

**Database Manageability and Productivity
Cost Comparison Study**

Oracle Database 11g Release 2

vs.

Microsoft SQL Server 2008 Release 2

January 10, 2012

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Executive Summary

Over the last several decades, database management systems have become an integral part of every corporate IT landscape. The overall number of databases coupled with the rate of data growth means that every organization in the world has significant cost centers that revolve around the management and implementation of various data stores. The challenge for every organization that tracks large amounts of data is to cost effectively deal with explosive growth, while keeping IT budgets intact. The purpose of this database manageability and productivity cost comparison study is to provide IT decision makers with factual information to address these challenges.

ORC International compared the database management and productivity costs of two leading enterprise database management systems: Oracle Database 11g Release 2 Enterprise Edition and Microsoft SQL Server 2008 Release 2 Enterprise Edition. ORC International also looked at the announced new features of Microsoft SQL Server 2012 and concluded that the results of this study are likely to be substantially the same when compared with the SQL Server 2012 as well.

At ORC, we interviewed several Oracle and SQL Server database administrators (DBAs) and IT architects. Using our own testing labs we measured the productivity savings a DBA might expect when running typical tasks as they relate to the day to day responsibilities of an IT database professional. The runtime of each step was recorded, as well as the total number of steps required to perform each task. This allowed our analysts to calculate relative management and productivity savings that a typical organization might expect to gain or lose when implementing the compared products. In the comparison of the two systems, we found the Oracle DBA to be much more productive than the SQL Server DBA.

While the initial hardware and licensing costs may seem to be the primary recipient of database departmental spending, the actual cost of an enterprise database management system is in the daily management of these systems by the individuals that are assigned to perform the tasks that have been outlined in this study. The cost savings we outline in this study are realized in increased productivity which results in eventual dollars saved.

Based on our weighted averaging of everyday DBA tasks, the study revealed significant time and resource savings when using Oracle Database 11g Release 2 Enterprise Edition over SQL Server 2008 Release 2 Enterprise Edition. The study concluded:

- Oracle Database 11g Release 2 Enterprise Edition resulted in an overall **49 percent time savings** when compared to SQL Server 2008 Release 2 Enterprise Edition.
- Oracle Database 11g Release 2 Enterprise Edition resulted in an overall **46 percent step/complexity savings** when compared to SQL Server 2008 Release 2 Enterprise Edition.
- Based on a **productivity savings of 49 percent**, the time savings amounted to **\$58,800 dollars per year per DBA** for an Oracle Database 11g Release 2 DBA versus an SQL Server 2008 Release 2 DBA.

The two key areas that combined to account for 55 percent of a DBA's time, based on our weighted variables, included *Backup and Recovery*, and *Performance Tuning Tasks*. These two areas had the greatest manageability differences between the two products. Oracle Database 11g Release 2

Enterprise Edition exceeded SQL Server 2008 Release 2 Enterprise Edition in these two areas by **48 percent average time saved, and 38 percent average step/complexity savings.**

ORC International also looked at the overall usability of the tools, including the number of tools required to complete the tasks.

Oracle Database 11g Release 2 can be run on virtually any operating system, including Linux, UNIX, or Windows¹. SQL Server 2008 Release 2 is solely Windows based², and will not support installation in any other operating system, thereby raising the cost significantly for UNIX or Linux server-based organizations. In order to manage a SQL Server 2008 Release 2 instance or database, additional client applications must be installed on the DBAs machine. Oracle Database 11g Release 2 Database Control (the management console) is browser-based, which means it can be run from any location and any computer with connectivity to Oracle Database 11g Release 2 Enterprise Edition server.

SQL Server 2008 Release 2 has several tools that make up the management and feature set of the SQL Server database. While many of the basic functions of each application can be accessed via the SQL Server Management Studio, to gain full power of each application, they must be launched separately. In some instances, these additional applications can be launched via a contextual Tools menu within SQL Server Management Studio, others require additional configuration as External Tools within the application itself. Oracle Database 11g Release 2 Diagnostics and Tuning Packs, though separately licensed, come pre-installed with the database kernel and therefore do not require any additional installation times from the DBA. This study only includes tools that are already pre-installed and available out-of-the-box with each database, since external tools require substantial amount of time to be spent for installation and configuration before use.

While both products provide sufficient tools for DBAs to complete frequent and infrequent tasks efficiently, this report focuses on the differences between them for a common set of DBA tasks.

About this Report

This in-depth comparative productivity cost study compares two products, employing pre-defined tasks and steps that DBAs perform daily or regularly. DBAs were interviewed about the amount of time they typically spent in each of the four areas of study to determine the weighted workload value for each subject area, and multiple database disciplines were chosen, including 24x7x365 production DBAs as well as application and development DBAs.

To develop productivity cost comparisons and infer a dollar cost comparison, common DBA tasks were the focus of this study. Some factors were excluded from this study which could directly affect the overall cost of ownership of either platform. Not included in this study were:

- **Physical Server and Hardware Costs:** The costs associated with servicing the DBMS platforms on the physical hardware.
- **Licensing Costs:** The costs associated with servicing the DBMS platforms from a software perspective. These include operating system costs as well as the DBMS costs, or any other software required to operate these platforms in a production environment.

¹ Oracle Database 11g R2 Supported Operating Systems: <http://www.oracle.com/us/products/database/enterprise-edition/index.html>

² SQL Server 2008 R2 Supported Operating Systems: <http://msdn.microsoft.com/en-us/library/ms143506.aspx>

For this study, the tools provided out-of-the-box with each platform were the only ones used to complete the tasks. No third-party tools were used. In a few instances a tool was not available for use and the task was completed using an SQL command, rather than a GUI-based tool. These instances are highlighted in the report.

The tools used for this study were:

Oracle Database 11g Release 2 Enterprise Edition

- Oracle Enterprise Manager Database Control , including the Diagnostics and Tuning Packs

SQL Server 2008 Release 2 Enterprise Edition

- SQL Server Management Studio (SSMS)
 - SQL Server Agent (SQL Agent) used as an extension of SQL Server Management Studio
- SQL Server Profiler (Profiler)
- Database Engine Tuning Advisor

Report Audience

This report is intended for a variety of DBMS users:

- **IT Decision Makers** who are responsible for managing IT centers including DBMS environments.
- **Database administrators** who work on the DBMS daily.
- **System architects** who have a stake in the success or failure of the DBMS.
- **Corporate product champions** who are responsible for outlining the features of a corporate application, or system that may rely on DBMS features.
- **Corporate decision makers** responsible for making financial and strategic choices for the corporation.

Testing Methods

Several DBAs in multiple disciplines and environments were interviewed to determine the weighting of the subject areas being tested. The tasks were chosen by a team of database architects and identified as the most common areas of time consumption for the DBA. The categories and tasks were defined as:

- Initial Setup and Installation
 - Out-of-the-box installation
 - Setup of additional database instance(s)
 - Setup of proactive monitoring
- Daily Administration Tasks
 - Tablespace/Data file creation

- User/schema creation
- Table creation
- Index creation
- Additional user creation
- Increasing Tablespace/Data file space
- Managing database fragmentation
- Loading data from external sources
- Configuring and processing workloads
- Backup and Recovery Tasks
 - Configuring and running full backups
 - Recovery of a dropped table
 - Recovery of a corrupt data file
 - Recovery of an erroneous transaction
- Performance and Tuning Tasks
 - Problem diagnosis
 - Instance memory tuning
 - SQL statement tuning

Tasks were broken into steps, each of which required a user action to continue the workflow. Timing methods were applied to track the time and the number of steps required to complete each task. Whenever available, defaults were selected in all test cases, and at the first sign of a “Finish,” “OK” or “Submit” button, that button was selected.

