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Oracle Enterprise Manager 11g

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Introduction

IT is critical to running any business today. The management of modern IT systems involves a number of stakeholders. Firstly, there is the Business that invests in applications to deliver efficiencies and competitive advantages. The operational management of the applications is the responsibility of a second group, the IT organization, which uses a variety of tools to manage application health and availability. Finally, there are IT vendors. These include suppliers of applications, middleware, databases, operating platforms and management tools.

Despite a common interest in application availability, these groups have historically been disconnected from each other, ignoring critical dependencies that exist between them. Technology vendors lack an understanding of business processes supported by applications. The management tools they offer help to improve efficiency in the IT organization, automating the management of disparate physical systems, however, these tools are fragmented and generally focused on managing an individual technology component. These tools lack business impact as they have no visibility of business transactions and processes and therefore do not provide IT Operations staff with the information they need to prioritize activities.

Furthermore, during the course of resolving application issues, IT operations staff may need to raise service requests with IT vendors. The management tools deployed in the data center do not provide the vendors with basic, yet critical information such as version numbers, configuration settings and applied patches. This slows down problem resolution as the vendor has to spend time helping in-house IT operations gather all the relevant information to diagnose a problem.

These disconnects between Business, the IT organization and the IT Vendors ultimately limit the business value delivered by applications.

Today, Oracle is uniquely a supplier of business applications, software and hardware infrastructure, and a comprehensive set of management tools. This enables a new business-driven approach to IT management that brings these groups closer together. With this strategy, Oracle is able to not only increase IT efficiency, but is also able to build upon this to deliver increased business agility and efficiency. This white paper

describes the key capabilities in Oracle Enterprise Manager 11g and how they enable customers to achieve this efficiency and agility. The paper is divided into three main sections – i) Business Driven Application Management ii) Integrated Application to Disk (Cloud) Management iii) Integrated Systems Management and Support.

Business Driven Application Management

Yesterday's breed of applications were less complex than today's. Often housed within a single server or few servers, IT staff used key metrics such as CPU utilization or I/O statistics to determine the overall health of an application. Today, the adoption of Grid, Cloud, SOA, and composite applications means that an application or business process can span many systems, some of which could even be provided by external parties, such as partners. In these new architectures, IT metrics are inadequate in determining the overall health of the application or the business impact of any infrastructure related incidents. Business owners are concerned with metrics or KPIs such as number of orders taken, where they are from, and what caused them to fail, while IT measures and reports on a different set of metrics such as application uptime, number of sessions and server utilization. The consequence of this is that IT staff can have difficulty prioritizing their activities as their tools lack any business context for the problems they are faced with.

Oracle Enterprise Manager provides a unique Business-Driven Application Management approach so that IT can focus on the activities that will have the highest business impact.

This approach starts with User Experience Management, which monitors application users so that issues they encounter can be detected proactively, without a need for them to contact IT. This helps IT to fix the issues that are actually impacting end users before they become frustrated or abandon business transactions.

Business Transaction Management provides an end-to-end view of individual transactions as they move through different IT services, enabling application support staff to quickly isolate the root-cause of issues. Business Transaction Management leverages business data to help IT understand the business context to make decisions based on business criteria rather than technical criteria.

Finally, Business Service Management helps IT determine which services are performing sub-optimally and visualize the complex and dynamic dependencies that exist between the components that make up these services. IT administrators can use the resource management capabilities to diagnose and remediate any issues.

In this section, we will explore these three key capabilities, namely – i) User Experience Management, ii) Business Transaction Management, iii) Business Service Management.

User Experience Management

Applications play an increasingly strategic role in organizations. Whether deployed internally to increase efficiency or externally to generate revenue, the performance of these applications has a growing influence on the overall performance and success of the business.

According to industry experts, over 70% of user issues are still reported by end-users, instead of by system monitoring tools. For web applications, this creates a significant problem. For example, a customer who encounters an issue with a web purchase is unlikely to pursue problems with application support staff. This user can easily switch to a competitor, resulting in lost custom while the application problem goes completely undetected by IT. To overcome this challenge it is necessary to manage users proactively to ensure that all users receive satisfactory service levels whether they complain or not.

Oracle's User Experience Management product, Oracle Real User Experience Insight, is designed to identify and resolve user experience issues before the business is impacted. It monitors all application end users and tracks not just IT metrics, such as page performance, but also provides visibility of business metrics, such as order value, customer name and customer location. Using Real User Experience Insight, application support staff can pinpoint exactly which users are having problems by identifying technical exceptions, such as which users experience poor performance or HTTP 404 (Not Found) errors, as well as business exceptions like "Product Out of Stock" messages.

