

An Oracle White Paper

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Evolution from the Traditional Data Center to Exalogic: An Operational Perspective

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Introduction: Management Overview

IT organizations are struggling with the need to balance the day-to-day concerns of data center management against the business level requirements to deliver long-term value. This balancing act has proven difficult and inefficient; systems and application management tools are resource intensive and traditional infrastructure management architectures have developed over time on a project by project basis. These traditional management systems consist of multiple tools that require administrators to waste time performing too many steps to handle routine administrative tasks. Operational efficiency and agility in your enterprise are directly linked to the capabilities provided by the management layer across the entire stack, from the application, middleware, operating system, compute, network and storage. Only when this end to end capability is provided will we experience the full benefit of a scalable, efficient, responsive and secure datacenter.

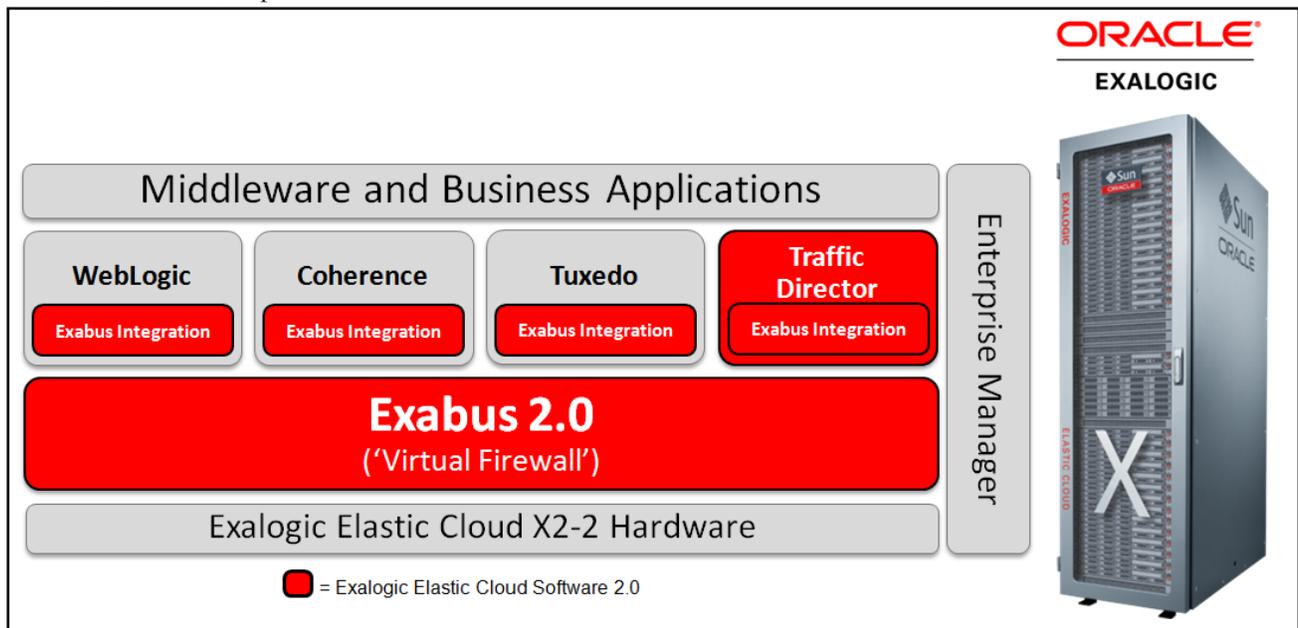


Figure 1 - Exalogic hardware and software overview

Managing Exalogic is substantially less complex and error prone than managing traditional systems built from individually sourced, multi-vendor components because Exalogic is designed to be administered and maintained as a single, integrated system (Figure 1). It is at the forefront of the industry-wide shift away from costly and inferior one-off platforms toward *private clouds and Engineered Systems*. For enterprises that want to get more for their IT investment than merely *keeping the lights on*, Exalogic is the only choice.