The tasks were tracked individually for time and step count, so results are available at the detail and aggregate level. A workload weighting constant was applied to each task. The weighting constants were determined during interviews with DBAs of different disciplines.

These results were compared to the total available work hours in a year (40 hours X 52 weeks = 2080 annual work hours), to calculate productivity results.

Dollar cost comparisons were also done to get task cost per occurrence; however the DBA salary per year is a constant in this study (the same for both platforms). Dollar costs can be compared at the individual task level, but the productivity savings value is what will lead to overall dollar savings by an organization.

Comparison Study

Workload Weighting

Using workload weighting, constants were applied to the tasks. These constants were based on interviews with DBAs, and take into account the percentage of time a DBA might spend on a specific task area. Reports from various ticketing systems were analyzed for category assignment to also look at the frequency of various requests to help balance the responses from the interviews. The workload weightings are shown in Table 1.

Table 1 - Workload Weighting

Task Area	Workload Weighting
A. Initial Setup and Installation	5%
B. Daily Administration Tasks	25%
C. Back and Recovery Tasks	10%
D. Performance and Tuning Tasks	45%
E. Administrative Functions * (Not Measured or Evaluated)	15%

**15 percent of time was allotted for administrative/HR functions and not counted towards evaluation of the actual DBA's time and energy. All percentages of time mentioned in the remainder of the document reflect the percentage of time that has been accounted for, 85 percent.*

Tasks

Each task is a request or action a DBA performs based on a user request. To validate the chosen task list, it was compared to various ticketing system categories in production and application support queues. The categories and issues reported were then looked at for frequency in order to ensure the tasks fit into the most requested categories, and accounted for 85 percent of DBA work, minus administrative functions and meetings.

Time

Time was measured from the start of a given task, when the mouse began to move to complete the task. For tasks that could run in the background, time was measured when the job or process was submitted to the DBMS. The job was tracked as a subtask and the run time was recorded independent of the task that required the DBA's attention.

For study consistency, any task that prevented a DBA from completing another task (for example, additional database creation, or initial setup and installation), was measured for the time required to complete the task.

Complexity

Complexity can be defined in many ways and each task has its own level of complexity. For this study, a formula was defined that weighted the step count to simulate the amount of DBA attention required to complete the task.

A step was defined as requiring a DBA to interact with the application to perform or finish a task, irrespective of clicking Next, Finish, or Submit. A step could include the typing of object names, or configuration of parameters such as passwords or instance names. These intuitive tasks received a step count of one.

Depending on a step's complexity, a step count penalty was applied. This included the inability to perform the task using a GUI-based tool. This penalty was the total number of steps required to perform the task, including clicking of menus, additional commands, and writing of scripts. If a script was required it was viewed as a single step, since most DBAs maintain frequently used scripts in their own toolboxes.

Comparison Testing

The purpose of doing comparison testing between these database management systems is to determine the long-term productivity and dollar savings or costs between the two systems. At first glance, hardware and licensing costs can appear high. However, the real cost of a database management system is a combination of the daily management of the system and the people costs in time and dollars associated with performing the outlined tasks. The annual dollar cost of a DBA is constant for a given calendar year. Therefore, the cost savings to consider is improved productivity—allowing the DBA to do more in a calendar year.

To compare dollar cost savings, rather than the dollar costs of each task, a \$120,000.00 annual US salary was taken from the report of a salary study of database administrators, architects, and developers who mainly focus on database development. The number was chosen from an available online Salary Study, and the number was chosen from the highest salaries reported in the study³.

Using the salary from the study and our own weighted productivity savings, we calculated the dollar cost savings of Oracle Database 11g Release 2 Enterprise Edition over SQL Server 2008 Release 2 Enterprise Edition as:

$$\text{Salary } (\$120,000.00) * \text{DBA Time Savings (49\%)} = \$58,800.00$$

This number represents the cost savings **per DBA, per year**, within a corporate organization. In reality, the cost of the DBA does not change for a corporation; the productivity of the DBA does. The test results below highlight how much more effective a DBA is when operating Oracle Database 11g Release 2 Enterprise Edition compared to SQL Server 2008 Release 2 Enterprise Edition.

This section provides the detailed comparative findings on the two platforms: Oracle Database 11g Release 2 Enterprise Edition and SQL Server 2008 Release 2 Enterprise Edition. For the remainder of the document, Oracle Database 11g Release 2 Enterprise Edition will be referred to as Oracle Database 11g R2 and SQL Server 2008 Release 2 Enterprise Edition will be referred to as SQL Server 2008 R2.

³ The salary study is available from:

http://salary-surveys.eri.com/content/Architecture_Salary_Survey/Database_Architect_1856/US_National.htm

Administration Workload

The general Administration Workload Testing takes into account tasks performed infrequently by the DBA. In our weighted workload value, these infrequent tasks account for only 5 percent of the DBA's work hours, or 104 work hours per year, based on a 40-hour work week. The tasks included in this part of the test are shown in the table below.

Table 2 - Testing: Administration Workload Tasks

A. Initial Setup and Installation		Time (Min:Sec)		Steps		Percent Difference	
		Oracle	SQL Srv	Oracle	SQL Srv	Time	Steps
1	Out-of-the-box installation	15:59	20:28	1	7	22%	86%
2	Setup of additional database	04:20	09:37	2	7	55%	71%
3	Setup proactive monitoring	00:19	01:04	4	24	70%	83%
Total		20:38	31:09	7	38	34%	82%

Out-of-the-Box Default Installation

Installation of both systems was simple and straightforward. The system documentation for both DBMS systems was complete and thorough. Both systems install all pre-requisites without issue or error. Oracle won on installation time by 22 percent. Oracle Database 11g R2 was less complicated to install and required fewer steps than the SQL Server 2008 R2. As the results show (Table 2 - Testing: Administration Workload Tasks), Oracle Database 11g R2 took only 1 step to complete, SQL Server 2008 R2 took 7 steps to complete.

No additional steps were required for either DBMS platform in order to put it to task. Both Oracle Database 11g R2 and SQL Server 2008 R2 were ready for duty as soon as the installation was completed.

Both installations were easy. Oracle Database 11g R2 installation required little or no confirmation except for a few text boxes (e.g., passwords, instance names) which required input. SQL Server 2008 R2 also required only steps that were intuitive, similar to the Oracle Database 11g R2 installation (e.g., passwords, database name, instance name, etc.).

Both systems had few required parameters and adequate defaults to complete the installation. As stated before, both systems installed flawlessly and without issue. It is the opinion of ORC that during the initial installation of SQL Server 2008 R2 however the initial installation screen can be intimidating and cumbersome to a DBA installing SQL Server 2008 R2 for the first time. DBAs that were interviewed also expressed the opinion that the installation screen is still quite confusing when using it for the first time, even SQL Server DBAs that had been using that specific DBMS for many years prior to the release of this specific construct.

Setup of New Database Instance

New database creation was simple for both systems. Both installed flawlessly without errors or undocumented prerequisites that would be required in order to make the database/instance operational.

An Oracle Database 11g R2 instance provides user schemas, advanced security, tablespace file organization, indexes, and all other types of database objects collectively known as a database, whereas

a SQL Server 2008 R2 instance holds a collection of databases, with each database having user schemas, advanced security, file organization and all other types of database objects. To view the two as synonymous is a bit misleading, however for the purposes of this test, we identified that we would use common terminology behind each platform. When setting up additional databases, Oracle Database 11g R2 outperformed SQL Server 2008 R2 by more than 55 percent and took 71 percent fewer steps to install over SQL Server 2008 R2.

Proactive Monitoring Setup & Configuration

Proactive monitoring setup and configuration were much faster and easier for Oracle Database 11g R2 than SQL Server 2008 R2. For both products, four nearly-identical thresholds were modified with the following results:

- Oracle Database 11g R2 required 83 percent fewer steps for setup than the SQL Server 2008 R2.
- Oracle setup time was also 70 percent less than for the SQL Server 2008 R2.

