

Oracle Real Application Testing – business agility through superior testing

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Oracle Real Application Testing – business agility through superior testing

Executive summary

Being able to adapt to change is a strategic imperative for all successful businesses, whether done by companies that pursue major transformational change or by those that undertake successive incremental changes. Companies that cannot adapt to address fluctuating business opportunities and challenges face serious downside risk. The ability to adopt new IT technology successfully can be a major enabler for change, while the inability can be a major anchor that holds a company back, preventing business evolution.

Superficially, it can seem relatively easy to make technology changes, but testing and assessing the impact of those changes is typically a long, complex, costly and error prone process. Altering IT infrastructure can also be very risky, with changes causing unforeseen consequences not uncovered during testing. Oracle Database 11g Real Application Testing (Oracle Real Application Testing) facilitates new technology adoption associated with infrastructure changes and offers the following benefits:

- *Greater agility – Oracle Real Application Testing allows for greater business agility by reducing the time required to test and QA system changes by as much as 80%*
- *Lower costs – Oracle Real Application Testing capabilities can lower infrastructure testing costs by as much as 70% for some customers*
- *Reduced Risk – by improving the ability to accurately assess the effects of changes, the new features will allow companies to mitigate risks by reducing the number of unexpected outages and by improving the service quality of their IT operations*
- *Enhanced efficiency – by intelligently automating many manual and complex testing tasks, Oracle Real Application Testing capabilities allow junior DBAs to perform tasks that currently demand the attention of senior DBAs and enhance the overall efficiency of IT engineers.*

Introduction

Efficiency was once the mantra of business, with companies seeking this goal by engaging in long and complex business process re-engineering projects. Although the objective of business efficiency has not gone away, it has been joined by new

business goals: increased agility, innovation, responsiveness, and flexibility. In other words, *adaptability to change* has become key to business success.

Oracle Real Application Testing, a key feature of Oracle Database 11g, allows rapid and safe adoption of infrastructure technology changes by reducing the testing effort and time required to ensure the robustness and quality of the changes before they go into production. Feedback from participants in the Oracle Database 11g early adopter program indicates that tasks that previously took many weeks can be reduced to a few days. These early adopters included Fortune 1000 companies with multi-terabyte databases and thousands of IT personnel.

Business drivers for change

Adopting new technology is often, but incorrectly, thought of as a 'nice to have' option rather than a business necessity, driven largely by the desire of IT staff to work with the latest technology. In actuality, change is a fact of business life, and the IT infrastructure must adapt to new business demands and opportunities rapidly and effectively for a company to remain competitive. Among the core drivers of change are:

- **business growth.** Traditionally, planning for business and application-service growth has involved guesswork, with the infrastructure initially put in place often reflecting conservative estimates of how fast the number of users will grow. Frequently, however, businesses find themselves needing to quickly upgrade their infrastructure to continue to maintain the service levels their customers expect as their customer or user base grows
- **compliance.** Regulatory requirements dictate that regulated systems in an enterprise must have a process for adoption of necessary changes within a reasonable timeframe to ensure that sensitive data and services are not exposed to exploitation and loss. Traditional testing is time-consuming and still has an element of guesswork and doubt, with businesses unsure that the changes they make to regulated systems will have the desired effect. This uncertainty is incompatible with many of the regulated markets, where it is essential to remedy vulnerabilities in a rapid and predictable fashion
- **business threats and opportunities.** No company operates in a vacuum, nor does its IT infrastructure. IT operations that may seem sufficient may suddenly fall short if a company's competition introduces new products, services or more effective business operations. Likewise, new market or revenue opportunities can materialize at times with little warning. In a business world, almost completely dependent on an IT foundation, the ability to adapt rapidly to counter risks or to exploit opportunities is more a necessity than a luxury.