Traditional Datacenter Management, Roles, Pros and Cons

There is a need to consider both your every day operations against your longer term objectives in order to deliver value over the long run. This is proving to be a challenge and is creating inefficiencies: application management tools and the systems they run on are resource intensive and the traditional management architectures have developed over time on a project by project basis. These traditional management systems use a multitude of tools that make inefficient use of the administrator's time. Routine tasks, like O/S updates, backups, or user account updates require

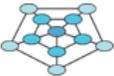
Role	Responsibility	
System Admin		Servers Operating Systems Lifecycle Management
Network Admin		Physical Network QOS, Bandwidth Management IP Address / DNS Management / vLans
Storage Admin		Shared Storage Provision Luns Backup / Recovery
Database Admin		DB Deployment, Monitoring & Tuning Enrolling Users and Maintaining Security
Application Admin		Application Deployment, Monitoring & Tuning Platform Patching / Upgrade

Figure 2 – Traditional data center roles and related tasks

multiple steps. In addition, there is no consistency or visibility across the multiple roles and tiers in the data center, forcing administrators to use sticky-notes as their primary method of communication.

Within larger enterprises, we typically see multiple administrators managing these complex environments, including System, Network, Storage, Application, and Database Administrators. Each

person has a very specific role, set of tasks, and associated tools (see Figure 2), which simplifies their job and provides a very secure environment for that particular application.

System Administrator

System Administrators are usually charged with installing, supporting and maintaining servers, the associated operating systems, and planning for and responding to service outages and other problems. They also may be asked to do scripting or light programming, project management for systems-related projects, and supervising or training computer operators.

Network Administrator

The Network Administrator manages network address assignment, assignment of routing protocols and routing table configuration as well as configuration of authentication and authorization – directory services. This role often

includes maintenance of network facilities/components in individual machines, such as network interfaces, device drivers and configuration settings of personal computers as well as printers. It could even in some cases include maintenance of certain network servers: file servers, VPN gateways, and/or intrusion detection systems.

Storage Administrator

Storage Administrators must make sure storage is being used efficiently and that there is plenty of storage capacity available for the applications and underlying databases and, if storage issues occur, they are swiftly resolved. The storage administrator is also responsible for back up and restoration of requested data. They also install new storage systems as required.

Database Administrator

The database administrator role includes the development and design of database strategies, monitoring and improving database performance and capacity, and planning for future expansion requirements. They may also plan, co-ordinate and implement security measures to safeguard the database.

Application Administrator

Finally, the application administrator is responsible for activities related to application deployment, monitoring, and tuning, as well as migration of patches, upgrades, and changes to production. They may also be asked to oversee daily maintenance, including routine hardware and software audits, as well as manage users, access requests, security settings and access rights for all groups and users within the system.

There are many dependencies between roles, and often the tools used vary from group to group. The result is that there are mundane, repetitive tasks and much time spent idle waiting for others to provide support before that task can be completed. For example, if a system administrator is installing and configuring a new server, he needs to have storage provisioned (allocated) for this new deployment. The storage administrator would normally provide this service, which includes the assignment of LUNs. Until this task is complete, no additional work can proceed on that implementation. As mentioned earlier, these inefficiencies lead to an organization where a great deal of time is spent on tactical activities (i.e. provisioning LUNS or IP addresses) with no time left to focus on new strategic initiatives or projects.

Datacenter with Virtualization, Roles, Pros and Cons

Virtualization has introduced a new paradigm in traditional data center management, and, this transformation has received some resistance from existing teams. Roles are changing. System Administrators are very often becoming Virtual Infrastructure (VI) Administrators, and this new role introduces some new capabilities.

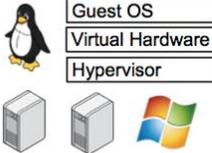
Role	Responsibility
System Admin / Virtual Admin 	Virtual Infrastructure Management Virtual - Network / Compute / Storage + Servers Operating Systems Lifecycle Management
Network Admin	Physical Network QOS, Bandwidth Management IP Address / DNS Management / vLans
Storage Admin	Shared Storage Provision Luns Backup / Recovery
Database Admin	DB Deployment, Monitoring & Tuning Enrolling Users and Maintaining Security
Application Admin	Application Deployment, Monitoring & Tuning Platform Patching / Upgrade

Figure 3 –Data center with virtualization roles and related tasks

storage duties would include tasks like provisioning the storage for virtual machine files, taking virtual machine snapshots, and adding/reducing storage capacity for virtual machines.

