IT CHANGE MANAGEMENT & THE ORACLE EXADATA DATABASE MACHINE

EXECUTIVE SUMMARY

There are many views published by the IT analyst community about an emerging trend toward turn-key systems when deploying IT solutions. In many respects, this is a trip backward in time to where the computer is packaged not with just an operating system, but also with other portions of the software stack including a database. Mainframes and AS/400s were early examples of such an approach. However, proprietary systems did not keep up with the latest hardware and software advances or pricing models leading to open systems mixing various software, server, and storage solutions. While a component based approach created an aggressive pricing structure, this approach also created new costs linked to systems integration and additional specialist roles within IT organizations around the components.

Within the past decade, appliances and solutions described as "appliance-like" have reemerged, initially most often focused on data warehousing. Using commodity components, the vendors of such systems design them so that the database software is optimized for specific well-defined configurations. The configurations are designed to deliver optimal performance and throughput balance for certain workloads. Unlike their predecessors, the systems evolved rapidly by following the development curve of the commodity components and pricing can be quite aggressive.

The Oracle Exadata Database Machine often competes against such platforms. Its commodity components include Intel-based CPUs in standard Sun servers that are used as Database Server nodes and Exadata Storage Server cells. Other key Sun components include a high-speed InfiniBand interconnect and Flash technology. The degree of commodity components present is a differentiator enabling Oracle to rapidly evolve this platform. But equally important is the required Oracle Database 11g Enterprise Edition engine, enabling the platform to be used for data warehousing, transaction processing, or as a consolidation platform for multiple databases.

Oracle sees the future of such platforms as being more than pre-defined database machines. As Larry Ellison, Oracle CEO, said on January 27, 2010, "By having all of the pieces of the stack – from the silicon all the way up to the application – we'll be able to deliver systems that run faster, are fault tolerant, are highly secure – much more secure, much more performance, much more cost-effective, much easier to use than we ever could have delivered by simply delivering components."

As Oracle produces such platforms delivering solutions that extend into the realm of applications, how might IT roles change? In this paper, we'll explore the impact upon how such systems are designed, configured, and delivered, how they are managed, and considers what roles will remain critical and what roles will change. Our goal with this paper is to help IT organizations prepare for and manage this change.

Design, Configuration and Installation of the Oracle Exadata Database Machine

Before a system is purchased, a thorough understanding of the role it will play in solving business issues and how it will fit into the technical architecture is necessary. This is also the phase at which critical performance and availability

needs are determined for the workloads to be deployed as well as potential future growth. These are used to determine what size of Oracle Exadata Database Machine is needed and what sort of disaster recovery system(s) might be used. At this point, the IT organization also begins to plan backup and recovery strategies and ramifications of the power, cooling, and footprint required. In some consolidation situations, part of the justification to deploy this platform can come from reducing the power, cooling, and footprint when comparing the Oracle Exadata Database Machine to multiple stand-alone servers and storage devices.

Given the Oracle Exadata Database Machine requires Oracle Database 11g Release 2 and RAC, technical considerations at this point include whether the applications to be moved are supported on this version of the database and are able to scale on RAC. Since ASM is used to manage storage, the applications should also have been written such that they do not provide their own unique storage management.

When determining the Oracle Exadata Database Machine configuration to deploy, there are choices of balanced configurations that come in Quarter Rack, Half Rack, or Full Rack varieties, as well as the ability to configure multiple connected Full Racks. These configurations contain a balanced mix of Database Server nodes, Exadata Storage Server cells, and InfiniBand Switches. Such packaged solutions eliminate much of the pre-implementation system sizing work common in custom solutions, though you will still need to provide Oracle with information regarding the number of databases to be deployed, the purposes of those databases, and the workloads you are expecting. Given these are pre-configured complete systems, the Oracle Exadata Database Machine will eliminate current processes for acquiring system components and validating that all of the pieces needed have been ordered.

When an Oracle Exadata Database Machine ordered from Oracle is delivered, Oracle and Sun complete the configuration process on-site as part of available initial delivery services. This includes set up of the internal networking and installation of a working database. You will need to provide Oracle with available IP addresses, a desired Oracle Database name, what national language character set you want assigned, and whether you want database logging turned on. Set-up includes prescribed init.ora parameters for optimal database performance. The database set-up also includes a fully mirrored layout on disk using ASM in which there is no single point of disk or Exadata Storage Server Cell failure. Additional services are available for variations to a standard installation, such as when deploying multiple databases to the Database Machine. These procedures generally eliminate current IT tasks related to installation and configuration and testing and validation that are common in custom built solutions and solutions built from reference architectures.

