An Oracle White Paper
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Lowering your IT Costs with Oracle Database 11g Release 2

ORACLE

INTRODUCTION

As business operations become more complex, the demand for change in IT increases accordingly, complete with associated risks that must be mitigated. Today's IT professionals are being asked to manage more information, and deliver that information to their users, with ever increasing quality of service, in a timely manner. And, in today's economic climate, IT is additionally tasked with reducing budgets and deriving greater value out of their existing investments.

Oracle Database 11g Release 2, the second release of the award winning Oracle Database 11g, provides the foundation for IT professionals to successfully deliver more information with higher quality of service, make more efficient use of their budgets, and reduce the risk of change in data centers. By deploying Oracle Database 11g Release 2 as their data management foundation, organizations can utilize the full power of the world's leading database to:

- reduce server costs by a factor of 5,
- reduce storage requirements by a factor of 10,
- improve mission critical system performance by a factor of 10,
- increase DBA and Developer productivity by a factor of 2,
- eliminate idle redundancy in the data center, and
- simplify their overall IT software portfolio.

This white paper identifies the key capabilities in Oracle Database 11g Release 2 that enable IT professionals to successfully deliver more information, with higher quality of service, and at much lower cost, than they have ever been able to do so in the past.

REDUCE HARDWARE COSTS BY A FACTOR OF 5X

"We've been able to save over $5 million dollars a year by re-platforming from our mainframe to Oracle Real Application Clusters."

Eugene Park, Senior Director of Platform Services

PG&E

Reduce hardware costs through consolidation

Most data centers today are a mish-mash of hardware and software that have evolved over time to meet individual business requirements. Data centers typically consist of different server and storage silos, complete with a complex software portfolio to integrate everything together.

Mixed data center environments are very expensive to maintain – a large part of any IT budget, estimated as high as 30%, is spent on making sure that all these different components work well with each other, and more importantly continue to work through the lifecycle of each component. Maintaining separate server and storage silos is also extremely inefficient. Individual systems are often over-provisioned with spare processing and storage capacity, leading to a great deal of under utilization throughout the data center. Managing individual systems to deliver performance, availability and security expectations is both inefficient and costly.

To address this challenge, organizations have been looking to consolidate their data processing and storage infrastructure into virtual shared environments, where a common, standardized platform is available for all business applications. Server and storage consolidation can lead to savings from pure economies of scale alone. The Oracle Database has enabled many organizations to consolidate onto their preferred hardware and operating systems. In addition, Oracle software enables significant commoditization of consolidated environments, driving down the cost of hardware, often by a factor of 4x to 6x. Organizations can get an efficient consolidated data center, and unlock the price/performance benefits of commodity hardware.

Unlock the price performance of commodity hardware

In the past, organizations have used stand-alone SMP servers as a single shared platform to consolidate multiple workloads, and Oracle Database 11g Release 2 works very well in this environment. Oracle Database has a twenty-year lead in getting the best SMP performance and is supported with all major virtualization and LPAR software. Oracle Database 11g Release 2 also offers the concept of 'Instance Caging' where databases can be confined to use specific cores in the SMP environment, thereby removing the need for virtualization or LPAR software.

However, large SMP servers continue to be very expensive both in terms of initial costs and incremental costs of scaling. Alternatively, small commodity servers running open source operating systems, such as Linux, can be clustered together offering similar processor and

memory capacity, but at 4-6x initial cost savings. And, instead of incurring the 'fork lift' cost of expensive scale-up SMP servers, customers can simply scale-out their database cluster at a low incremental cost by adding more commodity servers. In addition, commodity hardware is often the first to take advantage of the latest processor and memory technology. For example, the new Nehalem chips from Intel, which are extremely fast, will only be available on commodity servers for 2-3 years before they become available in their bigger SMP brethren – and at a significantly lower cost per component.

Consolidate ALL data processing onto low cost Grids

Oracle Real Application Clusters (RAC), an option to Oracle Database 11g Release 2, enables a cluster of low-cost commodity servers to work together as a single shared database grid. Applications can be deployed on a grid without modification or re-architecture and enjoy the benefit of consolidation, higher availability, faster performance and scalability on-demand.

With Oracle Database 11g Release 2, management of multiple applications consolidated onto a shared Grid is made easy, with the ability to allocate resources within the Grid to different server pools. For example, a Front Office server pool of nodes can be allocated, in which all the databases for CRM and Web sites can be run. Similarly, a Back Office server pool can be allocated for ERP databases. Nodes can also be allocated to a Data Warehouse and Reporting server pool. Any un-allocated nodes are managed as a free resource server pool.