These new capabilities can cause concern for the storage and network administrators who need to be sure they retain ownership of the policies directly associated with their roles. As an example, the Storage Administrator is still responsible for the overall data backup and recovery policies, and the Network Administrator is still the owner of the network security and QoS policies.

What is being realized, however, is the increase in overall efficiency and simplification of the mundane, day-to-day tasks. For example, if a new virtual machine needs to be provisioned, the VI Administrator can very rapidly create a new VM in addition to the required network and storage for that VM. At the same time, Storage and Network Administrators still own the overall policies, which would include backup and recovery settings or network security policies. As long as the VI Administrator works within those policies, tasks like configuring and deploying a new server are completed very quickly with little or no dependencies. This faster and easier infrastructure provisioning

VI Administrators

This role combines system administration duties, along with the tasks associated with the required network and storage for their virtual environment (See Figure 3). This would typically include managing the associated resources for the VMs, including network, storage, and memory resources. Associated networking tasks would include things like adding/removing port groups, virtual Ethernet adapters and switches, or updating IP routing for the host. Newly associated

provides a more flexible and scalable enterprise, while at the same time, simplifies configuration for network and storage resulting in higher operational efficiency.

While these new capabilities are providing increased efficiencies, the Database and Application administrator roles remain largely unchanged. They are still, with or without virtualization, performing a large number of day-to-day tactical responsibilities involving deployment, monitoring, managing, optimizing and patching.

Datacenter Enhanced with Exalogic

One well documented challenge for any enterprise is the deployment of business critical software, which spans from the application to the middleware to the database, and on down to the underlying operating system. Installing, configuring, and patching all these tiers is time consuming and error prone. Another related issue is the Application administrators' difficulty in managing capacity to changing workload patterns. When there is an increased demand for services, there is no efficient or automated way to adjust the underlying infrastructure – by adding capacity - to

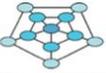
Role	Responsibility
System Admin / Machine Admin	 Exalogic Machine Management Exalogic – IB Network / Compute / Storage Operating Systems Lifecycle Management
Network Admin	 Physical Network QOS, Bandwidth Management IP Address / DNS Management / vLans
Storage Admin	 Shared Storage Provision Luns Backup / Recovery
Database Admin	 DB Deployment, Monitoring & Tuning Enrolling Users and Maintaining Security
Application Admin	 Application Deployment, Monitoring & Tuning Platform Patching / Upgrade

Figure 4 –Data center with Exalogic, roles and related tasks

Now, true end to end visibility from the application to the storage layer is provided from a single tool for all administrators, providing unified administration for both physical and virtual infrastructure, along with simplified application deployment and life cycle management. The Exalogic Machine Administrator can manage the physical and virtual layers, including the Infiniband network, compute and storage, up through the o/s, virtualization,

improve application performance. Most often, manual, error-prone methods are used. Such lifecycle management challenges result in Database and Application administrators spending a significant amount of time performing software provisioning and maintenance operations.

Machine Administrator

Exalogic is explicitly designed to be administered and maintained as a single, integrated system, which means that simplification and ease of management span across all the roles in the data center (Figure 4).

middleware, and application layers. He can view current assets and user privileges, receive notifications, and even send service requests from the same console.

An example of further simplification for the Exalogic Machine Administrator comes from automation of common provisioning operations such as cloning Oracle SOA Suite 11g and scaling out an Oracle WebLogic Domain, making such critical datacenter operations easy, efficient and scalable. More on these capabilities are found in the following Enterprise Manager section of this white paper.

Additional capabilities include application delivery control and enhanced security. Oracle Traffic Director and Infiniband partitioning, which are built in to Exalogic, include the ability to provide application traffic management and application isolation within the existing management framework. For example, the network administrator can view and treat Exalogic as a node on a network. There is no additional complexity or work required on that role, but now the application administrator has the visibility and capability of more directly managing QoS and availability for their applications.

Essentially, with Exalogic, the same benefits that virtualization management introduced (operational roles changing and becoming more streamlined) are now extended to provide unified management for all compute, network and storage, as well as simplified application deployment and lifecycle management. Enterprise Manager provides this capability to the Machine Administrator (Figure 4).

