading and Transaction Throughput Shows Significant Performance Improvement over more traditional solutions](image)

**Key Observations (figure 6)**
- The baseline was able to scale up to 15-20 CPUs and then throughput dropped
- Oracle Exalytics In-Memory Machine scales perfectly to all available CPUs and then throughput stays flat with increasing load
Extending Planning Across the Enterprise

Oracle Exalytics In-Memory Machine enables the extension of planning beyond finance into every LOB, leading to improved information accuracy and informed decision making at all levels of the business. Examples of the types of line of business planning that can be supported more easily with Oracle Hyperion Planning running on Oracle Exalytics In-Memory Machine include:

- SKU level forecasting in Consumer Packaged Goods (CPG)
- Daily product by store level forecasting in Retail
- Clinical Trials results forecasting in Health Sciences
- Financial Instrument level planning in Financial Services
- Customer Churn and Product Affinity Analysis in Telecommunications
- Smart Meter Data Analysis and Energy Usage Forecasting in Utilities

Figure 7: Oracle Exalytics In-Memory Machine Can Support Large Numbers of Concurrent Planning Users Without Any Appreciable Increase in Response Times

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<th>Total Response Time in Seconds</th>
<th>Typical Number of Concurrent Users</th>
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</table>

Figure 7: Oracle Exalytics In-Memory Machine Can Support Large Numbers of Concurrent Planning Users Without Any Appreciable Increase in Response Times

Key Observations (figure 7)
- Oracle Exalytics In-Memory Machine shows a 5x response time improvement under load

Users of Oracle Exalytics In-Memory Machine also benefit from better visualization and the ability to quickly see the impact of business decisions on projected financial results. In fact, early adopters have realized significantly higher productivity and faster interactivity (5X to 100X faster). They are also able
to make better decisions due to increased ease of use capabilities, including detailed variance analysis by finance and LOB users, timely impact analysis and scenario modeling, and insight into root causes and trends.

Figure 8: Oracle Exalytics In-Memory Machine Delivers Visualization Without Limits

The integrated Business Intelligence Foundation Suite (BIFS) on Oracle Exalytics In-Memory Machine enhances forecast accuracy with an out of the box ability for guided analytics and rich visualization.

Simplifying Administration and Lowering Costs

Oracle Exalytics In-Memory Machine can also simplify IT system infrastructure. Whereas complex and enterprise-wide planning deployments can require multiple platforms and many servers, Oracle Exalytics In-Memory Machine can support the consolidation of multiple planning and reporting applications on a single server platform – saving IT costs and resources.

Figure 9: Oracle Exalytics In-Memory Machine Simplifies System Infrastructure
As an engineered appliance, Oracle Exalytics In-Memory Machine requires no hardware specific application redesign and tuning. Existing applications based on Oracle Hyperion Planning can be deployed without any significant design changes. Hence Oracle Exalytics In-Memory Machine provides a ready platform to implement Oracle Hyperion Planning applications with no additional learning curves for functional users or application designers, while providing all the benefits of agile planning mentioned above.

Benchmark tests have shown that Oracle Exalytics In-Memory Machine can dramatically improve the response time and significantly increase the throughput of a typical Oracle Hyperion Planning application. Below is a summary of some of these extreme performance results.

| ORACLE EXALYTICS IN-MEMORY MACHINE DELIVERS MULTIPLE BENEFITS FOR PLANNING USERS |
|----------------------------------|----------------------------------|------------------|
| BENEFIT                          | CAPABILITY                       | IMPROVEMENT METRICS |
| Faster, more accurate plans      | Faster information retrieval within forms and grids | 5x improvement in response time |
|                                  | Managing large number of users   | 7x reduction in CPU usage |
|                                  | Managing larger grids            | 2x improvement in parallel data load |
| Dynamic forecasts                | More frequent and dynamic updates of dimension members | 7x faster cube rollup cycles |
|                                  | Faster aggregations              | 5x acceleration in cube restructuring |
|                                  | Ability to build larger sized applications | |
| Increased capacity for complex calculations | More accurate representation of information for data entry | 93X faster MDX queries |
|                                  | Faster data retrieval time with larger sets of dimensions | 15X faster interactive calculations |
|                                  |                                    | 20x improvement in performance |
|                                  |                                    | ½ the CPU usage |
| Improved data backup and recovery | Faster backup                     | 10x improvement in parallel data export |
|                                  | Faster restore                    | |
| More detailed analysis of larger data sets | Embedded analytics | 3x throughput increase in MDX queries in ASO cubes |
|                                  | Create larger reporting cubes for analysis | 3x improvement in MDX queries with dynamically calculated members in ASO cubes |

Figure 10: Improvements with Oracle Exalytics In-Memory Machine
Oracle Exalytics Turns Planning into a Competitive Advantage

Competing in today’s global economy requires an enterprise-wide approach to planning and budgeting, and the ability to respond quickly to changes in the environment through frequent re-forecasting of results. Organizations can no longer rely on corporate finance staff or divisional financial analysts to provide updated planning assumptions, and many are now extending the planning process to include active participation by sales, marketing and other line of business managers.

The combination of Oracle Exalytics and Oracle Hyperion Planning provides a scalable and responsive solution for detailed, enterprise-wide planning, budgeting and forecasting that meets the needs of today’s environment. Each of the planning modules targets a specific set of requirements, and they work together to enable the alignment of strategic, financial and operational planning and forecasting. The Oracle Exalytics In-Memory Machine provides an engineered systems platform that scales to thousands of users and provides advanced visualization capabilities for rapid data discovery, analysis and planning.

The combined solution allows organizations to plan with agility to navigate market volatility. Planning and reporting cycles are shortened to support daily or intra-day planning and reporting. More granular planning and forecasting models are supported, and the ability to leverage the wisdom of crowds helps drives planning and forecasting across the enterprise. The solution is deployed quickly and efficiently, resulting in a faster time to value and lower total cost of ownership. In summary, Oracle Exalytics In-Memory Machine enables organizations to truly plan at the speed of business and turn planning into a competitive advantage.
Appendix

The benchmarks quoted in this whitepaper use an Oracle Exalytics In-Memory Machine running Oracle Essbase 11.1.2.2.000 which is part of Oracle Business Intelligence Foundation Suite 11.1.1.6.

### HARDWARE AND SOFTWARE SPECIFICATIONS

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<th># CORES PER SOCKET</th>
<th>CPU SPEED</th>
<th>MEMORY</th>
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<td>Oracle Enterprise Linux</td>
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<td>Oracle Essbase</td>
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<td>Intel Xeon® 2.40 GHz processors</td>
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<td>Oracle Enterprise Linux</td>
</tr>
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**Benchmark Methodology**

The following methodology was used for the Oracle Hyperion Planning and Oracle Essbase benchmarking:

- An automation load-testing tool was used to generate multiuser workloads such as End-to-End Oracle Hyperion Planning, Oracle Essbase queries and interactive calculations. The Oracle Essbase command line tool was used for other test cases covering such admin-type routines as multidimensional database calculations, data load, export, and restructuring.

- Multiuser workloads were executed in synchronous mode using rendezvous points and fixed think times in front of each action or in asynchronous mode using mixed scenario without any synchronization and think times.

- In multiuser workloads the analysis collected Number of Users, Total Transactions, Transaction Response Time, CPU and memory usage for Oracle Exalytics In-Memory Machine for each individual process.

- In single-user admin workloads, the analysis collected elapsed time and also process CPU and memory usage for Oracle Essbase.