A customizable dashboard provides high-level information such as the location of users and can display both business and IT based Key Performance Indicators. Business Transaction Funnels graphically illustrate the progress of users through a multi-step transaction so that the source of customer abandonments can be rapidly identified and investigated. Real time charts that show user satisfaction rates and transaction abandonment rates can be used to accurately pinpoint when customers started getting frustrated with the application experience. This information can easily be used to correlate changes to the underlying infrastructure that may have caused problems.

In the event of an application problem, IT staff can use Real User Experience Insight's Session Replay feature to replay actual user issues without the end users involvement. Information captured, such as customer names and email addresses, can even be used to recover business that would have otherwise been lost to failed transactions.

Session information can be exported from RUEI and imported into Oracle Application Testing Suite, so that testing can be done faster and with higher quality.

"There was a point in time when we were more or less driving in the dark.... Now I'm convinced that for us, this product will pay back within the first six months, easily."

Oscar Diele, Global vice president of e-commerce, TomTom

Real User Experience Insight has no impact on the performance of applications and requires no application changes to be made. It measures all user interactions and can be used on traditional

Web-based applications as well as Forms, SOA and AJAX enabled applications. Applications Accelerators for E-Business Suite (including Oracle Forms), Siebel, PeopleSoft and JD Edwards EnterpriseOne provide an out-of-the-box solution that automatically discovers running application modules and translates the network objects into human readable business functions. Delivering a Real User Experience Monitoring solution that is pre-integrated with industry leading applications offers immediate value to customers as it accelerates the deployment of these solutions.

RUEI provides in context drill-downs into Enterprise Managers diagnostics tools, for example for Java, E-Business Suite and Siebel thereby simplifying and accelerating problem diagnostics. This approach helps IT to focus on high priority applications, users or domains and issues that may be directly impacting the top line rather than focusing on IT oriented metrics.

Synthetic Monitoring complements Real User Monitoring by executing synthetic performance and availability tests. Enterprise Manager Beacons execute pre-recorded test transactions against an application, as if it were an end user performing the same actions. They can test availability and performance of critical business transactions from a variety of locations and can be used to establish a performance baseline which can be monitored over time to determine if gradual slowdowns are occurring.

A wide range of different tests are available supporting many different protocols, including Web Transactions, Forms Transactions, SOAP/REST, and several others. Setting up service tests requires no programming expertise. Forms and Web Transactions are simply recorded in a browser.

Enterprise Manager correlates these services and tests to the underlying infrastructure, so that the business impact of IT issues can be more easily understood by IT operations staff. Information about Service Levels and Service Usage can be viewed in Dashboards which can be published to line of business or end users.

Real User Experience Insight provides integration between real and synthetic user monitoring by automatically recognizing requests that have been initiated from Enterprise Manager Beacons. These requests can subsequently be used to create business transaction in RUEI so that service test performance can be compared to real user performance.

Business Transaction Management

An end user action in a web browser can initiate a business transaction that makes a series of service calls spanning many different systems and including both synchronous and asynchronous steps. For example, an order placed on a web site could result in the invocation of the credit check service, inventory check service, workflow approval service, and, finally, a shipping service. While the end-user performance may be perfectly acceptable, the business processes could encounter a number of issues such as getting lost, stuck, facing business or technical exceptions or slow performance due to resource constraints.

Oracle Enterprise Manager Business Transaction Management (BTM) provides sophisticated instrumentation for real-time detection, alerting, and remediation of various types of unexpected business or technical conditions. BTM gives application support teams end-to-end visibility of in-flight transactions across multiple tiers and applications. It shows the flow and status of each individual transaction and enables IT staff to narrow down the root cause to a specific service in an end-to-end business transaction.

Using BTM, application support personnel can search transactions based on message content and context. Message content could include revenue amount, customer name or product identifier. In addition to message content, valuable contextual information such as time of arrival is also collected. By leveraging message payload, it is possible to manage application performance based on business criteria such as revenue, customer name, or service level requirements.

As an example, an enterprise might define groups of users with different Service Level Objectives, such as Platinum, Gold or Silver. With BTM, performance for each of these groups can be tracked, segmented and measured against the respective Service Level Objective. If performance for Platinum users is seen to be close to violating the SLO, BTM can trigger some remedial action, such as throttling of non-Platinum users, thus helping to ensure that the service level for the most important Platinum users is maintained.

As business and technical exceptions are more commonplace in composite applications, it is critical to have tools that can detect when these exceptions occur. Using BTM, these exceptions can be correlated to individual transactions so that the affected parties can easily be pinpointed.

Oracle BTM works for both synchronous and asynchronous transactions and requires no modification of application code or transaction messages.

Business Service Management

According to a recent survey by Enterprise Management Associates, EMA, on average businesses spend 60% of the time taken to resolve issues on problem localization and triaging.

