



An Oracle White Paper  
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# Exalogic: The Optimal Platform for ATG

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## Executive Summary

Increasing conversion rates in an ever-more competitive eCommerce environment is critical to ensuring success in a fragmented and global eCommerce landscape. With a median conversion rate of 2.46% among those in the 2011 Internet Retailer Top 500 Guide<sup>1</sup>, there is a business imperative to grow conversion rates without sacrificing margins. Oracle's engineered system (hardware and software optimized to work together) for Oracle ATG Web Commerce is the Exalogic Elastic Cloud and it can increase conversion rates by improving ATG performance 3x over ATG's already industry-leading baseline performance on a traditional hardware/software stack. For an average member of the Internet Retailer 500, an additional 5% in revenue due to increased conversion rates could lead to \$64.7 million per year that would not otherwise be realized.

In addition to unbeatable performance leading to higher revenue, Exalogic allows ATG deployments to be brought to market faster than traditional systems. Exalogic contains everything needed for a new environment, with the exception of a database. Exalogic contains networking switches, storage, flash, RAM, and compute nodes, which are all pre-integrated and optimized to work together. Exabus (InfiniBand networking technology, related protocols, and Java APIs), connect all components within Exalogic, between different racks of Exalogic, and between Exalogic and other engineered systems from Oracle, like Exadata and Exalytics. Furthermore, the software on top of the hardware has been vertically optimized to work with other software as well as with the hardware inside of Exalogic on which it is running. New environments can be up and running in as little as a day<sup>2</sup> as opposed to the months it traditionally takes.

Finally, the total cost of ownership is dramatically reduced due to Exalogic's pre-integrated architecture, end-to-end vertically integrated monitoring (Oracle Enterprise Manager) and because ATG runs 3x more efficiently on Exalogic, you can eliminate 2/3 of the CPU cores, as compared to traditional systems. An example of how Exalogic reduces the total cost of ownership is in how patching is performed. All patches and firmware updates below WebLogic are provided in one certified update, similar to how hardware and software updates are all bundled in single iPhone updates. Gartner<sup>3</sup> estimates that staffing and implementation account for 71% of a system's total cost of ownership over five years. Exalogic and the integrated Oracle Enterprise Manager capabilities have been designed to significantly reduce this cost.

Together, these benefits come together to create an unparalleled platform for ATG.

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<sup>1</sup> <http://www.internetretailer.com/shop/2011-top-500-guide.html>

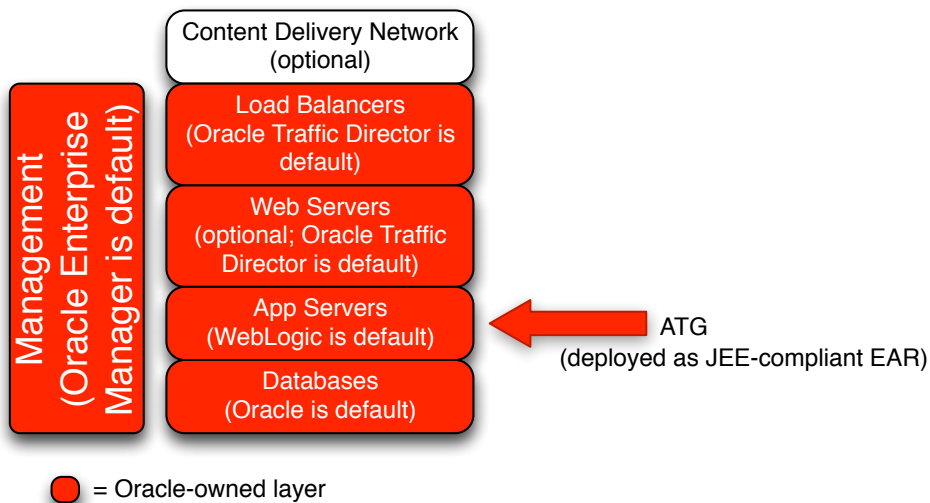
<sup>2</sup> <http://www.youtube.com/watch?v=aWHPC188tus>

<sup>3</sup> Philip Winslow, "Dr. Exalove: How I Learned to Stop Worrying (about Sun) and Love Exalogic Too," Credit Suisse, Nov. 23 2010

## ATG Introduction

Oracle ATG Web Commerce, or simply ATG, is Oracle's market-leading eCommerce solution. It consists of a robust development framework, built on a library consisting of over 10 million lines of Java code. On top of this framework is a set of pre-built functionality. ATG is primarily used for B2C commerce through the web channel but it may also be used for B2B and C2C across channels ranging from mobile to embedded video game consoles.