While these and other common business drivers can catalyze IT infrastructure changes, so can the advancement of IT technology itself. In addition to the familiar processes of upgrading software and hardware to new versions and reconfiguring existing assets to better support their business processes, companies are:

- adopting new low-cost infrastructures, such as grid computing and tiered storage solutions
- implementing information lifecycle techniques and systems to better manage and leverage corporate information
- deploying new operating system configurations, including a growing number of firms that are moving many of their data center operations from commercial operating systems to the Linux open source alternative.

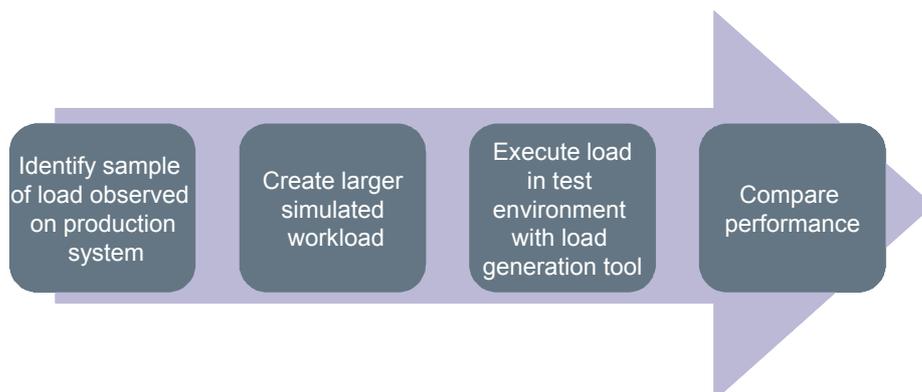
Given all of these business and technical drivers, a business that is not able to manage its ability to test and adopt IT changes can be exposed on many fronts. Worst case, poorly tested changes can disrupt a company's ability to function. Such risks are issues that should be high priorities for business executives. Those executives need to continuously challenge their IT counterparts to be sure that the business imperatives that drive change and reduce risk are not road-blocked or undermined by deficiencies in the IT operation.

Testing change in the traditional database world

Changes to production environments are a fact of life for IT professionals. Change control processes need to be robust but often result in change being slow to implement. As an example, one of the major international banks has a change control cycle for production systems that is targeted to take 18 months, and typically takes longer than this in practice.

Even with such robust processes and extensive testing, it is often still difficult to be fully sure of the production impact of these changes. The typical workflow in a traditional change-testing situation is illustrated in *Figure 1*.

Figure 1 **Typical testing process for database changes**



Source: Oracle, Ovum Summit

There are several flaws in this traditional approach:

- the representative transactions identified accounts for only a small percentage of the complete workload – typically 1–3% of what is used in the operational environment – resulting in a risk that key aspects of the workload behavior would not be tested
- the transaction replay does not represent the variability in workload well over a production period; e.g. a day or a month, where workload characteristics may vary greatly over the period
- simulating a small sample and then scaling up to a larger workload does not produce the same concurrency characteristics as the real production environment.

Some DBAs recognize the above deficiencies and work to create a much more representative workload for their load generation tools. However, this process is complex and exceptionally time consuming – often taking months to produce a synthetic workload that, in the end, is still not sufficiently similar to the real workload of the production environment to produce dependable results.

The result: testing using legacy techniques has substantial problems, requiring months to produce tests that try to match the live environment, and still often failing to replicate issues and patterns that occur in the production environment.

Oracle's Real Application Testing takes on change challenges

Oracle Database 11g offers a new solution designed to help IT professionals cope with the costs and risks of change in the production environment. The new change assurance capabilities, called Real Application Testing, include two key features: Database Replay and SQL Performance Analyzer. Together, Database Replay and SQL Performance Analyzer provide a comprehensive solution designed to help DBAs fully assess the impact of a change in a test environment using real production workloads. The testers can validate the change in test environment and then take any corrective action, if necessary, before introducing it to the production systems. This process can minimize unanticipated and undesirable results such as service outages, performance degradation, and so forth.