The use of SOA and composite applications introduces a number of management challenges. Firstly, there are layers of abstraction, for example Service Bus, that make it more complex to determine what is actually servicing a request. Second, services can be composed from many different application components including web components, Java servlets, EJBs and databases. In addition, these environments are subject to constant change, and manually maintaining management tools to reflect the changes is not practical. Traditional tools have been proven to be inadequate for managing these applications, neither able to localize performance bottlenecks in multi-domain environments nor report on application impact on the end-to-end requests being executed in production.

Enterprise Manager Application Performance and Dependency solves these problems. It automatically discovers the dependencies and relationships that exist in composite applications

and how the individual components such as EJBs and JDBC calls relate to high-level business services such as JSPs, Servlets, Portals and Web Services. Application topologies can be visualized both statically, using application metadata as well as dynamically, which uses runtime invocations to determine execution call paths.

Furthermore, Application Performance and Dependency automatically detects changes that occur in composite application topologies, eliminating the need to manually maintain the monitoring tool.

Administrators can use Application Dependency and Performance to perform a delay analysis. This can be used to determine the time taken in each component when servicing requests over a given time period so that the cause of performance bottlenecks in application services can be traced back to low level components such as Java classes or SQL statements.

Application Performance and Dependency is intended for use in Production environments. It runs with low overhead and does not require manual instrumentation of code.

Integrated Application-to-Disk Management

While architectures taking advantage of technology such as SOA, Grid, Virtualization and Cloud provide a more flexible foundation for business applications, they have increased complexity in the data centre. Spanning multiple tiers and technologies, they are difficult to support using conventional management tools, which focus on a particular tier or discipline and do not provide an end-to-end view.

Furthermore, the cost of supporting applications can be a significant drain on IT budgets, limiting the resources available for new business initiatives.

Oracle Enterprise Manager provides management tools from Application to Disk. It is an integrated set of tools which provides a complete solution for managing each tier of the stack. Instead of providing 'bolted-on' management tools, the teams who build Oracle systems/applications and the teams that build the tools to manage them work together, building manageability into the core infrastructure and applications. This enables an IT infrastructure that is increasingly self-managing and allows complex multi-tier diagnostic issues to be addressed easily.

As well as managing the stack from top to bottom, Enterprise Manager enables management across the stack with vertical management solutions for Application Performance Management, Lifecycle Management, Configuration Management and Application Quality Management. Together these solutions help organizations reduce the cost and lower the complexity of managing applications, while improving IT efficiencies.

Packaged Applications Management

Oracle Application Management Packs provide comprehensive, integrated management solutions that help you achieve high levels of performance and availability, and reduce the costs of managing your mission critical business applications.

These management packs provide insight into application specific components alongside the underlying infrastructure components supporting the application.

Application Management Packs are available for:

- Oracle E-Business Suite
- Siebel
- PeopleSoft Enterprise
- JD Edwards Enterprise One
- Communications Billing & Revenue Management

Application Management Packs have a set of common capabilities such as 1-step Discovery, real time and historical monitoring, alerting/notifications, Configuration Management and Service Level Management. There are also application specific capabilities that address key management challenges for each individual application. Some of these capabilities include E-Business Suite provisioning, patching and cloning automation, Siebel workflow monitoring and transaction diagnostics, and centralized log management for PeopleSoft environments. In addition, a number of Application Accelerators are available for Real User Experience Insight and Application Testing Suite to provide out-of-the-box solutions for Oracle Applications environments.

For more information on Enterprise Manager's applications management capabilities please visit http://www.oracle.com/technology/products/oem/prod_focus/app_mgmt.html

Integrated Middleware Management

Enterprise Manager 11g provides a single and comprehensive solution for the discovery, monitoring, central administration, configuration management, and service level management of Oracle Fusion Middleware 11g components. These new features streamline your ability to manage Fusion Middleware targets directly from within Enterprise Manager Grid Control, without having to switch between different user interfaces.

Supported targets include:

- Oracle WebLogic Server
- Oracle SOA Suite and Service Bus
- Oracle Identity Management Suite
- Oracle WebCenter
- Oracle Coherence

- Oracle Business Intelligence

Oracle Enterprise Manager 11g enhances support for Oracle WebLogic Server with significant improvements in the discovery and monitoring mechanisms. The collection of WebLogic configurations has been extended to include WebLogic server installation information, including applied patches and customizable performance metric palettes let administrators create their own custom dashboards. Enterprise Manager 11g also introduces the ability to automatically provision WebLogic managed servers into a domain, helping to eliminate errors, lower cost and increase business agility as additional servers can rapidly be provisioned to support in increased workload. . This capability is discussed further later in this paper.