Enterprise Manager

Enterprise Manager manages across the entire infrastructure stack—from firmware, operating systems and virtual machines, to servers, storage, and network fabrics.

Specifically engineered to work with Oracle's Exalogic Elastic Cloud, Oracle Enterprise Manager allows every individual hardware component within an Exalogic deployment to be monitored in real time and, at the customer's option, have hardware faults automatically reported to Oracle Support for proactive system maintenance.

Enterprise Manager, with built in hardware management functionality, can be used for managing all aspects of your physical environment. It allows for the discovery, provisioning, update, management, and monitoring of the physical and virtual assets in multiple data centers from a single console. The following key features are supported in the Exalogic machine environment:

- Hardware lifecycle management
- Server Hardware view
- ZFS Storage view

- InfiniBand fabric views and Ethernet network view
- Integration with My Oracle Support enabling support cases to be opened and viewed

Through integration with Oracle Support, Enterprise Manager can apply tested patch bundles tailored for Exalogic that cover every layer of the system, from device firmware and operating system to JVM, application server, upper-stack Fusion Middleware, and Oracle Applications.

Enterprise Manager Cloud Control 12c

Oracle Enterprise Manager Cloud Control 12c, part of the Enterprise Manager family, provides application-to-disk management for Exalogic deployments. In addition to the ability to monitor every individual hardware component