ATG uses a traditional tiered architecture, with a traditional relational database as the back-end.

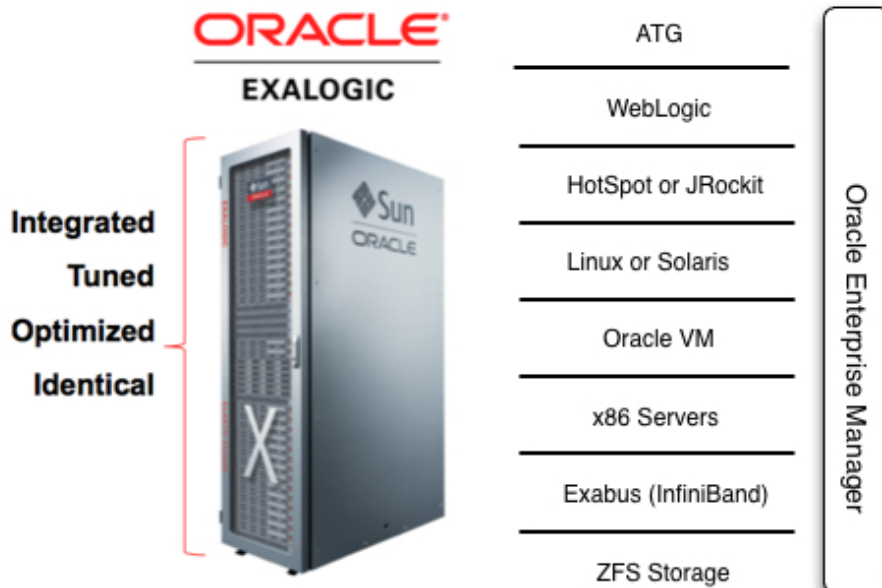


ATG is deployed in the most demanding of environments, with large configurations serving millions of end-customers concurrently and thousands of page views per second. All components in the stack are scaled horizontally and/or vertically, depending on what makes the most sense for a given use case. Bottlenecks in the system are most frequently due to I/O – both within a single JVM and when calling out to remote hosts. Exalogic eliminates these bottlenecks.

While the traditional deployment architecture that ATG uses has proven to be sufficient, Exalogic brings benefits that are substantially better and simply unachievable through other means.

## Exalogic Introduction

Exalogic is a rack-based system containing compute nodes (x86 servers), RAM, FlashFire SSD, and ZFS storage, all pre-integrated to work well together and connected using Exabus (InfiniBand networking technology and related protocols). Exalogic is available in configurations containing 48 CPU cores ( $\frac{1}{8}$ th rack), 96 CPU cores ( $\frac{1}{4}$ th rack), 192 CPU cores ( $\frac{1}{2}$  rack), and 360 CPU cores (full rack), with the ability to seamlessly link up to eight racks of Exalogic together using Exabus.



Each configuration of Exalogic contains the appropriate amount of RAM, SSD, and storage so that the system is “balanced” for optimal performance. Configurations below a full rack ( $\frac{1}{8}$ <sup>th</sup>,  $\frac{1}{4}$ <sup>th</sup>,  $\frac{1}{2}$ ) may be upgraded (e.g.  $\frac{1}{4}$ <sup>th</sup> to  $\frac{1}{2}$ ) without any downtime. Each configuration leverages the same physical rack.

Oracle Linux or Solaris 11 Express for x86 may be selected for the operating system, with each having been extensively tuned for the underlying hardware. Oracle Linux, like Red Hat Linux, is based on the Fedora Core codebase, so applications are likely to be highly compatible. Oracle’s JVMs (HotSpot and JRockit), Oracle WebLogic, Oracle Coherence, and many Oracle applications have been modified and tuned to transparently take advantage of the hardware and software below it in the stack. The additional changes and tuning are fully transparent, so no special knowledge or hotfixes are required. This vertical integration between software and hardware is part of what enables Exalogic to provide such exceptional performance for ATG. Similar gains can be realized in the database tier by using Exadata Database Machine, an engineered system optimized for OLTP and OLAP workloads.