Other key features for managing Fusion Middleware include:

- Automated deployment of BPEL processes, OSB services and SOA Composites
- Enterprise Service Dashboards
- Identity and Access Management service tests
- Automatic discovery of WebCenter applications
- Real time and historical monitoring of Coherence caches and nodes
- Support Workbench for Weblogic Server

For further details on how Enterprise Manager can be used to manage your Oracle Fusion Middleware systems, please see

http://www.oracle.com/technology/products/oem/prod_focus/soa_mgmt.html

Comprehensive Database Management

Enterprise Manager provides best-in-class management for the best-in-class database with a single solution for all aspects of database administration such as performance management, change and configuration management, testing, provisioning and patching. Oracle Enterprise Manager 11g adds full management of new Oracle Database 11g Release 2 features.

Performance management has been built in to the database kernel, providing always on, zero overhead automated management. By taking this approach, database issues are detected and diagnosed automatically so that they can be repaired before they become major incidents. Real-time SQL monitoring provides an effective way to identify run-time performance problems with resource intensive long-running and parallel SQL statements. Enterprise Manager 11g includes Active Reports which can be saved or e-mailed for off-line analysis and offer the same level of interactivity as live Enterprise Manager screens, with drill-downs to various levels of detail.

A number of Advisors are available to help DBAs take the most effective course of action when problems are identified. These advisors include the SQL Tuning Advisor which automates the tuning process, comprehensively exploring all the possible ways to tune a SQL statement.

Compression Advisor provides an estimate of storage savings that can be realized through the use of OLTP Table Compression.

Enterprise Manager provides out-of-the-box support for the setup and ongoing management of HA environments. 11gR2 Grid Plug and Play (GPnP) eliminates RAC per-node configuration data and the need for explicit add/delete nodes steps. A system administrator can take a template system image and deploy it on a new node with no additional configuration, thereby removing many manual operations. Automated procedures are available to migrate from single instance to RAC, extend RAC clusters and setup Data Guard configurations. The Data Recovery Advisor provides DBAs with a guided workflow on how best to recover from one or more high availability failures and RAC performance issues are identified with cluster-wide performance recommendations. Enterprise Manager 11g enables Active Session History in standby databases, facilitating performance diagnostics for disaster recovery sites.

Enterprise Manager supports Oracle Exadata V2, allowing you to monitor Exadata Storage Server targets and gather storage configuration and performance information on storage components such as Grid Disks and Cell Disks. Real Time SQL Monitoring supports execution plans that are being executed by Exadata.

Enterprise Manager 11g also adds full support for the security options supported in Oracle Database 11g, including the ability to monitor and administer Oracle Database Vault enabled database targets. It allows the propagation of Oracle Database Vault policies such as realms and command rules from a source database to multiple Database Vault enabled destination databases.

Hardware, Virtualization, and OS Management

Oracle Enterprise Manager provides solutions to centralize and automate discovery, provisioning, updating and monitoring of physical and virtual systems. Customers choosing Oracle's virtualization technologies can monitor virtualized entities alongside the physical infrastructure and perform complete lifecycle management of guest virtual machines.

Automated discovery enables systems administrators to determine what hardware has been provisioned, what virtualization software and operating systems are deployed, as well as access detailed information about the configuration of each system.

The initial building of systems can involve a lot of manual steps which consumes a lot of time and is error prone. Using automated procedures, Enterprise Manager can provision Solaris and Linux onto bare-metal. Customers taking advantage of virtualization can deploy Oracle VM Server for SPARC and Oracle VM Server for x86 hypervisors and use Enterprise Manager for the lifecycle management of their virtual machines. In addition, Enterprise Manager Ops Center can be used to provision Firmware updates.

Enterprise Manager includes solutions for patching operating systems with support for Solaris, Linux and Windows environments. Enterprise Manager Ops Center includes package dependency checking for Solaris and Linux systems and also has a patch simulation, allowing a

dry-run of a patch installation prior to live deployment. Patch Rollbacks ensure systems administrators can revert to a known good configuration if a patch should fail.

Finally, Enterprise Manager can monitor the performance of hardware and operating systems for physical and virtual environments. A range of metrics that includes CPU, memory, network, IO and filesystem utilization are stored for historical analysis and trending.

Management across the Stack

Enterprise Manager's Application-to-Disk solutions span the lifecycle of systems management activities from provisioning test environments, through functional and load testing, and the subsequent deployment into production, where monitoring and diagnostics, patching, configuration management and scale-up/scale-down operations take place.