Among its core uses, Oracle Real Application Testing allows IT personnel to test all infrastructure changes within and below the database tier. These include changes such as:

- database, operating system and hardware upgrades
- operating system and database patches
- operating system migrations; for example, Windows to Linux
- configuration changes; for example, conversion from single instance to Oracle Real Application Clusters (RAC)

- storage changes, such as a move to Oracle Automatic Storage Management (ASM) or the use of information lifecycle management techniques such as partitioning and compression.

Expediting system change and reducing risk with Oracle Real Application Testing

All types of technology change introduce an element of risk, ranging from minor performance issues through to major business disruption and business continuity problems. Pre-production testing is supposed to uncover these issues, but often fails to do this because the tests are typically performed with unrepresentative or artificial workloads. As a result, many problems only appear later in the live production environment.

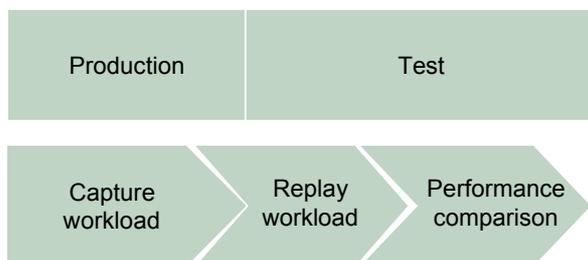
Database Replay

One of the Oracle Real Application Testing features, Database Replay, allows the testing and validation of system changes by recording a workload from a live production system and replaying it in another system while retaining all its original characteristics such as timing, concurrency, transaction dependencies, and so forth. By testing any planned changes on the actual production workload, the risk of these changes causing unforeseen problems once they are made in the operational environment can be significantly reduced.

There are three key stages to a test scenario that uses the Database Replay feature of Oracle Real Application Testing, as illustrated in *Figure 2*.

- Capture of full workload on the production system for a specified period of time.
- Execution of the planned system change on the test system followed by workload replay. The captured workload is replayed with the exact timing, concurrency and transaction characteristics of the production workload.
- Analysis of the replay, including comparison of key performance metrics of the production and test systems.

Figure 2 **Database Replay stages**



Source: Ovum Summit

Because Database Replay makes possible the capture and replay of real-world workloads at the click of a button, it has a number of advantages.

- Database Replay can reduce the test cycle for large applications or complex environments by as much as 80%, and can bring testing time down from months to days. In fact, one early adopter of the product that we interviewed expects upwards of 90% reduction in their testing cycles. This is possible because Database Replay eliminates the need for manual development effort and does not require users to spend time learning application functionality and usage patterns necessary to create a synthetic workload.
- Workload can be captured for interesting periods, such as peak times or month-end close – so that testing of the specific impact on key periods can be carried out.
- Workload can be captured with low overhead for an extended period of time and used to assess changes in environment performance that may only emerge over a period of time.
- Workload is real rather than simulated, so the risk of unforeseen problems in production environments is significantly reduced.

SQL Performance Analyzer

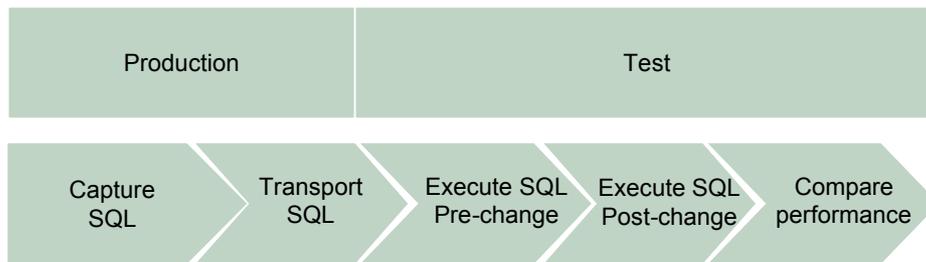
The second feature of Oracle Real Application Testing, SQL Performance Analyzer, assesses the impact of any change in SQL statement performance. A single rogue SQL statement can have major performance consequences for a production environment, generating poor system performance and resulting in unhappy business users. As a result, DBAs must spend time monitoring and analyzing database performance on a daily basis, trying to identify these issues and work quickly to solve them. SQL Performance Analyzer is designed to make this process faster and more predictable.