A defining feature of Exalogic is the elimination of I/O bottlenecks through an I/O subsystem called Exabus. This subsystem is a collection of technology including InfiniBand switches, gateways, host channel adapters, firmware, device drivers, operating system extensions and software libraries.

Together, this technology allows the kernel and operating system’s TCP/IP stack to be bypassed (also known as Remote Direct Memory Access, or RDMA) for most inter-process communication. Within the same Java process, I/O bottlenecks are eliminated through extensive tuning at all layers.

Exalogic is engineered to be managed and monitored as one single stack. Oracle Enterprise Manager (for software) and Oracle OpsCenter (for hardware) allow comprehensive system-wide management because they were modified and configured for Exalogic. While Enterprise Manager and OpsCenter work well in a heterogeneous environment with non-Oracle products, they work especially well with Oracle products including Exalogic. Patching and other maintenance becomes a lot easier because

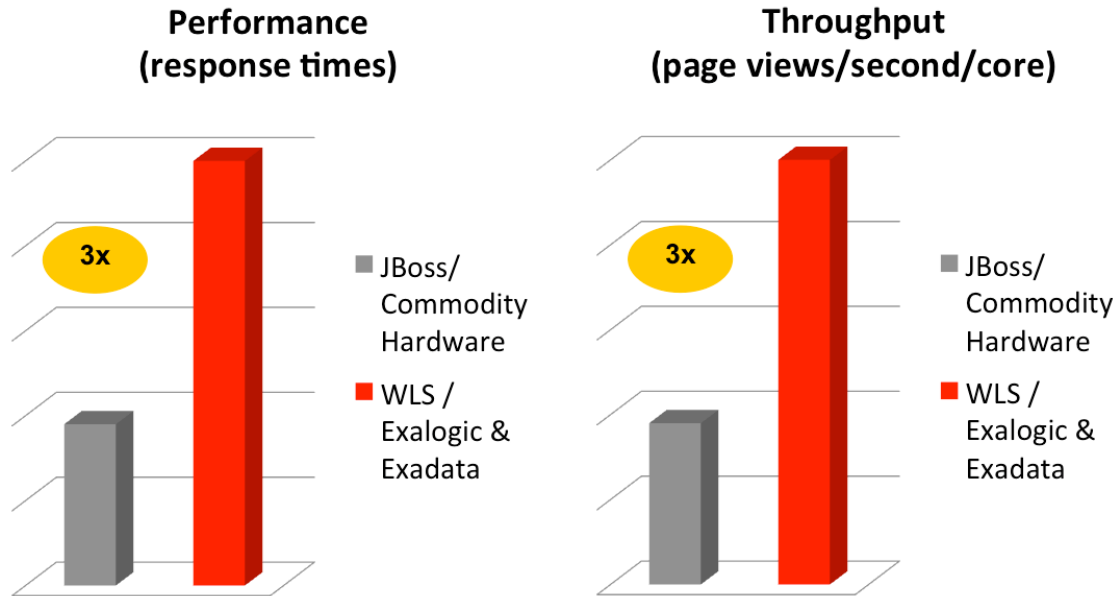
Oracle can provide single file patches (from storage to operating system) due to its knowledge of each system's configuration. With a finite and well-known number of system configurations, it becomes easy for Oracle to release consolidated patches. Finally, embedded hardware diagnostic capabilities allow for Exalogic to "phone home" to file Oracle Service Requests in the case of hardware failures. The integrated nature of Exalogic, the quality of the products on their own, and the value of the integrations between these best-of-breed products inside of Exalogic allows for unparalleled management, monitoring and ease of maintenance.

Internally, Oracle product engineering (including ATG) uses Exalogic for performance testing, QA testing, and other times when hardware is required. Oracle also uses Exalogic as the foundation for its Public Cloud. Exalogic is easy to set up and performs exceptionally well, which makes it optimal for an environment such as Oracle's.