The management functions enabled by Enterprise Manager can be categorized as follows:

- Application Performance Management – Helps ensure that applications are meeting performance and availability objectives.
- Configuration Management and Compliance – Helps establish and maintenance of software configurations.
- Software Lifecycle Management – Automates software provisioning and patching operations.
- Application Quality Management – Testing applications prior to production deployment.



Application Performance Management

A complete Application Performance Management (APM) solution encompasses three separate stages

1. Identify that a problem exists

2. Isolate the problem to the correct component
3. Drill down into component to diagnose and resolve problem

Application Performance Management enables application owners to proactively monitor end-user performance and quickly trace the cause of performance problems. As discussed earlier, Oracle's solution includes real end-user monitoring, so that issues are detected proactively. Application Dependency and Performance helps to determine the components that are most likely to be the cause of an issue. Once the problem component has been identified, Enterprise Manager provides tools to drill down into production applications to determine the root cause.

Oracle's end-to-end solution is optimized for production diagnostics – which can accelerate resolution times when issues arise. It can also help resolve problems that currently go unresolved, since they are impossible to reproduce in QA/test environment. There are 3 key characteristics that support this capability

1. Low production overhead
2. No manual instrumentation
3. Easy to deploy, setup, and use

JVM Diagnostics

Diagnosing problems that have been isolated to the Java tier presents several challenges. Conventional Java diagnostics tools use manual instrumentation of code, requiring specialized skills, application knowledge and server restarts. Furthermore, as more instrumentation is added, the performance overhead increases. These characteristics make such tools unsuitable for production deployment, hence they are often used by architects or developers working in test environments. Using these tools means that Java problems can be slow to resolve as it is necessary to reproduce production problems in non-production environments, something which may not always be possible.

Oracle JVM Diagnostics is a lightweight Java application monitoring and diagnostics solution that enables administrators to diagnose performance problems in production. It's extremely low overhead (<1%) means that it can be deployed in 'always-on' mode and can help solve transient issues that would be difficult to reproduce outside of the production environment. It does not require application restarts or complex instrumentation and can be used to identify deep Java problems or Database issues without any application knowledge.

JVM Diagnostics can find the status and call stacks of all active threads in a JVM. It also provides cross-tier correlation between Java sessions and database sessions, helping DBAs and applications administrators pinpoint the line of code and resource causing transaction bottlenecks.

Java memory leaks can cause application slowdowns or crashes. These problems are difficult to replicate in test environments and cannot easily be diagnosed in production. Using Oracle's JVM

Diagnostics, administrators can take multiple snapshots over a period of time and compare the deltas between object memory allocations to identify the cause of a memory leak.

Advanced Database Diagnostics

The Oracle database is the most self-managing database available today. Database tuning has historically been a manual task, relying on DBAs to know which metrics to collect, to interpret these metrics correctly and then need to decide on an appropriate course of action. This approach leans heavily on experience and trial and error is often used to arrive at a well tuned system.

Oracle database has advanced diagnostics built-in. This automates manually driven activities, continuously collecting the most relevant database statistics, interpreting them and advising on remedial actions, along with a projected benefit. This is enabled through the following key features

- AWR (Automatic Workload Repository) - This forms the foundation for all the self-management functionality of Oracle Database. It contains operational statistics about that particular database and other relevant information. At regular intervals (once an hour by default), the Database takes a snapshot of all its vital statistics and workload information and stores them in AWR.
- ASH (Active Session History) - A key component of AWR, is Active Session History which samples the current state of all active sessions every second and stores it in memory. This sampled data is also pushed into AWR every hour for the purposes of performance diagnostics. ASH enables performance analysis of transient problems that occur for a very short duration.
- ADDM (Automatic Database Diagnostic Monitor) – This is a self-diagnostic engine built right into the Oracle Database kernel. ADDM enables the Oracle Database to automatically diagnose its performance problems, thereby completely liberating administrators from this complex and arduous task. For Oracle Real Application Cluster (RAC) environments, ADDM has a special mode for cluster-wide performance analysis. In this mode, ADDM analyses the RAC cluster and reports on issues that are affecting the entire cluster as well as its individual instances.
- Advisors – Within the Oracle database, a set of advisors are available that can help automate the tuning process. These include the SQL Access Advisor, which can advise on how to optimize schema design and the SQL Tuning Advisor which will analyze a statement and explore all the possibilities for tuning.

Together, these features help DBAs spend more time on strategic, high-value activities rather than constantly reacting to complaints from unhappy and frustrated users.

Configuration Management & Compliance

In managing all aspects of an enterprise, Configuration Management is a critical component in day-to-day operations. Enterprise Manager provides a comprehensive configuration management solution that lowers cost and reduces risk through the automation of IT processes. Using Enterprise Manager, customers can discover, track, analyze, implement and report on changes, helping to simplify management, improve service and enforce compliance.