If, for performance or availability reasons, additional nodes are required for any server pool, they can be dynamically assigned from the free pool, or re-assigned from another server pool with less priority, allowing the Grid to dynamically re-allocate resources to meet service level requirements.

Oracle RAC One Node

Consolidation onto the Grid in this manner is not only for mission-critical applications – many IT organizations are building Grids on which they deploy the many departmental and line of business applications in their management portfolio. Oracle RAC One Node provides a solution that allows organizations to consolidate their many small to medium-scale databases onto the grid. This new option to Oracle Database 11g Release 2 provides the fault tolerance and flexibility of RAC, but runs databases on just a single server. RAC One Node capabilities include support for cluster failover, rolling upgrades of hardware and software, and online move of a database between servers in the grid.

New Grid Plug and Play features in Oracle Database 11g Release 2 also make it easier to provision Grid environments, and to add (or remove) additional servers as the platform grows to accommodate greater consolidation and future business growth.

With Oracle Database 11g Release 2, and Oracle Real Application Clusters, IT professionals can unlock the value of low-cost commodity hardware and deploy a reliable, low-cost consolidation platform for all their data processing requirements. In doing so, they can reduce their hardware

costs caused by over-provisioning and under-utilization of stand-alone hardware environments, and unlock the 4-6x price differential between SMP and commodity hardware. They also benefit from the performance and availability management capabilities provided by Oracle RAC.

Get on the Grid faster with the Sun Oracle Database Machine

Many Oracle customers build their own Grids piecemeal, purchasing hardware servers, storage, and switches, and architecting a solution from the ground up. This bespoke approach to hardware deployment can be costly, and also introduces unnecessary complexity. It can also be difficult to build these systems into a balanced configuration that is optimized to get the maximum performance out of the processors and storage devices used.

To this end, Oracle provides Sun Oracle Database Machines for customers wanting to deploy an optimized Grid environment in the fastest possible manner. The Sun Oracle Database Machine delivers extreme database performance for OLTP, Data Warehousing and mixed workloads. Built using industry-standard hardware from Sun, and database and storage software from Oracle, the Sun Oracle Database Machine is an optimized and preconfigured package of software, servers, and storage that delivers the perfect Grid environment for database consolidation.

Sun Oracle Database Machine

By consolidating onto a shared computing environment and unlocking the price/performance advantage of commodity hardware with the Sun Oracle Database Machine and Oracle Real Application Clusters, IT organizations can start to significantly reduce their infrastructure costs.

IMPROVE PERFORMANCE BY A FACTOR OF 10X

"Oracle Exadata outperforms anything we've tested to date by 10 to 15 times. This product flat-out screams."

Walt Litzenberger, Director Enterprise Database Systems

The CME Group

Business users are always looking for greater performance from their day-to-day systems. Oracle Database 11g Release 2 allows performance improvements to be realized from the existing hardware resources that are already be in place. For example, using ASM to fully utilize the I/O bandwidth of storage arrays offers increased performance, and an instant return on investment.

Offload OLTP processing to the Middle Tier

Advantage can also be taken of the under-utilized resources that may be available in the application (or middle) tier. The In-Memory Database Cache (IMDB Cache) option of Oracle Database 11g Release 2, allows data to be cached and processed in the memory of the applications themselves, off-loading the data processing to middle tier resources. Any network latency between the middle tier and the back-end database is removed from the transaction path, with the result that individual transactions can often be executed up to 10 times faster. This is particularly useful where very high rates of transaction processing is required, such as those found under market trading systems, Telco switching systems, and Real Time manufacturing environments. All data in the middle tier is fully protected through local recovery, and asynchronous posting to the back end Oracle Database.

With Oracle Database 11g Release 2, the ability to transparently deploy IMDB Cache with existing Oracle applications becomes much easier – with common data types, SQL and PL/SQL support, and native support for the Oracle Call Interface (OCI).

Increase parallelization and in-memory execution of data queries

Oracle has consistently led the Data Warehouse market, and continues to add intelligent optimizations to the database engine. These optimizations include advanced techniques such as parallel operations, bit-mapped indexing, materialized views and summary management, and integrated ETL, OLAP and Data Mining capabilities. Oracle Database 11g Release 2 adds further optimizations, including capabilities to automatically determine the most optimal degree of parallelization for a query, based on available resources. With this comes automated parallel statement queuing, where the database determines that, based on current resource availability, it is more effective to queue a query for later execution once required resources have freed up.