## Benefit #1: Supercharged ATG Performance

While ATG is already recognized for excellent performance, Exalogic brings performance to a level that is unattainable elsewhere. ATG has been modified and tuned to take advantage of the hardware and software present in Exalogic, resulting in 3x better performance and 3x better throughput.

Extensive benchmarking has shown ATG's performance and throughput to be 3x better on Exalogic, WebLogic and Exadata when compared to traditional commodity x86-based blades, JBoss and a database running on commodity x86-based blades.



The absolute values for performance and throughput varied significantly based on the application, testing scripts, and testing methodology but the 3x better performance and 3x better throughput held consistent across all benchmarks.

Exalogic enables this industry-leading performance by its vertical integration between hardware and software, the elimination of I/O bottlenecks through its Exabus technology, and tuning/modifying ATG to fully utilize the entire Exalogic stack. For example, performance tuning showed that JSP page includes were causing contention, so ATG's code was modified to use faster Java APIs. In another example, Active GridLink for RAC, a component of WebLogic, is used to connect Exalogic to Exadata over an InfiniBand-based network with a throughput of 960 gigabits per second, as opposed to the traditional 1 gigabit per second. Bottlenecks have been entirely eliminated from the stack – not simply moved elsewhere. It is the elimination of bottlenecks that leads to such fast performance and high throughput.

## Benefit #2: Fast Time-To-Market

Exalogic can go from arriving at a loading dock to being available for an ATG production deployment in as little as a day<sup>4</sup>, as opposed to the months it traditionally takes to procure, set up, configure, and tune a traditional bespoke system. Because Oracle is responsible for connecting the storage, networking, compute nodes and all supporting software, on-site setup time is minimal. Oracle has invested significant resources to ensure that Exalogic arrives on-site ready to be plugged in, configured, and operational. Oracle has also performance tuned all software that sits on Exalogic so that it can be used to run ATG without further tuning.

Once Exalogic is running, Oracle Enterprise Manager can be used to automate ATG provisioning. Traditionally, application server instances have been statically provisioned by hand in a production environment, with an ATG EAR file being deployed to each application server instance. Exalogic's hardware resources can be provisioned in self-contained Oracle VM images using a dynamic or static provisioning model. With these models, various Oracle VM templates are configured to reflect each possible ATG instance configuration. Then using simple administration interfaces, ATG can be deployed on top of Exalogic hardware.

The benefit of Exalogic's fast time-to-market capabilities is that it allows organizations to focus resources on higher value activities, like improving a site's search engine optimization or fine-tuning personalization in order to increase conversion rates. With Exalogic, Oracle has assumed responsibility for the majority of an environment's creation while streamlining ATG's production rollout by automating many ATG deployment-related tasks. Furthermore, the work Oracle does prior to Exalogic delivery helps to take a lot of the risk out of an ATG deployment by ensuring that ATG is deployed to a rock-solid foundation.

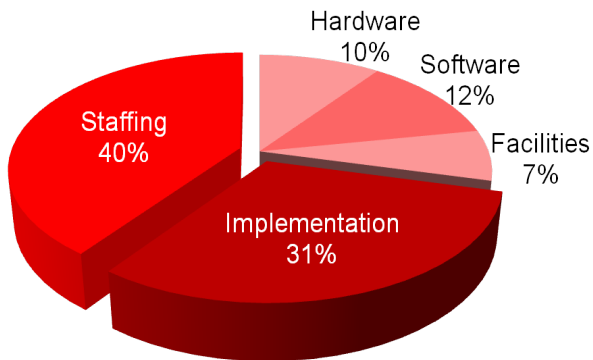
Exalogic enables fast time-to-market because the software and hardware that comprises Exalogic was designed with that in mind. When software and hardware are designed to work together, less time is spent trying to get them work together.

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<sup>4</sup> <http://www.youtube.com/watch?v=aWHPC188tus>

## Benefit #3: Reduced 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)<sup>5</sup>. Exalogic provides dramatically reduced total cost of ownership by reducing the amount work that people have to do and reducing the quantity of hardware and software that must be managed. This allows organizations to focus limited resources on activities that contribute to the top-line revenue. For example, resources can be freed up to improve search engine optimization as opposed to tuning ATG for optimal performance.