Comparing the two platforms was difficult, as they approach threshold monitoring and configuration quite differently. As the numbers above reflect, using the provided tools for Oracle Database 11g R2 required less setup time and steps than using the provided tools with SQL Server 2008 R2.

For Oracle Database 11g R2, all monitoring thresholds were configured from a single screen, and all changes enabled in a single submit/commit. When working with SQL Server 2008 R2, the SQL Server Agent had to be employed in order to configure the thresholds. For each threshold, a separate SQL Server Agent Alert had to be configured, and there was no automated alerting of violation of the rules set forth. Additional configuration options would have had to be configured and deployed in order to provide automated alerting. Manual searching and monitoring of SQL Server 2008 R2 logs would have to be looked at regularly in order to see an alert event raised within the system. It is the opinion of ORC International that this can lead to a false sense of security by an inexperienced DBA. The dashboard that is provided by Oracle Database 11g R2's Oracle Enterprise Manager Console far exceeds the usability requirements of the tools by offering analytics around problematic areas within the instance once the thresholds are defined.

The task of setting up and configuring proactive monitoring is not performed regularly. This typically happens on initial database creation, but sometimes must be changed until the DBA has identified the biggest areas of contention within his or her database. In interviews, DBAs said that of all the administrative tasks, this one must be performed most often. The type of database (e.g., production, implementation, quality assurance, development) plays a role in configuring this task due to monitoring requirements and SLAs being different based on the type of environment the database is in.

One benefit of Oracle Database 11g R2 over SQL Server 2008 R2 is the installed Oracle Diagnostics Pack and Tuning Pack. More specifically, the Automatic Database Diagnostic Monitor (ADDM) is integrated into Oracle Database 11g R2 kernel. This self-diagnostic tool takes much of the guesswork out of performance-tuning Oracle Database 11g R2 instance. Performance tuning often comes from theory, and DBAs are likely to look for performance issues in areas they have encountered in the past, therefore making decisions on performance metrics that may be unfounded or inaccurate. Sometimes these metric configurations yield false positive alerts to the DBA and production support teams, thereby resulting in the alerts being ignored or turned off for lack of response.

With the ADDM performance problems are categorized into trees; root cause is located based on the combined years of performance-tuning experience by Oracle's trained architects. Key performance indicators (KPI) are included for each ADDM-reported issue, so each issue can be prioritized and addressed according to its impact on the database instance. The ADDM recommendations are based on a repository, called Automatic Workload Repository (AWR) that enables Oracle Database 11g R2 to accurately monitor and diagnose instance problems. The AWR contains statistics on how the instance is used operationally. The purpose of the AWR is to take periodic snapshots of the current database instance load for processing by the ADDM; it forms the foundation for how the ADDM processes and parses the data. The AWR allows the ADDM to identify and present performance issues and enables historical instance analysis to allow the DBA to isolate the instance in question and show performance improvement over time.

With SQL Server 2008 R2, if the DBA is not utilizing the SQL Server Management Pack available in Microsoft Systems Center Operations Manager, they must rely on their years of experience with the database platform in order to setup or monitor the overall health of the database. While specific reports are available for a DBA to access to monitor the health of the system, no proactive monitoring is provided by the database platform. Third-party tools are available to diagnose and proactively monitor both DBMS platforms, yet it is ORC's opinion, and the opinion of our DBA panel, that one of these third-party tools is absolutely required when employing SQL Server 2008 R2 to the corporate production infrastructure. Microsoft does provide a pre-configured pro-active monitoring package that is available for Microsoft Operations Manager 2007 SP1 and R2⁴.

Purchase of additional tools would then require the unforeseen cost of licenses for a third-party tool, installation, configuration and training on the product, and this would yield a higher overall cost of ownership of SQL Server 2008 R2.

SQL Server 2012 (Code named SQL Server Denali) does not have any new major enhancements related to proactive monitoring. It does have a new feature set called Distributed Replay, that will allow a DBA or architect to replay a workload on a different server to test upgrades and new features of an existing production load, however the same methods of performance diagnostics will still need to be employed in order to locate and find any performance bottlenecks within the platform.

Daily Administrative Tasks

Daily administrative tasks account for 25 percent (520 work hours) of the DBA's workload. The daily administration tasks identified by our DBA panel are listed in the table below:

⁴ Microsoft pre-configured SQL Server Monitoring Management Pack:
<http://www.microsoft.com/download/en/details.aspx?id=10631>

Table 3 - Testing: Daily Administration Tasks

B. Daily Administration Tasks	Time (Min:Sec)		Steps		Percent Difference	
	Oracle	SQL Srv	Oracle	SQL Srv	Time	Steps
4 Create Tablespace	00:13	00:15	2	1	13%	-100%
5 Create User/Schema	00:06	00:22	2	5	73%	60%
6 Create Table	00:45	00:36	17	17	-25%	0%
7 Create Index	00:43	00:29	3	4	-48%	25%
8 Create Additional User	00:09	00:22	2	5	59%	60%
9 Add Space to Tablespace	00:08	00:09	1	1	11%	0%
10 Reclaim Fragmented Space	00:33	00:25	4	5	-32%	20%
11 Load Data from Text File (csv)	01:20	00:40	13	4	-100%	-225%
12 Configure Adaptive Thresholds and Perform Workloads	00:46	01:09	0	9	33%	100%
Total	4:43	4:27	44	51	-6%	14%

Object Creation: Tablespace/Data File

Tablespace creation occurred 13 percent faster for Oracle Database 11g R2 when compared to SQL Server 2008 R2. The number of steps required for this task using Oracle Database 11g R2 required 1 more step than SQL Server 2008 R2 to perform the test, and because of the decreased amount of steps required for both systems to be tested, this resulted in some artificially skewed numbers.

Both platforms performed the task quickly and without error, with only a two-second time difference and a one-step difference between the two platforms. While these time differences seem minimal, they can add up to significant annual DBA productivity gains or losses.

Object Creation: User/Schema

Creating a new user/schema was easy, quick, and straightforward for both platforms. SQL Server 2008 R2 performed this task much slower than Oracle Database 11g R2, nearly 73 percent slower and with a step savings advantage of 60 percent. Both DBMS platforms created the additional user without issue or error.

Object Creation: Table

Table creation was also very similar for both platforms, with identical tables being created. Because the default tablespace was a system-based tablespace when using Oracle Database 11g R2, an additional step was added to Oracle Database 11g R2 to create the user-based objects in a non-system based tablespace. Oracle Database 11g R2 completed the task 9 seconds slower than SQL Server 2008 R2, using the same number of steps.

Object Creation: Index

Oracle Database 11g R2 far exceeded SQL Server 2008 R2 in speed and marginally exceeded SQL Server 2008 R2 in complexity during index creation. Default values were selected for both platforms and

Oracle Database 11g R2 performed this task in 25 percent fewer steps. However Oracle Database 11g R2 performed this task slower than SQL Server 2008 R2 by 14 seconds. The index consisted of a single column.

Object Creation: Additional User

An additional differentiating factor between the two programs was the creation of an additional user. It is ORC's opinion that both Oracle Database 11g R2 and SQL Server 2008 R2 each provide an intuitive interface for user/schema creation. Oracle Database 11g R2 took 59 percent less time to complete this task than the SQL Server 2008 R2, and also required 60 percent less steps. While this is a significant productivity difference, most DBAs use prepared scripts for creating additional or bulk users, which reduces screen navigation time. The user creation task is tricky to analyze fully, since users differ widely and are created for different purposes. In our interviews, we found that standard users are created only once.