Oracle Database 11g Release 2 can also take advantage of the increase in server memory in a Grid of low cost servers, and the advanced compression capabilities. Oracle Database 11g

Release 2 will automatically distribute a large compressed table (or a smaller non-compressed table), into the available memory across all the servers in the Grid, and will then localize parallel query processing to the data in memory on the individual nodes. This dramatically improves query performance, and is especially useful where large tables can be entirely compressed into the available memory using compression capabilities.

Achieve extreme performance with Oracle Exadata Storage Servers

The Sun Oracle Database Machine delivers a platform optimized to get extreme performance from databases - from 10x to 100x faster than what customers are achieving today on their current infrastructure. The unique technology driving the performance advantages of the Sun Oracle Database Machine is the Oracle Exadata Storage Server.

As data volumes have continued to grow exponentially, conventional storage arrays have struggled to process terabytes of data, and achieve the performance necessary for demanding database applications.

Oracle Exadata Storage Server

The Sun Oracle Database Machine includes Sun Oracle Exadata Storage Servers, providing a high-bandwidth, massively parallel storage solution that delivers up to 500 GB per second of raw I/O bandwidth and up to 1,000,000 I/O operations per second.

Each Exadata Storage Server stores up to 7 Terabyte of uncompressed user data, and also comes enabled with 384 GB of solid-state Flash cache. This Flash Cache automatically caches active data of the magnetic disks in the Oracle Exadata Storage Server, delivering a 10x performance gain for read and write operations under OLTP applications

Oracle Database 11g Release 2 also pushes query processing to Oracle Exadata Storage Servers, where all disks operate in parallel to process the query, returning only the relevant rows and columns to the database server. This means business users often see a performance increase of as least 10x when executing large database queries.

REDUCE STORAGE COSTS BY A FACTOR OF 10X

"Our Chief Financial Officer likes the Advanced Compression option of Oracle Database 11g because with it we won't need anywhere from a third to two thirds of the disks we have right now."

Mike Prince, Chief Technology Officer

Burlington Coat Factory

Every organization is facing an information explosion. Today's modern business user demands to be empowered with ready access to information about consumers, products, services and competitors. And, with increased regulation and governance, all business information has to be kept online longer. The result is that storage growth within enterprises has skyrocketed over the last few years. At the same time, storage utilization rates have plummeted as storage capacity becomes denser, while seek time and I/O throughput has not improved.

Lower the cost of storage management

Many IT organizations are deploying shared storage environments underneath their consolidated data processing platforms, in the form of large disk arrays. In the past, Database Administrators and System Administrators have spent a great deal of time determining to how best place data across these disk arrays, to get maximum performance and availability. The best procedure for data placement is to simply Stripe And Mirror Everything; stripe data blocks equally across all disks in an array, and then mirror the blocks on at least two disks. This approach provides the perfect balance between performance, disk utilization, and ease of use.

Automatic Storage Management (ASM), a feature of Oracle Database 11g automates the striping and mirroring of database without the need to purchase third party volume management software. As data volumes increase, additional disks can be added, and ASM will automatically restripe and rebalance the data across available disks to ensure optimal performance. Similarly, disks that report errors can be removed from the disk array, and ASM will re-adjust accordingly.

Oracle Database 11g Release 2 improves ASM in significant areas. New intelligent data placement capabilities store infrequently accessed data on the inner rings of the physical disks, while frequently accessed data is placed on the outer rings, offering better performance optimization.

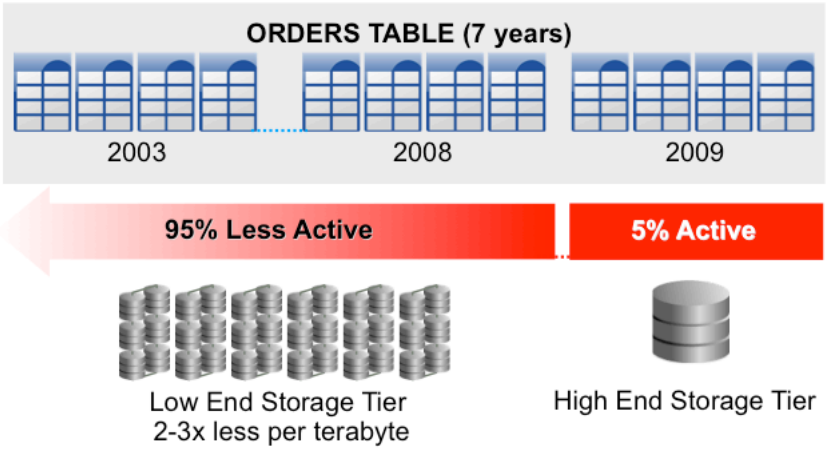
ASM Cluster File System

And the new ASM Cluster File System (ACFS) capabilities means that ASM managed storage can now be used for Oracle databases, and also for general-purpose file systems, offering a single storage platform for Oracle database files, Oracle software binaries, and for non-Oracle related files. Read-only snapshots are also supported, with up to 64 point-in-time copies of file system data available.