Source: Gartner, Credit Suisse

Exalogic reduces the total cost of ownership in the following three ways 1) the entire system is pre-built so there is no need to design, procure, assemble, deploy, and tune, 2) the entire system is easier to manage because of the holistic management approach that is taken with Oracle Enterprise Manager, and 3) less hardware is required because ATG runs 3x more efficiently on Exalogic.

Since each rack of Exalogic is an entire pre-built system (as opposed to a collection of individual components), there is no need to design, procure, assemble, deploy and tune each unique system. Exalogic is very conceptually similar to a laptop, in that customers buy pre-packaged complete systems containing hardware and software optimized in a vertical stack. Customers would not tolerate having to design a new laptop, procure individual parts from different vendors (e.g. screen, RAM, processor, hard disk, etc), assemble the parts into a single laptop, install an operating system, and tune the operating system to take advantage of the hardware on which it is installed. Instead, everybody buys pre-assembled laptops that can be plugged in, turned on, and immediately operational. Oracle is taking this concept to the enterprise.

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

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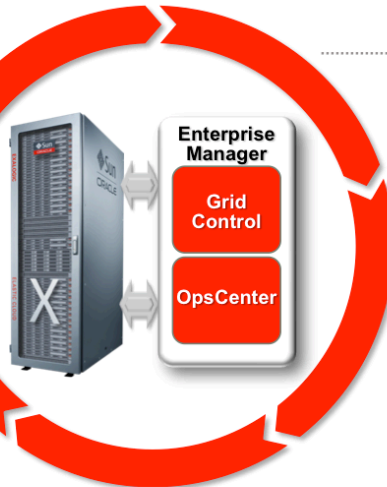
<sup>5</sup> Philip Winslow, "Dr. Exalove: How I Learned to Stop Worrying (about Sun) and Love Exalogic Too," Credit Suisse, Nov. 23 2010

## Maintain

- Remote Management
  - Telemetry
- Phone Home
  - Proactive Support
- My Oracle Support Integration For FMW and Databases

## Manage

- End-to-End Diagnostics
  - Service Levels
  - Root Cause
- Configuration Mgmt
  - Change Tracking
- Patch Automation
  - Firmware, OS



## Monitor

- Application-to-Disk
- Exalogic and Exadata Monitoring Integration
  - System, Middleware, Database, Applications, Compute Nodes, Switch, Storage
- Energy Utilization and Impact

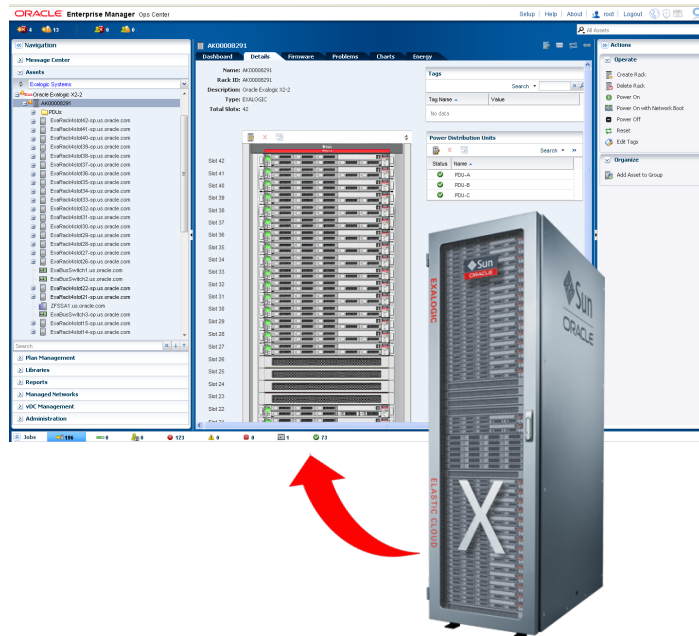
## Deploy

- Provisioning of Firmware, OS, Middleware, Database and Applications
- Clone and Scale-out

## Test

- Functional Testing
- Load Testing
- Test Management

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



In addition to providing management and monitoring capabilities, Enterprise Manager 12c supports static (self-service) and dynamic (real-time load-based) provisioning. When it is used in this capacity, 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 Exalogic system could be provisioned to a pre-production environment for testing, a production environment for a big sale, and then finally to the call center for post-sale customer service. Provisioning in this manner is scaling out an environment. This drives up resource utilization, which allows for a greater return on investment.