As a result, the Oracle Exadata Database Machine is believed by many to eliminate 6 to 9 months from this stage of the implementation cycle and provide as much as a 70 percent reduction in personnel costs during this stage. Of course, value from the platform is obtained by deploying business solutions to your database (or databases if you are deploying a consolidation configuration). So, at this point, you will deploy as you normally would once you have a new platform and database ready. Typical tasks include migration of existing database schema and data from the old platform to the new or design and development of new schema and applications.

Managing the Oracle Exadata Database Machine

Oracle's database evolved to become increasingly self-tuning and self-managing through its last 3 major versions, reducing the time and cost associated with managing an enterprise class database. Enterprise Manager Grid Control provides a single point of management for each database deployed to the Oracle Exadata Database Machine. Grid

Control also features plug-ins specific to managing the Database Machine and Packs for tuning, diagnostics, and provisioning. Since the Oracle Exadata Database Machine is a complete system and managed centrally, a Database Administrator can serve multiple roles or work much more quickly than where Storage Architects and System Administrators also help manage a custom system.

The DBA's day to day database management is reduced since the balanced hardware configuration eliminates much of the need for tuning common on platforms that are badly constrained in one or more dimensions (most often, due to inadequate throughput). For example, one of the tuning mechanisms historically used with Oracle databases is indexing to avoid massive full table scans where large amounts of data are analyzed. The Oracle Exadata Storage Server Software constructs "smart scans" that can minimize the need for indexes since query results residing in each Exadata Storage Cell are passed back to the database server where the results set is assembled.

Oracle provides a single point of support for the Oracle Exadata Database Machine for hardware and software. Support problems are resolved much faster than where multiple vendors are involved and can be reported and managed by the DBA. Any hardware and software problems are coordinated by Oracle Support behind the scenes. As part of the purchase, the Oracle Exadata Database Machine includes a 1-year basic warranty.

How Roles Change

Now that we've described what the design, configuration, installation, and management stages in deploying the Oracle Exadata Database Machine comprise of, we'll take a look in more detail at how certain roles within IT are impacted. The key IT roles we'll focus on are those of enterprise architects, management and development DBAs, storage managers, and systems & network administrators.

It is worth noting that we describe two types of DBAs here as the DBA role has evolved from a purely administrative role in installing and managing the database and its options. As technology and application complexity evolved, the DBA role expanded to include development activities. These development tasks included design of the database, including tables, table spaced, indexes and views. The roles became so complex that many organizations now have distinct roles and job functions for production and development DBA's. The system-based approach of the Oracle Exadata Database Machine has a direct impact on both the production and development DBA. But first, let's start with the role of the enterprise architect whose involvement starts before a system is purchased.

The Enterprise Architect Role

As noted previously, a thorough understanding of the role the Oracle Exadata Database Machine and database applications it hosts play in solving business issues is needed. Also, IT must be comfortable with how the platform will fit into the technical architecture, including non-database platforms such as applications servers. The leader in this effort is generally an enterprise architect. Such a person often leads a team of business sponsors and IT specialists to define current and future business needs, determine how the Oracle Exadata Database Machine might fit into the current technical architecture, and justify its deployment. The evaluation at this point can include investigating the viability of moving existing applications and an assessment of their ability to meet business needs. Sometimes, build versus buy decisions are made regarding new applications or data warehouse data models. Return on investment (ROI) justification usually consists of a combination of business benefits and cost savings associated with the new platform.

Since the Oracle Exadata Database Machine consists of "fixed" configurations of Database Server nodes and Exadata Storage Server cells, the likelihood of selection of a well-balanced hardware and optimal Oracle database platform is greatly improved compared to other hardware choices. The platform usage and requirements information gathered by the enterprise architect is used by Oracle to determine the standard configuration that is the best fit. At this point, an order is placed and the Data Center is prepared for arrival of the hardware.

The Development DBA Role

The role of the development DBA is critical in not only the technical implementation, but also in translation of a business model into a properly functioning database. The development DBA will use various design techniques to accomplish this goal. For example, for data warehousing, techniques can include usage of dimensional models, star schemas, and aggregate tables. The development DBA often uses Oracle database features such as partitioning, indexing, and materialized views to aid in both rationalization of the model and performance. This can lead to an abundance of "feature rich" designs that make extensive use of multiple database features and options. Such feature rich designs can require added maintenance and tweaking to keep the features optimized. For example, one such company deploying this way had their production DBA team spending over 75% percent of their time deploying and retuning features.