Partition for performance and storage cost reduction

As databases become larger, they become more complicated to manage. What works well with a few gigabytes rarely works as well when applied to terabytes of information. To this end, Oracle has been enhancing partitioning capabilities for over ten years. Oracle Partitioning, an option of Oracle Database 11g Release 2, allows very large tables (and their associated indexes) to be partitioned into smaller, more manageable units, providing a "divide and conquer" approach to very large database management. Partitioning also improves performance, as the optimizer will prune queries to only use the relevant partitions of a table or index in a lookup. Oracle Database 11g Release 2 provides multiple methods for partitioning data, and also allows different levels of partitioning on the same table, so that a single partitioning strategy can be used to improve both performance and manageability.

Oracle Partitioning can also manage the lifecycle of information. Typically, all databases have active data – the information being processed this month or quarter, and historical data that is primarily read-only. Organizations can take advantage of the inherent lifecycle of data to implement a multi-tiered storage solution and lower their overall storage costs. For example, a large table within an order-entry system could contain all the orders processed in the last 7 years. Oracle Partitioning can be used to set up monthly partitions, with the current last four months of order data partitioned onto a high-end storage array, with all the other partitions placed on a lower-cost storage solution, often 2-3 times less cost than the high end storage environment.



Example of partitioning used to reduce storage costs

With this approach, the need to continually buy high-end storage can be mitigated, as the growth is constrained to a scalable, low-end storage solution. In addition, all the data is online, so business users have access to all their information within their applications, offering significant advantages over off-line data archiving.

Reduce storage usage with Advanced Compression techniques

Oracle Database 11g also provides advanced compression techniques to further reduce storage requirements. Using Oracle Advanced Compression, an option to Oracle Database 11g, all data in a table can be compressed using a continuous table compression capability that achieves a 2-4 times compression ratio with little performance impact on OLTP or Data Warehousing workloads. This compression technology replaces duplicate values in a table with a single value, and continuously adapts to data changes over time, so compression ratios are always maintained.

Assuming a model where 5% of the data in a system is active, with the remaining 95% historical, a 10:1 reduction in storage costs can be realized with the partitioning and compression capabilities in Oracle Database 11g Release 2, resulting in substantially reduced need for future storage purchases, and with the same or even increased performance of the applications. In addition, the savings cascade through the enterprise, as backups and copies of the databases also use less storage.

With Oracle Database 11g Release 2, the Exadata Storage Servers in the Sun Oracle Database Machine also enable new hybrid columnar compression technology that provides up to a 10 times compression ratio, with corresponding improvements in query performance. And, for pure historical data, a new archival level of hybrid columnar compression can be used that provides up to 50 times compression ratios.

MAXIMIZE AVAILABILITY

"Active Data Guard will enable us to reduce system costs by up to $100,000 on our larger mission-critical systems"

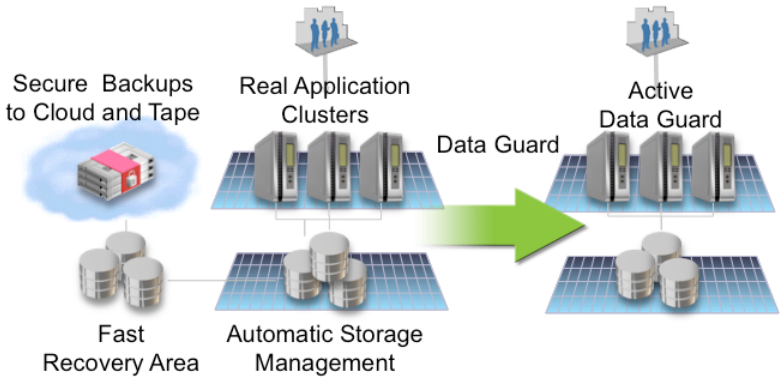
Aris Prassinos, Distinguished Member of Technical Staff

MorphoTrak

One of the primary reasons IT organizations consolidate their environments is to make it easier to manage the availability of their business applications. Providing 24 by 7 access to business applications requires protection from unplanned downtime, and mitigation of planned downtime for maintenance operations. In addition, organizations need to be able to recover from human error quickly.