Temporary users, on the other hand, are created often, so as to allow architects or developers to diagnose production and quality assurance systems. Temporary users are often created and then dropped, or passwords changed once access is no longer needed. This human analysis speaks to the speed and efficiency levels that the Oracle Database 11g R2 DBA provides when performing this task.

Space Management

Add Space to Tablespace

Both DBMS platforms, Oracle Database 11g R2 and SQL Server 2008 R2, provide an intuitive user interface to grow the tablespace/data files, rather than add an additional file to the tablespace/data file. For this study, the amount added was 25 percent of the initial space. Oracle Database 11g R2 outperformed SQL Server 2008 R2 by 11 percent and both required only one step.

Reclaim Fragmented Space

Oracle Database 11g R2 offers the ability to reclaim fragmented space by reorganizing the tablespace with a very intuitive user interface. In order to accomplish the same task in SQL Server 2008 R2, the Maintenance Wizard had to be employed, however by doing it in this fashion using SQL Server 2008 R2, the steps can be saved to a regularly running maintenance plan. The process was straightforward and not confusing on either platform. Oracle Database 11g R2 completed this task requiring 20 percent fewer steps when compared to SQL Server 2008 R2.

Load Data

For this task, ORC International's testing representatives chose a small country-to-IP mapping table and identified a 169,000-record dataset for loading. This table is commonly truncated, loaded and unloaded into production systems. For this exercise, the technicians chose to create the table upon the first load, adding considerable steps to Oracle Database 11g R2's loading of the file.

Oracle Database 11g R2 required double the time and 9 more steps to load this table than SQL Server 2008 R2. SQL Server 2008 R2 saved time and steps by automatically assuming table format and creation during the import process. Oracle Database 11g R2 required the user to fill out the structure of the table prior to importing it. Oracle did auto-generate control files for the import process.

The overall process of importing data took significantly longer for Oracle Database 11g R2, importing data into the respective platforms took approximately 50 percent less time for SQL Server 2008 R2 than Oracle Database 11g R2.

Configure Adaptive Thresholds and Perform Workloads

This is an important task for any database administrator. In order to analyze and know what is happening inside of the database instance on a day to day basis, it is critical to properly analyze how the database responds to various application loads. It also enables the database administrators to communicate to other departments how the users behave in the system, and how they use a given database. The need to quickly access and consume this data is critical to the everyday interface for the database administrator.

Oracle Database 11g R2 was superior in this category and testing scenario. Oracle Database 11g R2 accomplished configuration, consumption and processing of the workload in 46 seconds, 33 percent less time than the comparable test run on SQL Server 2008 R2. Oracle Database 11g R2 also accomplished this task with zero steps, only increments. No further input was required of the database administrator.

SQL Server 2008 R2 was a laborious process requiring the use of the SQL Server Profiler. The SQL Server 2008 R2 DBA must also know what metrics to gather when doing a trace using this tool. SQL Server 2008 R2 does however provide standard data-gathering templates to help aid this process.

In addition to having to use the SQL Server Profiler, the Database Engine Tuning Advisor was also employed. The use of this tool added to SQL Server 2008 R2's step count in this category by 100 percent. Oracle Database 11g R2 far exceeded SQL Server 2008 R2 in step/complexity count in this category.

Backup & Recovery Tasks

Backup and recovery are vitally important to a DBMS platform and not surprisingly, both systems performed these tasks. Oracle Database 11g R2 showed significant productivity gains over the SQL Server 2008 R2. The following table outlines the tasks performed:

Table 4 - Testing: Backup & Recovery Tasks

C. Backup and Recovery Tasks	Time (Min:Sec)		Steps		Percent Difference	
	Oracle	SQL Srv	Oracle	SQL Srv	Time	Steps
13 Configure and Run Full Backup	00:08	00:10	0	0	20%	N/A
14 Recover Dropped Table	00:28	02:23	3	8	80%	63%
15 Recover Corrupt Datafile	01:32	01:13	5	2	-26%	-150%
16 Recover from erroneous transaction using Flashback	01:18	01:46	8	11	26%	27%
Total	3:26	5:32	16	21	38%	24%

Configure & Run Full Backup(s)

Configuring and running full backups were very similar for both Oracle Database 11g R2 and SQL Server 2008 R2. Both have intuitive interfaces for accomplishing this task outside standard maintenance. This

task is often required in the middle of the day or during a production time, when a release occurs, a problem needs diagnosis, or QA requires a refresh of the most current data.

Oracle Database 11g R2 performed the backup process 20 percent faster than the SQL Server 2008 R2, and required zero steps on the technician's part other than selecting Next/Submit. Both platforms executed the task quickly and without issue.

Recover Dropped Table

Recovery of a dropped table in Oracle Database 11g R2 was very simple. In fact Oracle Database 11g R2 outperformed SQL Server 2008 R2 with an 80 percent time and 63 percent step/complexity savings. Oracle Database 11g R2 provided out of the box options for the recovery of a table. The steps are clearly defined and easy to follow, and in less than 30 seconds, our testing had recovered a table with over 160,000 rows in it.

SQL Server 2008 R2 required the testers to restore the database to a new location, extract the data from the newly restored database, truncate the destination table, then import the freshly exported data. It was found that there were multiple points at which this could cause problems. For a database of significant size in a production environment, where the database is > 100 GB this additional restore could add hours to the overall restore process of a single table when using SQL Server 2008 R2, not to mention the requirement for additional space in a production environment.

Had this been an actual production instance, of significant size, Oracle Database 11g R2 would have still performed within seconds, since the option to flashback a single table is present and available. The exact amount of time to restore a database of significant size in an environment utilizing SQL Server 2008 R2 is not known since each production environment, including the computer and disk subsystem architecture can vary from company to company.

It is ORC International's opinion that based on this task, this alone can add a significant amount of time saved each year by an organization if they choose to utilize Oracle Database 11g R2 over SQL Server 2008 R2.

Recover Corrupt Data File

ORC International's team of experts was able to restore a SQL Server 2008 R2 datafile using the provided wizards and tools provided by Microsoft. The ability to select Files and Filegroups as options for restoration was intuitive and easy to find. It is our opinion however that using the Oracle Database 11g R2 provided Oracle Advised Recovery process, while it still took longer and required more steps, was more intuitive. The Oracle Database 11g R2 wizard hand-held the user through the entire process and made reliable recommendations to correct any known issue.

While testing this task, ORC International noted that SQL Server 2008 R2 outperformed Oracle Database 11g R2 by 21 percent in time savings and 60 percent in step/complexity savings.

Correct Erroneous Transaction

This scenario was very complex for the SQL Server 2008 R2 testers to complete. In this test not only did ORC have to repeat certain steps, to restore the database to a new location, export the table, import it back into the destination table after a truncation, but ORC also had to repeat certain transactions, since we only had our most recent backup to work with. By using the Flashback technology again, Oracle

Database 11g R2 outperformed SQL Server 2008 R2 by 26 percent in time savings and 27 percent in step/complexity savings.

It must be noted again that in the case of a large production database, this can result in many hours invested by a SQL Server 2008 R2 DBA in order to perform this recovery operation. Even with a DBA being 100 percent focused on the recovery, the amount of manual steps in the SQL Server 2008 R2 recovery operation can lead to further human errors that can potentially increase the amount of time it takes to recover from an erroneous transaction. It is therefore ORC's opinion that this task can lead to a significant amount of time and productivity savings to an organization that chooses to utilize Oracle Database 11g R2 as its DBMS platform of choice rather than SQL Server 2008 R2.

Performance & Tuning Tasks

Performance and tuning tasks are vital to the scalability and survivability of applications, so productivity in this area is important. The DBA needs to be able to quickly diagnose and solve a performance and tuning problems. ORC International's panel of database professionals revealed that in true 24x7 environments, this task accounted for nearly half of the DBAs' time.