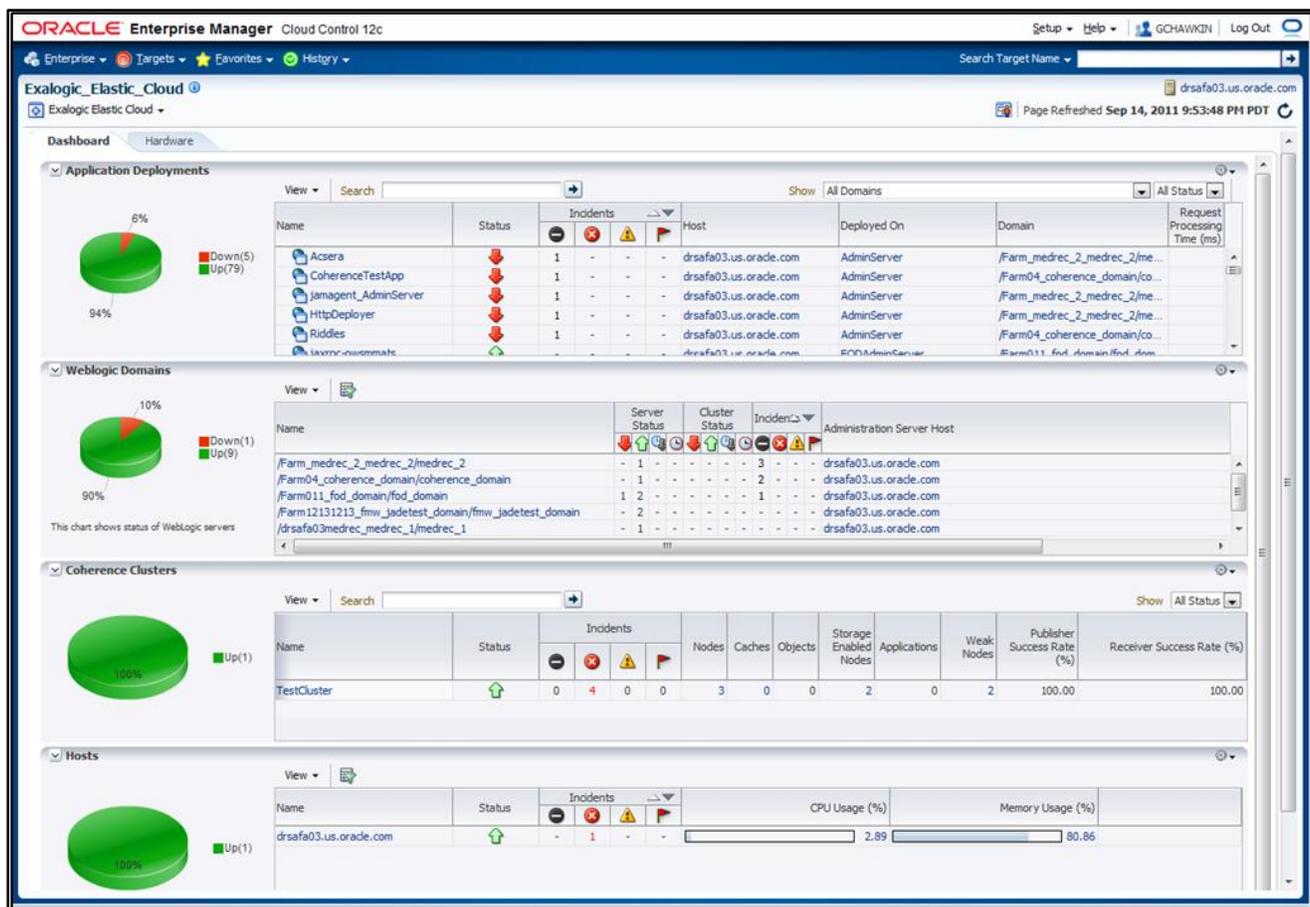


Figure 5 –Oracle Enterprise Manager Cloud Control 12c View of Exalogic Dashboard

within an Exalogic deployment in real time, more functionality is available at the software layer (Fig. 5). One can manage and monitor deployed applications and physical compute node status. Other operational views include operational status, KPI, Response & Load chart, alerts & policy violations, configuration changes, and component & JVM metrics.

Through integration with Oracle Support, Cloud Control 12c can apply tested patch bundles tailored for Exalogic that cover every layer of the system, from device firmware and operating system to JVM, application server, Fusion Middleware, and Oracle applications.

Enterprise Manager Cloud Control 12c allows customers to achieve:

- Seamless management of both hardware and software assets, systems management specifically designed for both the general enterprise and Oracle Engineered Systems
- Complete software lifecycle management over each phase: Deployment, Testing, Monitoring, Management and Maintenance
- Increased manageability and reduced support cost through proactive hardware monitoring, service request creation, and health-checks

Customer Quote

“In the old environment you had to have someone managing the SAN, someone managing the database boxes, someone managing all the web servers. Now, because it is all on one platform, it is simplified. With Oracle Enterprise Manager, we can also centrally manage our applications running on Exalogic that support our business, which ultimately enables us to improve the customer experience. Our previous environment was very personnel-intensive. We had to spend a lot of time trying to manage ourselves through the process of dealing with patches and dealing with performance issues. It was very time consuming. Now, we estimate saving between 50% and 80% of our time and resources needed to orchestrate end-to-end business processes across multiple applications.”

CTO, Asset Management SaaS Provider

Conclusion

Oracle Exalogic provides true end to end integration, from the application layer to disk, and in so doing provides streamlined management. The inefficient traditional infrastructure, and the wide ranging tools to manage it, can be replaced with a greatly simplified, flexible, and scalable system that provides comprehensive management and monitoring capabilities via standards based Oracle Enterprise Manager so time to resolution is significantly reduced. All aspects of application stack (application, operating system, server hardware, storage & networking) are managed through a single pane of glass, with contextual drill-downs, so administrators spend less time managing/monitoring their critical business infrastructure. Oracle Exalogic also comes with a rich set of system tools and utilities that can be used to inspect various components of the machine to perform diagnostics. This converged approach integrates hardware management across the infrastructure stack and extends the efficiencies associated with virtualization management tools to the application and database layers, helping organizations streamline operations, increase productivity, and reduce system downtime. And, because the operational approach to introducing Exalogic is similar to the change being adopted to accommodate the virtualization management layer, it can be rapidly and easily integrated into your environment.

Additional Resources (White Papers)

[Enterprise Manager Cloud Control 12c: Managing Exalogic Elastic Cloud with Oracle Enterprise Manager Cloud Control \(PDF\)](#)

[Consolidating Oracle Applications on Exalogic \(PDF\)](#)

[Exalogic Backup and Recovery Best Practices \(PDF\)](#)

[Exalogic Disaster Recovery \(PDF\)](#)

[Exalogic Security \(PDF\)](#)

[Oracle Exalogic Elastic Cloud: System Overview \(PDF\)](#)



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