Protection from unplanned downtime requires architecture built with redundant components. Extra disks are required for data mirroring, additional hardware is required for failover server processing, and additional data centers are required for disaster recovery. All this redundancy is very expensive, and typically only realizes any value when there is indeed a component failure; this is rather like an expensive insurance policy. In addition, a great deal of software is often required to integrate these different components together, typically from different vendors. This introduces additional complexity and greater risk for human error

Simplify high availability environments



Oracle's Maximum Availability Architecture

Oracle's approach is to provide a complete blueprint, called the Oracle Maximum Availability Architecture. All the software components required to protect the database are provided by Oracle; this provides a solution that is well integrated and reduces the complexity in the data center.

Eliminate Idle Redundancy

The main advantage of Oracle's Maximum Availability Architecture is that it uses redundant components to not only provide protection from unplanned downtime, but to also improve the performance and efficiency of the production systems as well. For example, as additional disks are added to an ASM environment to provide more storage for mirrored data, the additional I/O bandwidth provided by these disks is also applied to the production environment. On-disk backup and recovery areas allow backup and recovery operations to be automated, while unique incremental change tracking and backup image merging ensures that both backup and recovery objectives can be meet.

The same integrated software used to perform on-disk backup and recovery operations can also be used to backup securely to tape, and now also to storage in the Amazon Cloud.

Oracle Real Application Clusters not only provides protection from server failure, but also provides additional scalability to the business application.

For disaster recovery, the built in Data Guard technology can be used to provide low cost synchronization between the production databases and standby databases. And, the Active Data Guard option of Oracle Database 11g now enables reporting and backup operations to be offloaded from production to standby systems. This fully utilizes previously redundant resources to improve the performance of production systems, while continuing to protect from disaster.

Eliminate Planned Downtime

For many organizations, the real challenge lies in eliminating the need for planned downtime, and Oracle's Maximum Availability Architecture provides unique capabilities here as well.

Any hardware component in an Oracle Grid can be dynamically added or removed as required. Disks can be added or removed online with ASM, with the data automatically rebalanced across the new disk infrastructure. Additional servers can also be easily added or removed to a Real Application Cluster with users connected to these nodes rebalanced across the infrastructure.

This ability to migrate users from one server to another in a RAC cluster also enables rolling patching of the database software. If a patch needs to be applied, then a server can be removed from the cluster, patched, and then put back into the cluster. The same operation can be repeated for the next server in the cluster, and so on.

Similarly, users can be switched between production and standby databases in an Oracle Data Guard environment. Version differences of the database, and the operating system between the production and standby environments are supported. This means that the standby database can be upgraded to the next major version, the new environment can then be tested, and then users on the older version can be switched over to the new one, without any downtime.

Online Application Upgrade

Online table redefinition is fully supported with Oracle Database 11g, and now with Release 2, an application upgrade can now be performed online. With edition-based redefinition, changes to program code can be made in the privacy of a new edition within the database, separated from the current production edition. An editioning view exposes different projections of the same table into each edition, ensuring that the code in each edition only sees its own specific view of the table. Cross edition triggers propagate the data changes made by the old production edition into the new edition's columns, and vice-versa. This then allows both the old production environment and the new production environment to be used at the same time, for testing, and allows users to be moved online from one edition to the other. Once upgraded, the old production edition can be dropped, unused table columns can be removed, and the new edition becomes the new de facto production edition.

Eliminate data loss caused by Human Error

It's an unfortunate truism, but the number one cause of data loss is simple human error. Database Administrators logon to development systems to drop and clean up tables, only to find that they had logged onto a production system by mistake. Or a simple coding error is made in a large batch job, and suddenly many thousands of customers in the database all share the same mailing address.

In non-Oracle environments, these types of errors would require that the production database be shut down, and a point in time recovery performed. The production environment would be unavailable while this backup was being performed, and both the mistakes and any useful work done from the time the mistake was made would be rolled back, requiring transaction rekeying.

Oracle Database 11g provides unique online capabilities to undo human error. If a DBA does inadvertently drop a table, it is sent to a wastebasket, and can be returned with a simple command. Similarly, if one or more rows from a table are deleted or changed, the earlier versions of those rows can be queried online, and the specific transactions causing the mistake can be undone, without any loss of the data changes caused by additional transactions. And if needed, the entire database can be simply rewound in time, much like playing a video backwards.