From a timing perspective Oracle Database 11g R2 out-performed SQL Server 2008 R2 by a substantial margin of over 143 times improvement. The high difference is due to the variance of one task, where SQL Server 2008 R2 had a much more complex process for tuning SQL statements, and took much longer to process than Oracle Database 11g R2.

Table 5 - Testing: Performance & Tuning Tasks

D. Performance and Tuning Tasks	Time (Min:Sec)		Steps		Percent Difference	
	Oracle	SQL Srv	Oracle	SQL Srv	Time	Steps
17 Problem Diagnosis	00:08	00:14	2	2	43%	0%
18 Tune Instance Memory	00:00	00:00	0	0	0%	0%
19 Tune SQL Statements	00:00	18:50	0	8	100%	100%
Total	00:08	19:04	2	10	99%	80%

Problem Diagnosis

Oracle Database 11g R2 showed significant gains over SQL Server 2008 R2 in problem diagnosis, with 43 percent time savings. No steps are required to determine if there are issues with installation of Oracle Database 11g R2. Also, the initial Oracle Enterprise Manager's intuitive dashboard, with its KPIs and visualizations of database performance, makes problems easy to diagnose and locate. SQL Server has some standard informational reports that are easily accessible when using the SQL Server Management Studio, however the lack of a consolidated dashboard for easy identification makes the tool more cumbersome to use.

In ORC's opinion, the lack of an interactive dashboard within SQL Server 2008 R2 does not provide DBAs or other IT staff with a quick means to tell where a problem may be occurring. An overview dashboard of the DBMS system would enable quicker problem diagnosis and resolution. There are third-party monitoring products that are available for both DBMS platforms, however one of these additional tools would have to be purchased in order to get the same level of ease of use that comes from a

standard installation of Oracle Database 11g R2. This purchase would add to the overall cost of ownership for SQL Server 2008 R2, and also lead to lost productivity in installation, configuration, and training on such a third-party tool.

In our opinion, SQL Server 2008 R2 cannot be compared on any level of problem diagnosis with Oracle Database 11g R2, without the installation and configuration of third-party or custom built tools. Oracle Database 11g R2's additional productivity is gained by employing the ADDM and AWR. While SQL Server 2008 R2 does have standard reports that can be looked at, there is not an intuitive way for a DBA to get a high level view of database performance without a third-party tool.

Instance Memory Tuning

Both Oracle Database 11g R2 and SQL Server 2008 R2 offer out-of-the-box instance memory tuning. Therefore, this test will be removed from subsequent studies of this kind, since nothing was available for us to test.

SQL Statement Tuning

SQL statement tuning is an often-overlooked aspect of DBA work, but one that takes a good portion of their time. Sometimes DBAs are hired by organizations that have poorly-designed databases, or databases that require constant tuning. Other times, they find themselves part of a development team, or supporting a development team where the developers outnumber the DBAs 10 or 15 to one. In these cases, DBAs tune and review a lot of SQL. Oracle Database 11g R2 showed a total domination in productivity and time savings when compared to SQL Server 2008 R2. Oracle Database 11g R2 used no steps or time in order to complete this task.

Oracle Database 11g R2 provides out-of-the-box tuning of SQL statements and reporting of problematic SQL. The DBA need not wait for alerts on blocked objects or reports from operations that web pages are non-responsive. The DBA can easily navigate within Oracle Enterprise Manager using the SQL Response Time chart on the performance dashboard to quickly dive into KPIs and look at the collection details to identify poorly written SQL if they choose to not rely solely upon the Automatic Tuning features of Oracle Database 11g R2. For the purposes of this test, we made the assumption that SQL would be automatically tuned, that none of our production SQL contained recursive statements, or that queries would not go parallel⁵.

SQL Server 2008 R2 required the DBA to not only generate a workload on the database server, but also setup a specific trace type, wait for the trace to complete and then load it into the Database Tuning Advisor and wait for the system to consume and test the workload in order to make recommendations. It was of little consolation that the profile trace type was at least a template available from a drop down selection item. The amount of time it took to isolate and find problematic SQL using the out-of-the-box tools was a very long process. There is no KPI or automatic metric for the DBA to be able to see and proactively resolve before the issue becomes apparent to the users without manual research into the instance, thereby requiring a DBA to write custom SQL and alerts to properly monitor a SQL Server database/instance. The DBAs will be able to proactively maintain Oracle Database 11g R2 instance without causing or waiting for service interruption that could affect customers or internal staff.

Oracle Database 11g R2 outperformed SQL Server 2008 R2 by 100 percent in time savings and 100 percent in step/complexity savings.

⁵ Oracle Automatic SQL Tuning Features and Usage:
http://download.oracle.com/docs/cd/E11882_01/server.112/e16638/sql_tune.htm#CHDHICFI

SQL Server 2012

Microsoft has announced SQL Server 2012, code named Denali. At the time of writing of this report, SQL Server 2012 is in CTP3. Below are the publicly available information from Microsoft⁶ and other reliable sources⁷ on the new management features in SQL Server 2012. The interface for installation and management of the system go largely untouched in SQL Server 2012.

- **Always On:** SQL Server Always On⁸ is the next evolution in SQL Server Database Mirroring⁹.
- **User Defined Roles/Contained Databases:** Contained Databases include all required configuration information, including all security and users that are needed to connect to a SQL Server database within the database meta data itself.

Since both the above manageability enhancements do not materially change the analysis done in this document, we expect the conclusions arrived at in this document to hold good for the comparison with SQL Server 2012 as well.

Conclusion

Any organization can have a measurable productivity savings by choosing Oracle Database 11g Release 2 Enterprise Edition over SQL Server 2008 Release 2 Enterprise Edition. Each IT organization is different, however based on our own independent interviews and lab tests, these tasks, and their respective weighted averages, have been identified as the most common tasks that make up the typical database professional's day. Based on our findings, Oracle Database 11g Release 2 Enterprise Edition provides nearly a 50 percent productivity savings when compared to SQL Server 2008 Release 2 Enterprise Edition which translates into a cost savings of \$58,800 per Oracle DBA. From the currently available information, the results are expected to be similar with the newly announced SQL Server 2012.

⁶ SQL Server Denali Books Online: [http://msdn.microsoft.com/en-us/library/ms130214\(v=sql.110\).aspx](http://msdn.microsoft.com/en-us/library/ms130214(v=sql.110).aspx)

⁷ <http://www.windowssitpro.com/article/sqlserverdenali/sql-server-denali-new-features-140115>
<http://blogs.technet.com/b/dataplatforminsider/archive/2011/08/18/alwayson-new-in-sql-server-code-name-quot-denali-quot-ctp3.aspx>
<http://www.databasejournal.com/features/mssql/article.php/3916166/Top-9-New-Features-of-SQL-Server--Denali.htm>

⁸ Always On Blog: <http://blogs.msdn.com/b/sqlalwayson/>

⁹ Always On Details: <http://blogs.msdn.com/b/sqlalwayson/archive/2010/12/08/alwayson-availability-group-and-database-mirroring.aspx>