Finally, the 3x better throughput (page views per second per CPU core) and better resource utilization due to the provisioning capabilities of Enterprise Manager lead to needing a third of the hardware that would traditionally be required. So a production environment for ATG requiring 300 CPU cores would only require 100 CPU cores with Exalogic, and so on. Exalogic also reduces the number of physical servers that must be managed. A traditional blade server has around eight CPU cores. So a production environment requiring 300 CPU cores would require 38 individual servers, each of which must be procured, shipped, racked, stacked, cabled, etc. A single rack of Exalogic would be all that is required. It costs less money to manage fewer CPU cores.

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

## Benefit #4: Improved Return on Investment

In addition to the bottom-line benefits due to the reduced total cost of ownership, Exalogic brings significant top-line benefits due to improved performance leading to increased conversion rates.

According to the Aberdeen Group, a one second delay in page load time equals 11% fewer page views, a 16% decrease in customer satisfaction, and 7% loss in conversions<sup>6</sup>. According to Jupiter Research and Akamai, 33% of dissatisfied online shoppers attribute their dissatisfaction to poor performance and a further 40% of shoppers stated that high performance is critical to their loyalty<sup>7</sup>.

According to the 2011 Internet Retailer Top 500 Guide<sup>8</sup>, ATG is the most widely used eCommerce platform. The top 100 in the list had average annual sales of \$1.29 billion. An additional 5% revenue due to the improved conversion rates that Exalogic brings to ATG could lead to \$64.7 million per year, or \$323.5 million over five years.

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<sup>6</sup> <http://www.aberdeen.com/Aberdeen-Library/5136/RA-performance-web-application.aspx>

<sup>7</sup> [http://www.akamai.com/dl/reports/Site\\_Abandonment\\_Final\\_Report.pdf](http://www.akamai.com/dl/reports/Site_Abandonment_Final_Report.pdf)

<sup>8</sup> <http://www.internetretailer.com/shop/2011-top-500-guide.html>

Let's apply this to a hypothetical ATG deployment, with \$400 million in online revenue and 10% annual growth over five years. This is fairly representative of a customer around #50 in the 2011 Internet Retailer Top 500 Guide. Assuming 5% more in additional revenue due to the 3x better performance of ATG on Exalogic, a customer of this profile could expect to take in an additional \$134 million over five years. Here's a breakdown showing the math behind that figure:

<b>Year</b>	<b>Revenue</b>	<b>Revenue Assuming Exalogic</b>	<b>Marginal Gain from Exalogic</b>
Baseline (without Exalogic)	\$400,000,000.00		
Year 1 (with Exalogic)	\$440,000,000.00	\$462,000,000.00	\$22,000,000.00
Year 2 (with Exalogic)	\$484,000,000.00	\$508,200,000.00	\$24,200,000.00
Year 3 (with Exalogic)	\$532,400,000.00	\$559,020,000.00	\$26,620,000.00
Year 4 (with Exalogic)	\$585,640,000.00	\$614,922,000.00	\$29,282,000.00
Year 5 (with Exalogic)	\$644,204,000.00	\$676,414,200.00	\$32,210,200.00
		Total	\$134,312,200.00
		Annual Growth Rate	10.00%
		Revenue Increase due to Exalogic	5.00%

Revenue gain may be substantially higher than 5% if Exalogic improves the performance of an otherwise-slow site or permits advanced personalization that would not have been achievable due to poor performance.

When top-line revenue growth is coupled with the bottom-line benefits, the benefits to an organization's return on investment are substantial. For a customer with \$400 million in annual online revenue, the quantifiable benefits are an additional \$134 million over five years and the need to manage a third of the hardware and software that would otherwise have to be managed.

## Conclusion

Exalogic should be considered whenever a new ATG environment is built, whether for a new implementation, a hardware refresh, or an upgrade of ATG. Exalogic brings unbeatable time-to-market, increased top-line revenue (higher conversion rates due to 3x better ATG performance), cost savings and low total cost of ownership (not having to design/procure/assemble/deploy/tune, integrated management/monitoring, needing a third of the hardware that would traditionally be needed), all of which act together to provide the best return on investment and make Exalogic the best platform for deploying ATG.



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