MAXIMIZE SECURITY

"It is truly transparent data encryption. Within a matter of a few hours, the basic components were running and available, and we didn't notice any performance impact"

Sam Lebron, Senior Architect

Dress Barn

Information within an organization is increasingly at risk. IT is now subject to numerous regulations that mandate strong control and protection of personally identifiable information. To meet these requirements, Oracle Database 11g Release 2 provides in-depth data security capabilities, including data encryption and masking, access controls, high fidelity auditing and reporting, enterprise configuration scanning, and data change forensics.

One of the most pressing challenges for IT professionals is recognizing where they are vulnerable in terms of security. Oracle provides capabilities in this area – the Configuration Management Pack, available with Oracle Enterprise Manager, provides over 240 policies that implement and monitor best practices around security management, configuration and storage, across all Oracle Databases within an enterprise. Oracle Audit Vault provides a secure, centralized vault of audit information collected from multiple databases (including some non-Oracle databases), enabling simplified analysis, threat detection, and reporting of possible compliance issues across the entire information management infrastructure.

Oracle Total Recall, an option to Oracle Database 11g, provides a solution for the retention of historical information. With Oracle Total Recall, all changes made to data are kept to provide a complete change history of information. This means that auditors can not only see who did what when, but they can also see what the actual information was at the time – something that previously has only be available by building into the application, or by expensive backup retention policies.

New internal control requirements found in regulations can be difficult and expensive to implement in an environment with multiple applications. Oracle Database Vault, an option to Oracle Database 11g, allows access controls to be transparently applied underneath existing applications. Users can be prevented from accessing specific application data, or from accessing the database outside of normal hours; separation-of-duty requirements can be enforced for different Database Administrators without a costly least privilege exercise.

And Oracle Advanced Security, an option to Oracle Database 11g, can be used to transparently encrypt data at all levels – data in transit on the network; data at rest on physical storage and in backups. Similarly, the Data Masking pack can be used to obfuscate data as it moves from production to development, reducing the potential violation of privacy regulations or risking sensitive data leaks.

DOUBLE DBA AND DEVELOPER PRODUCTIVITY

"Oracle Enterprise Manager has helped us address system management issues proactively, automate previously manual administrative tasks, and reduce the need for extensive DBA training."

Arup Nanda, Senior Director

Starwood Hotels & Resorts

Business is increasingly dependent on IT and users naturally demand a higher quality of service; however, IT budgets have remained flat at best. To address this growing gap, Oracle has added more automated self-managing capabilities over successive releases, with the result that Oracle Database 11g Release 2 takes 50% less time to manage then previous releases.

Oracle's self-management approach takes two tacks. Firstly, wherever possible, repeatable, labor intensive and error prone tasks that can be fully automated in the database have been. For example, Storage Management, Memory Management, Statistics collection, Backup and Recovery, and SQL Tuning have all been automated.

Secondly, where operations cannot be fully automated, intelligent advisors are built into the database to mentor Database Administrators on how to get the best out of their systems. Advisors are provided for Configuration Management, Patching, Indexing, Partitioning, Performance Diagnostics, Data Recovery, and, new in Oracle Database 11g Release 2, Compression and Maximum Availability.

The combination of built-in automation and intelligent advisors reduces the complexity gap between the available database administration resources and the business's service level objectives. As the vast majority of the analysis and trouble-shooting is performed by the database itself, Database Administrators are now able to spend less time looking after the day-to-day operations of their databases, enabling them to manage more databases in their environments. Recent studies performed by an independent research company shows that Database Administrators can expect to spend 26% less time managing their 11g environments over their 10g environments, and as much as 50% when compared to older Oracle9i deployments

DEVELOP QUICKLY AS WELL

Oracle Database 11g Release 2 provides a single, integrated data management solution that is supported by all popular application development frameworks used by developers today. This protects IT's investment in developer resources, increases productivity, and reduces development cycles.

.Net

The Oracle Developer Tools for Visual Studio .NET is a tightly integrated add-in for Microsoft Visual Studio, making it easy for developers to write code for Oracle Databases. The Oracle Data Provider for .NET provides optimized data access from a .NET environment, allowing developers to take advantage of the advanced functionality in Oracle Database 11g Release 2. Oracle Database 11g Release 2 on Windows also supports the development, deployment, and execution of stored procedures and functions written in a .NET managed language such as C# or VB.NET, reducing the need for .Net programmers to have to learn different languages

Java

Similarly, Oracle Database 11g Release 2 supports Java developers. It includes an embedded Java Virtual Machine (Java VM) that executes Java directly in the database. Client and middle-tier applications written in Java can also use JDBC, an industry-standard application-programming interface (API) that lets developers embed SQL statements in Java code.