Summary Compilation

Comparison Summary Results

Table 6 - Summary of Testing Results

Task	Description	Time (Min:Sec)		Steps	
		Oracle	SQL Srv	Oracle	SQL Srv
A. Initial Setup & Installation		20:42	31:09	7	38
1	Out-of-the-box installation	15:59	20:28	1	7
2	Setup of additional database	4:20	9:37	2	7
3	Setup proactive monitoring	0:19	1:04	4	24
B. Daily Administration Tasks		4:43	4:27	44	51
4	Create Tablespace	0:13	0:15	2	1
5	Create User/Schema	0:06	0:22	2	5
6	Create Table	0:45	0:36	17	17
7	Create Index	0:43	0:29	3	4
8	Create Additional User	0:09	0:22	2	5
9	Add Space to Tablespace	0:08	0:09	1	1
10	Reclaim Fragmented Space	0:33	0:25	4	5
11	Load Data from Text File (csv)	1:20	0:40	13	4
12	Configure Adaptive Thresholds and Perform Workloads	0:46	1:09	0	9
C. Backup and Recovery Tasks		3:26	5:32	16	21
13	Configure and Run Full Backup	0:08	0:10	0	0
14	Recover Dropped Table	0:28	2:23	3	8
15	Recover Corrupt Datafile	1:32	1:13	5	2
16	Recover from erroneous transaction using Flashback	1:18	1:46	8	11
D. Performance and Tuning Tasks		0:08	19:04	2	10
17	Problem Diagnosis	0:08	0:14	2	2
18	Tune Instance Memory (Appendix C)	0:00	0:00	0	0
19	Tune SQL Statements	0:00	18:50	0	8

Final Results

Table 7 - Summary of Weighted DBA Time and Step Savings

Tasks Area		Workload Weighting	% Difference		Workday Savings	
			Time	Steps	Time	Steps
A.	Initial Setup & Installation	5%	34%	82%	2%	4%
B.	Daily Administration Tasks	25%	-6%	14%	-1%	3%
C.	Backup and Recovery Tasks	10%	38%	24%	4%	2%
D.	Performance and Tuning Tasks	45%	99%	80%	45%	36%
Total		85%*	49%	46%	50%	45%

**15 percent of time was allotted for administrative/HR functions and not counted towards evaluation of the actual DBA's time and energy.*

Detailed Comparison

Initial Setup & Installation

Task 1: Default Installation

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Default Installation					
In Explorer Navigate to DVD and start setup by double clicking setup.exe	00:00	0	In Explorer navigate to DVD and start setup by double clicking setup.exe	0:00	0
Waiting for Installer to Load	00:04	0	Select Installation - Select New Installation or add features to an existing installation, wait for setup support rules check	0:13	0
Email Configuration: Defaults selected/Warnings ignored	0:02	0	Input license Key: GYF3T-XXXXX-00000-11111-88888 (License Key altered for security), select Next	0:15	1
Install Options: Default selected	0:02	0	Accept License Terms by checking the box. Click Next	0:02	1
System Class / Defaults selected	0:02	0	Setup Support Files Installation. Click Install, wait for completion, at summary screen pending no warnings or errors, select Next	1:32	0
Password Screen / Set password to 123456	0:05	1	Leave default of SQL Server Feature Installation (Ignore PowerPivot, new R2 feature set, outside of current scope), select Next	0:01	0
Installation Review / Finish Selected	0:08	0	Feature Selection - Click Select All, click Next	0:02	0

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Default Installation					
Actual Installation / Binary Copy, etc.	8:31	0	Summary Screen, select Next	0:03	0
Oracle Database Configuration Assistant ran based on previous inputs	7:09	0	Leave Default Instance selected, click Next, View Disk Summary Page, click Next	0:05	0
The Oracle installed without any issues or errors			Server Configuration - Click Use same account for all Services, Modal appears, type in AD Username with Password, Click Next	0:07	2
			Account Provisioning Mixed Mode selected, SA password entered and confirmed. Select Add Current user, to add current AD user to Admin group on SQL Server	0:08	3
			Analysis Services Account Provisioning - Select Add Current User, click Next	0:05	0
			Reporting Services, click Next, Error Reporting, click Next, Installation Configuration Rules, Click Next, Ready to Install, Click Install	0:12	0
			Wait time for binary installation	17:43	0
Oracle Total	15:59	1	SQL Total	20:28	7

Task 2: Create additional database server/instance

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Setup of additional database instance					
Launch the database configuration assistant	0:00	0	In Explorer navigate to DVD and start setup by double clicking setup.exe	0:00	0
Splash screen	0:02	0	Select Installation - Select New Installation or add features to an existing installation, wait for setup support rules check	0:13	0
Create Database Screen	0:02	0	Input license Key: GYF3T-XXXXX-00000-11111-88888 (License Key altered for security), select Next	0:15	1
Database Template screen / General Purpose/OLTP selected	0:02	0	Accept License Terms by checking the box. Click Next	0:02	1
Database Identification / Database SID set to comptst	0:04	1	Setup Support Files Installation. Click Install, wait for completion, at summary screen pending no warnings or errors, select Next	1:32	0
Management Options / Default selected, nothing changed. (On subsequent run, the daily disk backup option was selected, where an OS username and password was entered in addition to default values selected)	0:04	0	Leave default of SQL Server Feature Installation (Ignore PowerPivot, new R2 feature set, outside of current scope), select Next	0:01	0
Password Screen: Select "Use the same password for all accounts" in order to speed process	0:04	1	Feature Selection - Click Select All, click Next (Some options already installed, and options are grayed out)	0:02	0
Database File Locations: Defaults selected – Finish button found and selected	0:02	0	Summary Screen, select Next	0:03	0

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Setup of additional database instance					
Summary Screen/ OK selected	0:03	0	Leave Default Instance selected, click Next, View Disk Summary Page, click Next	0:05	0
Database Creation Screen (Cosmetic, nothing to do)	3:56	0	Server Configuration - Click Use same account for all Services, Modal appears, type in AD Username with Password, Click Next	0:07	2
Password Management Screen / Exit found and clicked	0:01	0	Account Provisioning Mixed Mode Selected, SA password entered and confirmed. Select Add Current user, to add current AD user to Admin group on SQL Server	0:08	3
			Analysis Services Account Provisioning - Select Add Current User, click Next	0:05	0
			Reporting Services, click Next, Error Reporting, click Next, Installation Configuration Rules, Click Next, Ready to Install, Click Install	0:12	0
			Wait time for binary installation - Instance only installation, since all other tools are already installed	6:52	0
Oracle Total	4:20	2	SQL Total	9:37	7

Task 3: Set up proactive monitoring for performance and space utilization

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Setup Proactive Monitoring					
Enterprise Manager homepage / Select Metric and Policy Settings at the bottom of the page	0:01	0	Right click SQL Server Agent - Select New - Select Alert	0:02	0
Metric and Policy Settings / Edit four various thresholds and select OK	0:18	4	Type in alert name - Server Memory Monitor	0:03	1
			Type of alert - SQL Server Performance Condition Alert	0:01	1
			Select Object: MSSQL\$PRD: Memory Manager	0:02	1
			Select Counter: Total Server Memory (KB)	0:02	1
			Select Alert if counter: Rises Above - Enter 90 in value field	0:05	2
			Select OK	0:01	0
			All steps above repeated, however different counters x3	0:48	18
Oracle Total	0:19	4	SQL Total	1:04	24

Daily Administration Tasks

Task 4: Create Tablespace

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create Tablespace					
Server Screen / Tablespaces Selected	0:01	0	Expand Databases Folder - Right click comptst database, select properties	0:03	0
Tablespace Creation / Under Datafiles select Add (new tablespace named PRODDATA)	0:05	1	Select Files - Select Add	0:02	0
New Datafile Creation Location default selected. New file named proddata.tbs / OK selected	0:06	1	Type in new logical file name: comptst_dat2	0:04	1
Tablespace Creation Review / Summary screen viewed to ensure new space was created	0:01	0	Select OK - Wait for file to be created	0:06	0
Oracle Total	0:13	2	SQL Total	0:15	1

Task 5: Create User/Schema

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create User/Schema					
Enterprise Manager Homepage / select Security	0:01	0	Right click Security / Select - New - Login	0:03	0
Security Page / Click Create	0:01	0	Create Login - select SQL Server Login, Username PROD_APP, password Prod4pp (unselect user much change password)	0:08	3
Enter username "PROD_APP" password 123456 and all other fields left default / Select OK	0:04	2	Select User Mapping	0:02	0
			Select comptst, select db_owner	0:04	2