By comparison, the Oracle Exadata Database Machine and Exadata Storage Server Software introduces automated techniques leveraged by the Oracle optimizer, enabling development DBAs to deploy the database features in a laser focused effort instead of a mass deployment. The use of indexes becomes a more precise exercise since the balanced system and Smart Scans cut down on the need for indexes. Materialized views are still used, but more for clarity of design than for solving performance problems. Oracle tablespaces, previously used as a physical delimiter, become more of a logical tool. The move from a feature rich design changes the way a development DBA works day to day. The DBA can now spend more time focusing on key areas of the design that require attention, and apply the various high power features of the Oracle database as needed.

This change does require a mind-shift in both the development DBA and their management. A firm understanding of features that are now less likely to be of benefit and those to spend time on is critical. DBA management must understand this new work pattern and measure the DBA's effectiveness. The ability of DBAs to handle different workloads also changes. For example, whereas a development DBA may have been limited a single application database in the past, the Oracle Exadata Database Machine can enable the DBA change their focus to faster deployment of new and more varied business solutions. This can improve IT service levels in delivering development projects and shorten development cycles.

The Production DBA Role

The production DBA maintains the production environment including database software installation, upgrades, and tuning. Deploying the Oracle Exadata Database Machine also causes changes in this role.

In most shops, major effort is spent in managing and rolling out upgrades to the database. When a new patch arrives, a certification process ensures the new version of the database works as expected within the environment (operating

system, hardware, storage) and in conjunction with the application the database serves (CRM, ERP, EPM, etc.). This is not a trivial exercise. In many shops over 50% of the production DBA time is spent in upgrade certification.

The Oracle Exadata Database Machine environment greatly decreases the effort of certification. Since this platform is a complete system with hardware, storage, operating system and storage, much of responsibility for environment certification is shifted directly to Oracle. Patches to the database are coordinated with patches to the operating system and upgrades to firmware. The encasement of the interoperability allows the production DBA to significantly reduce the amount of time required to certify within their environment. The on-site certification effort shifts toward application-database certification, whereas the database-environment becomes more of a validation exercise.

This shift in workload has a direct impact on the production DBA role. Organizations can perform more upgrades in parallel, shift DBA resources toward new development, and sometimes outsource some production operations with decreased risk. Production DBAs and their management must understand this new paradigm in order to properly build their estimates for work, establish service level agreements, and measure performance of the production DBA.

Storage Management Role

Storage management, which initially began as a role of system administrators, became a role in and of itself in many organizations. The need for a full-time storage management role was driven by increasing sizes of the databases, the complexity of storage systems, the criticality of storage uptime, and an increase in unstructured data. Similar to the DBAs, storage managers spend much of their time in preparing for and managing to performance issues and upgrades. A storage manager must be able to understand capabilities and functions that are often very specific to the storage vendor (such as striping). Storage managers are also concerned with keeping their systems balanced, that is maximizing disk usage and minimize seek speeds. As new storage is requisitioned, the storage manager deploys the new storage and rebalances. The methods used range from manual exercises with custom scripts to semi-automated utilities.

Because the Oracle Exadata Database Machine's storage uses Automatic Storage Management (ASM) and is visible from Enterprise Manager Grid Control, management is through the same console the DBA uses. Automatic balancing / rebalancing, managing to hot spots, and smart requisitioning are all handled within ASM. So the main role of storage management shifts from a storage manager to the DBA, including the design and management of an ASM group and logical partitioning of the storage. Storage managers often move on to other tasks that require storage architecture skills such as planning for disaster recovery or work on more advanced storage management challenges such as dealing with unstructured data.

Network and System Administration Roles

IT organizations typically have groups of systems and network administrators. The good news here is that the Oracle Exadata Database Machine lends itself to less oversight and tuning by UNIX administrators and network administrators. The UNIX administrator's time in certification of a new database release or patch is generally decreased since Oracle supports the entire environment.

Network administrators face the challenge of keeping the network bandwidth in balance with the capacity and performance of servers and storage. Management considerations can include network tuning, the addition of adapters

and switches, and trouble shooting. In comparison, the Oracle Exadata Database Machine, with its redundant network switches and balanced high bandwidth, minimizes or eliminates the time for network trouble shooting and tweaking. Particularly in organizations not already deploying a balanced environment, the labor savings can be significant.

Summary

The Oracle Exadata Database Machine should have very positive productivity implications for IT and also help deliver better service levels to the business. Some roles will change within IT, including those of enterprise architects, management and development DBAs, storage managers, and systems and network administrators. In each of these roles, there is a great opportunity to spend more time on delivery of new solutions and less time on day-to-day maintenance. The end result of deploying the Oracle Exadata Database Machine can be better satisfaction and likelihood of success for everyone involved.

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