PHP

PHP is a popular, interpreted scripting language commonly used for creating Web 2.0 applications. It powers over twenty million Web sites on the Internet and has a large user community. Oracle has partnered with the open source community to create a stable, high-performance PHP database driver that is fully integrated with Oracle Database 11g Release 2.

Oracle Call Interface (OCI)

The Oracle Call Interface provides a high performance API for applications written in complied languages such as C, C++, Cobol, and Fortran.

PL/SQL

PL/SQL is a powerful procedural language designed specifically for the seamless processing of SQL commands against the Oracle Database. It can be used to create stored procedures, functions and triggers that execute within the Oracle Database. It may also be used in middle-tier and client applications as well.

Oracle Application Express (Oracle APEX)

Oracle Application Express is a rapid Web application development tool specifically for the Oracle Database. Using only a Web browser and limited programming experience, developers can develop and deploy professional applications that are fast and secure. Oracle APEX combines the productivity and ease of use qualities of a personal database with the security, scalability and availability of an enterprise database when building Web applications.

Oracle SQL Developer

Oracle SQL Developer is a graphical tool that enhances productivity and simplifies database development tasks. Designed for Oracle Database developers, Oracle SQL Developer simplifies development cycles and reduces the need to buy third-party tools for developing and debugging SQL and PL/SQL code.

Oracle SQL Developer Data Modeler

Oracle SQL Developer Data Modeler provides a suite of data and database modeling tools and utilities, including modeling for Entity Relationship Diagrams (ERD), Relational (database design), Data Type and Multi-dimensional modeling, full forward and reverse engineering and DDL code generation.

SIMPLIFY THE SOFTWARE PORTFOLIO

"Oracle (Database 11g, VM, Unbreakable Linux, Enterprise Manager and Business Intelligence) allows us to focus on delivering the best user experience and continue to lower the cost of operations. We owe this in part to the consistent, proven software solutions from Oracle."

Nicholas Tang, VP of Technical Operations

Interactive One

Just as a mish-mash of hardware and storage incur additional IT costs, so can a complicated software portfolio. Over the years organizations have deployed multiple data management platforms, typically under different business applications. So they can end up with Oracle Databases running on Unix and Linux systems, SQL Server on Windows, DB2 on the mainframe, pockets of legacy and specialist databases for data marts, XML and other spatial and multimedia management.

Each of these point data management solutions has different levels of capabilities – and as such all incur additional software environments in terms of supporting infrastructure. In turn they require different solutions for database management, cluster volume management, cluster failover, backup and recovery, data integration, data replication and more; the list is endless. Yet the cost of integrating all these different point solutions into a single, coherent solution is paid for by the customer, and is paid for on an annual basis. Plus, a single change in release level of any one of these components requires that the integration and testing be started all over again

Oracle Database 11g Release 2 provides a single, integrated solution of all information management requirements that's available on all open system platforms, and supported with all major third party applications. It not only stores relational data, but also stores Documents, XML, Multimedia, Location and Spatial Information, and supports advanced data types such as RFID tags, DICOM medical images, and Semantic data. Performance is optimized for these individual data types – for example, files stored in the database using the Secure Files feature can store and deliver files faster than typical operating systems. Indexing and SQL access is provided to all the extended data types stored in the database, allowing easy integration of the new data types into existing applications. Native access via the protocols normally associated with the specific data type are also provided – for example, http and XPath access to XML data, and new in Oracle Database 11g Release 2, SPARQL access to semantic data, as well as native NFS type interfaces to documents and images etc stored in the database via the Secure File capabilities.

All data stored in the database inherits the cost reduction, security and high availability capabilities provided by Oracle Database 11g Release 2. So by standardizing on the Oracle Database as their single data management platform, IT organizations can vastly simply their software portfolio, and reduce ongoing integration and maintenance costs, while at the same time simplifying the consolidation, governance and compliance, high availability, and management of their environment.