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create User/Schema					
			Select OK to close dialog- wait for user creation to complete	0:05	0
Oracle Total	0:06	2	SQL Total	0:22	5

Task 6: Create Table

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create Table					
Enterprise Manager Home, go to Schema / tables	0:01	0	Expand database - comptst, right click tables, select New Table	0:00	0
Tables change default schema from System to PROD_APP / Click Create	0:02	1	Columns entered, defaults given, identity column specified, primary key defined	0:32	16
Enter Table Name / 5 columns change various default values / data types/ nullability / Click OK	0:42	16	Save button on Toolbar in SSMS clicked, table name entered, OK clicked	0:04	1
Oracle Total	0:45	17	SQL Total	0:36	17

Task 7: Create Index

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create Index					
Enterprise Manager Home / go to Schema / tables	0:01	0	Expand Databases, Expand comptst, Expand tables, Pick table and expand, right click Indexes, select New Index	0:12	2 ¹⁰
Select Indexes / Create	0:02	0	Type new index name, IDX_IPCOUNTRY	0:04	1

¹⁰ SQL Server Contextual Penalty of 2

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create Index					
Input index name, enter table name and select Populate Columns	0:06	2	Select Add	0:02	0
Select single column to include in the index. / Select OK	0:34	1	Select Single column from table, click OK	0:05	1
			Click OK, wait for index to be created	0:06	0
Oracle Total	0:43	3	SQL Total	0:29	4

Task 8: Create Additional User

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Create Additional User					
Enterprise Manager Homepage / select Security	0:01	0	Right click Security / Select - New - Login	0:03	0
Security Page / Click Create	0:02	0	Create Login - select SQL Server Login, Username PROD_MAILER, password ProdM4i1 (unselect user must change password)	0:08	3
Enter username "PROD_MAILER" password 123456 and all other fields left default / Select OK	0:06	2	Select User Mapping	0:02	0
			Select comptst, select db_owner	0:04	2
			Select OK to close dialog- wait for user creation to complete	0:05	0
Oracle Total	0:09	2	SQL Total	0:22	5

Task 9: Add Space to Tablespace

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Add Space to Tablespace					
Enterprise Manager Homepage / Datafiles	0:01	0	Right click database comptst, select Properties	0:02	0
Pick an existing datafile / Additional space specified, OK selected	0:07	1	Select Files, change initial size to 25% larger than current size, click OK	0:07	1
Oracle Total	0:08	1	SQL Total	0:09	1

Task 10: Reclaim Fragmented Space

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Reclaim Fragmented Space					
Enterprise Manager Homepage	0:00	0	Expand Management Folder, Right Click Maintenance Plans, select Maintenance Plan Wizard	0:01	0
Schema Tab / Reorganize Objects / Tablespace / Various wizard screens to complete	0:33	4	Leave Defaults, as a one-time reorganize. (Can be scheduled for automated processing, rather than manual, click Next	0:02	0
			Select Shrink Database and select Reorganize Index, click Next	0:03	2
			Click Move Down, to perform the Index Reorg prior to the shrink. Select Next	0:02	1

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Reclaim Fragmented Space					
			Index Reorg - Pull down database list to select comptst, leave all other defaults, select Next	0:03	1
			Shrink Database - Pull down database list to select comptst, leave all other defaults.	0:02	1
			Reporting options - leave defaults, select next, Complete wizard screen, Click Finish; Wait time for process to complete	0:12	0
Oracle Total	0:33	4	SQL Total	0:25	5

Task 11: Load Data from Text File (CSV)

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Load Data from Text File (CSV)					
Enterprise Manager Homepage / Data Movement	0:00	0	Expand databases, right click comptst, select tasks / Import Data	0:03	0
Data Movement / Automatically generate control file, host credentials entered	0:02	0	Select Datasource - Flat File Source	0:02	1
Data Movement / Select Datafile / Create table, have to manually specify tables, even though source file has already been specified	0:51	13	Click Browse, navigate to file, change filetype to CSV, select file, click Open	0:11	1

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Load Data from Text File (CSV)					
Data Movement / Conventional Path / Various screens related to job submission, accept defaults.	0:09	0	Click Columns (Contextual penalty, as columns are not automatically defined, and must by clicking the columns option + 2)	0:01	2
Job Review	0:07	0	Click Finish, import load time	0:23	0
Actual Load	0:11	0			
Oracle Total	1:20	13	SQL Total	0:40	4

Task 12: Configure Adaptive Thresholds and Perform Workloads

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Configure Adaptive Thresholds and Compare Workloads					
Enterprise Manager Homepage / Select Baseline Metrics	0:04	0	Click Tools / SQL Server Profiler	0:02	0
Threshold Configuration / Quick Configuration Selected	0:06	0	Default Connect provided, click Connect	0:03	0
Profile Selected	0:05	0	Give Trace Name ATLHSQLPRD_WRKLOAD, select Use Template: Tuning, select Save to Table, Connection modal with default connection presented, click Connect, select PRD_STAGING as database, leave schema default as dbo, type table name TMP_WORKLOAD, select OK	0:19	4

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Configure Adaptive Thresholds and Compare Workloads					
Review Profile / Finish Selected	0:04	0	Click Run - Allow trace to run for specified consumption time (27 seconds), and stop trace, and close Profiler	0:27	0
Wait Time for Consuming	0:27	0	Click Tools / Database Engine Tuning Advisor	0:02	0
			Default Connect provided, click Connect	0:01	0
			Select Table option, Click search button, select PRD_STAGING as database name, leave dbo as default schema, and select TMP_WORKLOAD as workload table to use. Select comptst as database for workload analysis	0:09	3
			Select database to tune (comptst), click drop down to select tables, click checkbox next to "Name" to select all tables	0:03	2
			Leave Tuning Options to Default (however not common practice)	0:00	0
			Click Start Analysis	0:01	0
			Wait for workload to be consumed, look at and review various recommended indexes, partitions, etc.	0:02	0
Oracle Total	0:46	0	SQL Total	1:09	9

Backup & Recovery

Task 13: Configure and Run Full Backup

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Configuring and Run Full Backup					
Backup Configuration / Schedule a Full Backup	0:01	0	Expand Databases - right click comptst, select Tasks - Back Up	0:02	0
Schedule Oracle Suggested Backup	0:01	0	Accept Defaults, Click OK	0:01	0
Disks left as default	0:02	0	Wait for Backup to finish	0:07	0
Default time of 2:00 AM selected	0:04	0			
Job submitted	0:00	0			
Oracle Total	0:08	0	SQL Total	0:10	0

Task 14: Recover Dropped Table

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recover dropped table					
Enterprise Manger Homepage / Availability	0:02	0	Contextual Penalty + 3 - Right click databases, select Restore Database	0:02	3
Availability / Perform Recovery	0:00	0	Type in new database name: comptst_restore, select From Database: comptst in dropdown, most recent full backup already selected by default, assume last backup	1:08	2
Perform Recovery / Change the scope to tables / Operation Type to Flashback Dropped Tables / Click Recovery	0:03	3	Click OK, wait for restore to process	0:47	0

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recover dropped table					
Defaults selected / Object Recovered	0:23	0	Right click production database - select Tasks - Import Data	0:02	
			Type in existing servername ATLHSQLPRD1, select comptst_restore as source database, click Next	0:05	2
			Destination database filled in by default, as it was the database we right clicked on to import to. Click Next, Defaults left to copy data from one or more tables, click Next	0:02	0
			Select table from source to replace. Click Edit Mappings, click Delete Rows In Destination Table, click OK	0:06	1
			Click Next, to show Run Immediately, click Finish and wait for processing to finish	0:11	0
Oracle Total	0:28	3	SQL Total	2:23	8