Configuration Discovery and Change Tracking

Many application performance or availability problems can be attributed to incorrect system configuration. As the number and complexity of systems deployed in the Data Center grows, so does the challenge of managing these configurations. Organizations can potentially have thousands of servers deployed with only a handful of staff to manage them.

Many businesses attempt to manually track configuration information in static files such as spreadsheets, however, this is time consuming, error-prone and lacks sufficient depth of information. The reality of today is that operations staff are unable to answer simple questions, such as how many databases or application servers do I have, what versions are they on and what patches have been applied.

Enterprise Manager automatically performs deep discovery of system configurations including hardware, virtualization, operating system, database, middleware and applications. This configuration information is stored in a Configuration Repository which is periodically refreshed (every 24 hours by default) to provide a historical trail of changes.

Enterprise Manager's configuration management solution can minimize unplanned outages by:

- Providing a searchable configuration history - Enabling systems administrators to restore Service Levels faster by quickly pinpointing configuration changes that could be the root cause of a problem.
- Enabling configuration comparisons – The configuration of deployed systems can be compared with standardized (Gold) configurations or with similar systems. This enables proactive management of configurations which helps reduce the number of outages occurring due to systems being incorrectly configured.

"For SOX compliance we have to ensure configuration of our systems. Enterprise Manager helps us there and also with the change management lifecycle. We have test, development, pre-production systems. With EM we are able to compare the systems and whether we have provisioned them in the right way."

Dr. Werner Rath, Division Manager Operations, Metro Group IT

Policy Driven Configuration Management

Oracle Enterprise Manager comes with a set of pre-defined best-practice configuration and security policies. The policies address Host, Database, Middleware and Application

configurations, helping to detect common issues that may later cause problems for applications. Examples of some of the Configuration Policies provided by Enterprise Manager are:-

- Host open ports check
- Database default passwords check
- WebLogic production mode enabled check

Custom configuration policies enable organizations to create their own policies based on their own requirements and standards.

Real Time Change Detection

While snapshot based configuration management tools help ensure configurations remain consistent, they do not detect system changes in real-time, hence there will be a delay between the change being made and the tool picking it up.

Enterprise Manager's Configuration Change Console provides real-time change detection against configuration items. Together with a set of out-of-the-box policy frameworks, it helps organizations meet regulatory requirements, such as for SOX, PCI and HIPAA. Configuration Change Console can detect changes to objects such as files and directories, user accounts, processes server resources, database tables, network devices and the Windows Registry and help IT understand what change was made, who made it and when. Integration with Change Management Systems enables them to determine if the change was authorized or unauthorized.

Lifecycle Management of Application Configurations

Differences in the configurations of development, test and production environments can slowdown application development, as different configuration issues need to be resolved at each stage of the lifecycle. Therefore, one of the challenges as applications move through development, test and production environments is ensuring that the configuration of these systems remains consistent. This can be a complex task as application architectures can span many different tiers and technologies with configurations stored in a variety of places. A second challenge is that configurations can change in production environments, causing unexpected results. IT operations staff need tools that will help them identify what has changed and help them quickly revert to previous configuration settings.

Application Configuration Console automates the discovery, tracking and propagation of application configurations across multiple tiers, helping IT staff avoid configuration issues occurring between development, test and production environments. It also helps them find configuration anomalies and remedy them by propagating a reference version of a configuration back to a running system. Application blueprints for common infrastructure and applications are supplied out-of-the-box and custom blueprints can be created where an out-of-the-box solution is not available provided.

Software Lifecycle Automation

Enterprise Manager provides the most comprehensive solution for the deployment of Oracle software, automating the deployment of software, applications and patches. It makes critical data center operations easy, efficient and scalable resulting in lower operational risk and cost of ownership

Systems Administrators can use Enterprise Manager to build systems from bare metal with support for Solaris and Linux installation. Deployment Procedures contain a hierarchal sequence of steps which can be customized for specific environments. Deployment Procedures also support secure host authentication using sudo or PAM. Enterprise Manager 11g provides out-of-the-box Deployment Procedures for provisioning operations such as:

- Oracle Database Provisioning
- Oracle Grid Infrastructure / RAC Provisioning
- One Click Extend Cluster Database
- Delete/Scale Down Oracle Real Application Clusters
- Coherence Node Provisioning

With Enterprise Manager 11g you can automate the provisioning of WebLogic domains and Fusion Middleware Homes using the Fusion Middleware Deployment procedure, which launches a guided workflow that enables you to automate the provisioning of:

- WebLogic Domains with a corresponding Oracle Fusion Middleware home which includes WebLogic Servers and one or more Oracle Homes.
- WebLogic Domains without a corresponding Oracle Fusion Middleware Home assuming that the Oracle Fusion Middleware software has already been provisioned.
- Oracle Fusion Middleware Homes.