ACHIEVE BUSINESS VALUE IN A QUARTER OF THE TIME

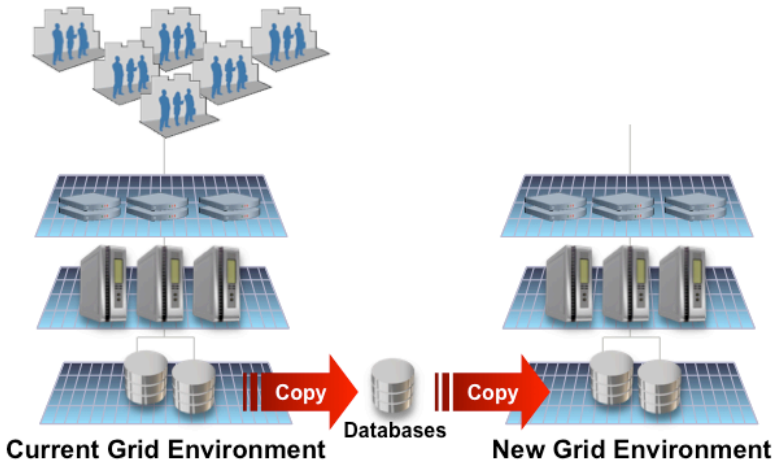
""Each Oracle upgrade—from Database 8 through to 8i, 9i, 10g and now 11g—has increased system performance, stability, and availability, while cutting management overheads, and providing ever-higher levels of service"

Charlotte Melén, Web Technology Manager

Comic Relief

One of the biggest challenges for IT lies in effectively realizing the value of change. As systems become more complex, and more mission critical, it becomes more difficult to make changes in the data center. Even though there is business value in adopting change; e.g. greater performance, lower cost, or higher availability, making the change itself can be seen as risky. This means that instead of performing regular improvements, IT will often delay changes thereby incurring additional costs to the detriment of business operations.

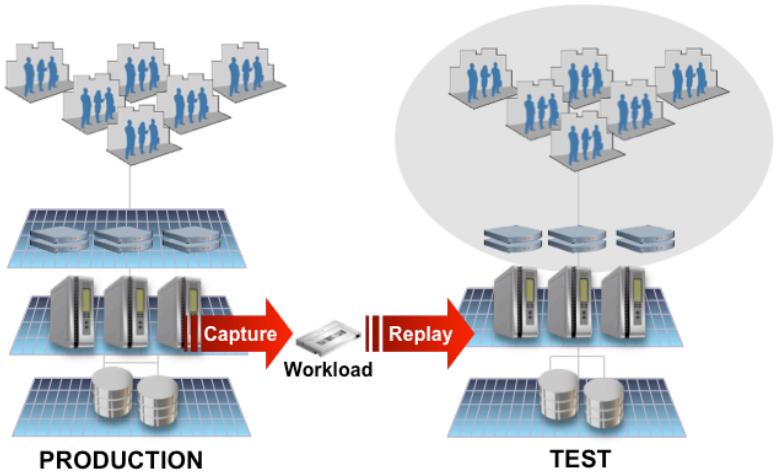
One of the bigger challenges in the IT environment is software upgrade. New versions of database software come out regularly, as do operating systems (OS). In the past, upgrading the database and OS for individual environments has been very expensive and a never-ending job – by the time all of the business systems in house are upgraded individually, it is often time to start again. Grid consolidation has an important benefit to play in reducing this cost and time. By consolidating all their applications onto a Grid of low cost hardware, modern organizations can take advantage of additional agility provided by this. When required, a new Grid containing the new database and OS software can be easily and cost-effectively provisioned.



Migrating databases between different Grid environments rather than upgrading

Then the databases and associated end-users communities can be simply moved from the old consolidated environment to the new one, as time and business requirements. Once all databases have been migrated in this way, the older hardware can be re-provisioned for the next generational update.

Oracle Database 11g Release 2 also includes features that significantly reduce the cost and risk associated with making these changes. Oracle Real Application Testing, an option of the Oracle Database, enables capture of production workloads from Oracle Database 10g and Oracle9i Database for replay against Oracle Database 11g.



Real Application Testing capturing and replaying production workload onto test environment

This enables IT to test infrastructure changes with actual production workloads and automatically detect any change in behavior. IT can quickly determine the impact changes will have on their production environment, and will also know how to mitigate any negative impact before the changes go into production. Real Application Testing can reduce the time (and cost) taken to test changes by at least factor of 4. The risk and time associated with frequent, incremental upgrades to the database environment are significantly reduced, enabling IT to deliver continuous innovation to the business faster and without risk.

CONCLUSION

Oracle Database 11g Release 2, the second release of the award winning Oracle Database 11g, provides the necessary foundation for IT to successfully deliver more information with higher quality of service, and to efficiently manage change within their IT environment to deliver better value to the business.

By deploying Oracle Database 11g Release 2 as their data management solution within their IT architecture, enterprises can look to leverage the full power of the world's leading database to reduce their hardware and storage costs; improve their system performance by a factor of 10; dramatically simplify their software portfolio; double the productivity of their IT personal, and quarter the time taken to realize business value.

Lowering your IT Costs
with Oracle Database 11g Release 2

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