Task 15: Recover Corrupt Datafile

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recover Dropped Datafile					
Cannot connect to the Database Instance / Select Perform Recovery	0:00	0	Expand Databases. Right click comptst, select Tasks, Restore, select Files and Filegroups	0:03	0

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recover Dropped Datafile					
Perform Recovery / Provide username / password combination	00:06	2	Select From Device: and select "." button to pick the file. Select Add button and navigate to latest or correct backup set of data, and select it by double clicking it	0:06	1
Perform Recovery / Oracle Suggested Recovery	00:02	1	Leave defaults on General Page, move to Options Page, select Overwrite Existing Database option. Click OK, wait for restore process to finish	1:04	1
Manage Failures / Review / Datafile Missing / Select Advise	00:04	2			
Restore File / Recover	1:20	0			
Oracle Total	1:32	5	SQL Total	1:13	2

Task 16: Recover from erroneous transaction

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recovery from erroneous transaction					
Enterprise Manager Homepage / Select Schema / Select Tables	0:04	1	Right click databases, select Restore Database	0:02	3 ¹¹
Table Search – Enter Owner/Schema / Select Go / Select the table to flashback	00:09	2	Type in new database name: comptst_restore, select From Database: comptst in dropdown, most recent full backup already selected by default, assume last backup	0:08	2

¹¹ SQL Server Contextual Penalty of 3

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Recovery from erroneous transaction					
View Table: Select Flashback Table in Actions Go / Pick a point in time to flashback to input it into Flashback to a timestamp	00:12	2	Click OK, wait for restore to process	0:10	0
Perform OLR / Flashback Tables / Defaults Selected / Select Next	00:04	2	Right click production database - select Tasks - Import Data	0:02	
Confirmation / Select Next / Review / Select Submit	00:49	1	Type in existing servername ATLHSQLPRD1, select comptst_restore as source database, click Next	0:05	2
			Destination database filled in by default, as it was the database we right clicked on to import to. Click Next, Defaults left to copy data from one or more tables, click Next	0:02	0
			Select table from source to replace. Click Edit Mappings, click Delete Rows In Destination Table, click OK	0:06	1
			Click Next, to show Run Immediately, click Finish and wait for processing to finish	0:11	0
			Manually redo lost transactions	1:00 ¹²	3 ¹³
Oracle Total	1:18	8	SQL Total	1:46	11

¹² SQL Server Time Penalty of 1:00 Minute

¹³ SQL Server Contextual Penalty of 3

Performance and Tuning Tasks

Task 17: Problem Diagnosis

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Configure System to Identify Top Resource-Consuming SQL					
Enterprise Manager Homepage / Review latest ADDM findings and ORA errors in the alert log	0:02	0	Right click the Server - Select Reports - Standard Reports - Performance - Top Queries by average CPU time	0:04	0
Drill into each KPI to find root cause	0:06	2	Look at each query and top metrics, drill into query to find additional bottleneck information. From there manual process of tuning the query, index analysis, etc.(Two queries)	0:10	2
Oracle Total	0:08	2	SQL Total	0:14	2

Task 18: Tune Instance Memory

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Tune Instance Memory					
Automatic Memory Tuning is enabled as part of the installation	0:00	0	Automatic Memory Tuning is enabled as part of the installation	0:00	0
Oracle Total	0:00	0	SQL Total	0:00	0

Task 19: Tune SQL Statements

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Tune SQL Statements					
Automatic SQL Tuning used for this Task / No penalty / Nothing to do	0:00	0	Click Tools - SQL Server Profile	0:01	0

Oracle			SQL SERVER 2008 R2		
Process Flow	Time	Steps	Process Flow	Time	Steps
Task: Tune SQL Statements					
			Enter Password (server name and username defaulted) Hit Enter	0:04	1
			Select Template: Tuning; Click Save to File: Give File Name; press Enter	0:00	3
			Click Run, wait for 5 minutes to generate workload	5:00	0
			Stop Workload generation	0:01	1
			Click Tools - Database Tuning Advisor	0:01	
			Enter Password (server name and username defaulted) Hit Enter	0:02	1
			Locate Workload File, select database to run workload against	0:09	2
			Click Start Analysis - wait for workload to be consumed and analyzed	13:32	0
Oracle Total	0:00	0	SQL Total	18:50	8

Appendix A: Test Platform Details

Hardware

- Processors: Dual Xeon 5520
- Memory: 12 GB DDR, 6x2 GB
- Storage
 - Primary system drives
 - 2 146 GB SAS 15k RPM RAID 1
 - Data drives
 - 3 146 GB SAS 15k RPM RAID 5

Operating System

- Microsoft Windows Server 2008 R2 Enterprise

Oracle

- Oracle Database 11g Release 2 Enterprise Edition (64 bit)
- Oracle Enterprise Manager Diagnostics and Tuning Packs
- Oracle Database Configuration Assistant

SQL Server

- Microsoft SQL Server 2008 Release 2 Enterprise Edition
- SQL Server Profiler
- SQL Server Agent
- SQL Server Database Engine Tuning Advisor

Appendix B: New Features

Oracle Database 11g Release 2

The list of new features contained in the Oracle Database 11g Release 2 Enterprise Edition can be found at: http://download.oracle.com/docs/cd/E11882_01/server.112/e17128.pdf

SQL Server 2008 Release 2

The list of new features contained in SQL Server 2008 Release 2 Enterprise Edition can be found at: <http://msdn.microsoft.com/en-us/library/bb500435.aspx>

Appendix C: Detailed Task Descriptions

Testing: Administration Workload

Out-of-the-Box Installation

A standard installation of both DBMS platforms, accepting all defaults and only providing input when required in order to complete the steps. These installation steps do not account for any customization for the server platform for use in a production environment.

Setup of New Database Instance

Using provided tools and wizards, only defaults were selected and input was provided only when required in order to complete the steps. This step focused on the creation of a new database/instance for the DBMS.

Proactive Monitoring Setup & Configuration

Using the provided tools, monitoring was configured for both DBMS platforms. Defaults were selected.

Daily Administrative Tasks

These tasks were identified as daily administrative tasks that DBAs typically perform.

Object Creation: Tablespace/Data File

This task tested the creation of additional space for the database, in a separate file.

Object Creation: User/Schema

This task tested the creation of an additional user for the database. This could be viewed as either a temporary user account for access to the database, or a new application user of a more permanent nature.

Object Creation: Table

This task tested the creation of a new table.

Object Creation: Index

This task tested the creation of a new index on a given table.

Space Management

These tasks tested the ability and ease to add and remove space from existing data files.

Add Space to Tablespace/Data File

This task tested the ease of adding space to an existing tablespace that had grown to capacity.

Reclaim Fragmented Space

This task tested the ability to remove unused space from a data file.

Testing: Backup & Recovery Tasks

This set of tasks tested various backup and recovery options available in both DBMS platforms.

Configure & Run Full Backup(s)

In this test we checked the ability to run a single backup, at user request, which was not scheduled.

Recover Dropped Table

In this test we compared the DBMS platform's ability to recover a single table that had been lost either through user error, or through corruption.

Recover Dropped Datafile

In this test we compared the DBMS platform's ability to recover a single data file that had been lost either through user error, or through corruption.

Recover from Erroneous Transaction

In this test we recovered from a transaction that was run in error to either mass update a table or group of tables.

Testing: Performance & Tuning Tasks

In this group of tests we compared the DBMS platform's ability to quickly diagnose and resolve performance problems related to the everyday usage of the database platform in question.

Problem Diagnosis

For this test we looked at the ease in which problems could be located, and how quickly user response could be determined.

Instance Memory Tuning

This test was not run, since both platforms provide the out of the box instance memory management. This test will be removed from future iterations of this study.

SQL Statement Tuning

In this test we determined the ability for each DBMS platform to quickly isolate and resolve problematic SQL statements.