As with Database Replay, SQL Performance Analyzer enables testing and full assessment of the impact of changes, but focuses specifically on SQL response time changes. As outlined in *Figure 3*, SQL Performance Analyzer allows DBAs to capture SQL workload in the production environment, and then move it to a test environment where the workload can be re-executed as many times as necessary to test impact of one or more changes. SQL Performance Analyzer then produces detailed reports that compare the performance of SQL across the changes and identify all performance improvements and regressions.

The task of tracking and monitoring SQL in typical applications (which can easily range in hundreds of thousands of unique SQL statements) is error-prone, very time-consuming, and as a result frequently ignored. An IT executive at a Fortune 1000 company, who was an early adopter of the product, tells us that SQL Performance Analyzer could deliver orders of magnitude improvements in productivity compared to using more manual testing tools by bringing down testing time from many months down to a few days.

SQL Performance Analyzer is best for testing changes that can result in SQL execution plan and performance changes. Again, by using this Oracle Real Application Testing feature, DBAs can be more confident that they understand the full impact of change on the production environment before making the actual change.

Figure 3 **SQL Performance Analyzer stages**



Source: Ovum Summit

Oracle Real Application Testing business benefits

Oracle Real Application Testing can drive many business benefits by reducing testing time, cost and risk of IT infrastructure changes.

Risk mitigation

In this increasingly global and Internet-connected world, mis-steps can become instantly visible, with a potentially lasting impact on brand- and company image. In this environment, change predictability is a must. By allowing businesses to test changes easily (so that it is done frequently and routinely) and by using real data, Oracle Real Application Testing can significantly mitigate the business risk associated with unexpected production system outages.

Lower costs

Many CIOs are attempting to reduce the total cost of ownership and operation of their Oracle database environments via strategies such as migrating to Linux-based platforms, adopting Oracle Real Application Clusters or deploying improved storage fabrics. Reducing the time and money spent on testing activities can help to free up IT budget, either to use on new projects or to take as savings in an effort to reduce IT spend. Early adopters of Oracle Real Application Testing solutions indicate that the new features are expected to reduce their testing budgets by between 50% and 95%. For many customers, we believe that Oracle Real Application Testing has the potential to allow businesses to spend in the order

of 70% less on testing and change expenditure. For typical medium-sized enterprises, these savings could easily add up to more than \$5 million annually.

Greater agility

Oracle Real Application Testing allows for greater business agility by reducing the time required to test and QA system changes. These capabilities enable businesses to work faster than the competition as well as gain the potential to grow revenues faster, and also to sustain stronger margins. Post test, IT systems will also benefit due to the accuracy of running tests against real workloads. That is, there should be fewer instances of unexpected disruptions that impact system availability.

Enhanced productivity

Highly skilled IT personnel are a rare commodity and a valuable one. Being able to utilize these individuals best for strategic projects requires that organizations distribute tasks more evenly across the administration staff and minimize reactive actions that take precious time and resources. One way to do this is through improved tools and by increasing the reach of more junior technical staff, allowing operational cost to be constrained while maximizing the productivity of individual staff members. By automating many tasks and eliminating the need to manually develop complex application workloads, the Real Application Testing features permit junior staff to handle much of the change-testing work currently done by more experienced personnel. Moreover, with Oracle Real Application Testing, change testing can be accomplished much faster, thereby increasing productivity further. Again, the Oracle Real Application Testing early adopters surveyed said their early usage supported this anticipated productivity benefit. The features help DBAs at all levels to comprehensively identify all kinds of potential problems and their remedies.

All of the early adopters surveyed indicated that they know of no other testing tools that offer the functionality and automation that the Oracle Real Application Testing features deliver. Thanks to the prospect of simplifying the complex and labor-intensive characteristics of change testing, each of the early adopters identified these features as one of the most compelling and powerful of those offered as part of Oracle Database 11g.

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