In addition, a “Fusion Middleware Domain Scale Up” Deployment Procedure allows you to scale up a domain by cloning a managed server or adding a new managed server to an existing cluster.

Systems running in production will inevitably need to be patched. Enterprise Manager includes an end-to-end patching automation solution that works across the OS, database, management agents and middleware. The entire patching application can be run in command line (CLI) mode thereby making it possible to integrate with existing scripts and the application takes care of appropriate shutdown and startup of services. Such flexibility makes mass deployment of interim patches and patchsets feasible even in complex multi-tier environments.

"We manage thousands of databases and application servers with Enterprise Manager, and we have been able to reduce the time for provisioning software from 4 hours down to 1 hour, as well as reduce patch application time from 1 hour down to 1 minute per database. Enterprise Manager Grid Control allows us to automate this process, which translates into huge savings in time and money."

Andreas Stephan, Senior DBA Consultant, Bayer Business Services

Customers using Real Application Clusters can use the out-of-the-box 'Patch Oracle RAC Database – Rolling' Deployment Procedure to perform rolling patch operations. This procedure patches one node at a time so that an application can remain continuously available.

Application Quality Management

Application environments are subject to constant change as new functionality is added and patches are applied. These changes can introduce performance and availability issues in production environments that can have serious consequences for a business. Studies have shown that the cost of fixing problems in production is up to 100 times more expensive than addressing them in the development phase. Oracle Enterprise Manager's Application Quality Management (AQM) solutions focus on finding and fixing application quality and performance issues prior to production deployment, helping to ensure application users are not impacted. The solution includes three primary technologies that allow customers to deploy higher quality applications with less cost, complexity, and effort.

- Oracle Application Testing Suite
- Oracle Real Application Testing
- Oracle Enterprise Manager Data Masking

Oracle Application Testing Suite

Oracle Application Testing Suite provides an integrated solution for load testing, functional testing, and test management. Oracle Application Testing Suite enables customers to thoroughly test packaged, Web-based (J2EE or .NET), and service-oriented architecture (SOA)-based applications and their underlying infrastructures to ensure optimum quality, scalability, and availability. The suite includes:

- Oracle Functional Testing enables comprehensive functional testing of applications and Web services. Its transaction engine simplifies automated test script generation and enables the automation of complex applications and associated technologies out of the box to validate the end user's experience.
- Oracle Load Testing simulates up to tens of thousands of virtual users accessing an application to measure the effect of the load on application performance.

- Oracle Test Manager helps users manage the application testing process, allowing them to define testing requirements, specify and execute manual or automated tests to validate requirements, and then manage any identified defects.

Application Testing Suite provides custom test “accelerators” for testing Oracle packaged applications like Oracle e-Business Suite and Siebel, providing more efficient and optimized testing. Application Testing Suite 9.1 gives application testing teams the ability to import real user transaction information from Oracle Real User Experience Insight, meaning that test scenarios can be created faster and with higher quality.

Real Application Testing

To manage change and minimize impact of changes to the database environment, Oracle Real Application Testing offers an extremely cost-effective and easy-to-use solution that enables customers to fully assess the outcome of a change in a test environment, take any necessary corrective action, and then introduce the change safely to production systems. This allows businesses to continue to benefit from changes without any associated negative impacts such as performance degradation and outages.

Real Application Testing includes two solutions to test the impact of system changes related to the database stack or below. Examples of supported changes are OS, hardware and storage changes, database upgrades, migration to RAC or Exadata V2, enabling Compression and parameter changes.

- SQL Performance Analyzer (SPA) assesses the impact of system changes on SQL response time by identifying any variation in SQL execution plans and performance statistics resulting from the change.
- Database Replay can be used to replay a full production workload on a test system to help determine the overall impact of a change on the workload.

Oracle Enterprise Manager Grid Control offers full support for Real Application Testing, including a new user-friendly workflow for capture of a production workload for Database Replay Automation. This includes capturing the production workload, creating a test system, copying over the workload, and running the Database Replay operation of the production workload against the new test system.

Data Masking

Oracle Enterprise Manager Data Masking provides a comprehensive and easy-to-use solution to share production data with internal and external entities, while preventing sensitive or confidential parts of the information from being disclosed to unauthorized parties. The application provides out-of-the-box mask primitives for various types of data, such as random numbers, random digits, random dates, and constants. Oracle Enterprise Manager 11g provides extended functionality to include compound and condition-based masks. Compound masks enable sets of interdependent columns to be masked together such as address, city, state and zip

code. Condition-based masks provide the ability to specify separate mask formats for a condition, such as a driver's license format for each state. Lastly, integrated clone and mask workflow allow secure masking of sensitive data as a part of the database cloning operation from production to test environments.

Cloud Management

Organizations are adopting Private Clouds in their Data Centers to help them achieve greater levels of agility and flexibility. In order to manage these Private Clouds, several management challenges need to be addressed. The Cloud requires agility and flexibility, centralized management, transparency of where components are running and who is using them and visibility of the physical and virtual resources that are used to deliver an application.

Oracle Enterprise Manager 11g provides a set of solutions to help organizations move from Silo'd application environments to Private Clouds that take advantage of virtualization and resource sharing. Enterprise Manager provides the foundation for addressing these challenges with integrated tools for rapid provisioning, mass patching, monitoring, configuration management, resource usage tracking, application performance management and testing for Private Clouds.

Enterprise Manager has out-of-the-box support for the management of Cloud infrastructure including Oracle Real Application Clusters, Oracle Application Grid, Oracle VM Server for x86, Oracle VM Server for SPARC and Oracle Solaris Containers.

Enterprise Manager can consume multi-tier applications created with Oracle Assembly Builder as a software image/configuration and deploy it automatically to many locations as needed, helping with distributed deployment of applications in the cloud.

Integrated System Management and Support

IT Operations staff spend their time on a number of activities including managing system performance, provisioning new software, patching existing environments, implementing changes and managing configurations. They use a variety of management tools to help them accomplish these tasks.

IT Operations may find that they are unable to resolve issues without the support of the vendors who supply them with hardware and software. To manage this process, the vendors offer support portals which allow customers to consult knowledge bases, download patches and updates and raise service requests.

While this approach is the norm, it has a number of shortcomings. The IT Operations tools and vendor support portals provide different views, even though there is considerable duplication between these two environments. When raising service requests, customers must manually copy configuration information into the support portal. Initially this includes high level information such as product version numbers and platform, however, as a service request progresses it can

include more detailed information such as patches that have been applied and configuration files. The vendors will often request trace or log files to help them diagnose issues. The manual collection of this information prevents IT staff from working on other tasks, dramatically increases the time it takes for IT vendors to resolve problems and impacts the quality of service for the deployed application. Furthermore, as configuration information is only provided to the vendor in the context of a problem faced by a customer the support process is a reactive one.

Applying patches is normal in the course of managing an enterprise application, however, before patches can be applied a number of checks should be carried out. Firstly, a patch may be dependent on other patches, which may in turn have dependencies. When multiple patches need to be applied they need to be checked for conflicts such whether the same object within a library is updated by more than one patch. Finally, the patches will need to be checked for conflicts with other patches that have already been applied. Checking patches for these dependencies and conflicts can take significant time and is prone to errors.

Enterprise Manager Integration with My Oracle Support

Enterprise Manager 11g has full integration with My Oracle Support, enhancing Enterprise Manager's ability to serve as a single interface for managing and supporting the enterprise. It provides seamless access to My Oracle Support pages for managing Service Requests, deploying patches and reviewing Knowledge Base articles.

Enterprise Manager automatically uploads configuration information to My Oracle Support, providing Oracle Support with instant access to the comprehensive configuration data they need. By unifying the information in Enterprise Manager and My Oracle Support, Oracle is able to take advantage of a Global Configuration Database containing the configuration information of all customers who opt-in. Combining this configuration data with service request data provides Oracle with the ability to give proactive problem detection for customer environments, based on the experiences of other customers running similar configurations, including specific recommendations for patches that should be applied. This targeted approach makes support more proactive, helping customers to avoid situations where they raise service requests for critical issues only to be told that they have encountered a known problem.

"With [My Oracle Support], the time required for gathering information to provide details of our configurations for a service request went from hours, or in some cases days, to minutes. This greatly increases our ability to troubleshoot problems."

Raymond Payne, Principal Architect, The Johns Hopkins University Applied Physics Laboratory

With Oracle Support Workbench, IT Operations staff can raise My Oracle Support Service Requests against an issue from within Enterprise Manager and package up all relevant information such as trace files and test cases. This includes issues detected by the system as well as user defined issues. As this is all done from the Enterprise Manager Console, without having

to switch applications it dramatically speeds up the process of raising Service Requests and cuts down on the requests for more information. Support Workbench is available for Oracle Database and Oracle Fusion Middleware.

Enterprise Manager integrated with My Oracle Support enhances patching with the use of Patch Plans which can check for conflicts in a given set of patches. These can also be used to ensure that any patches that were previously installed on a system do not conflict with patches that need to be applied. Should conflicts arise a merged patch will be identified if available or can be requested if not. When all of the patches have been validated they can be applied in a single operation, helping to minimize the patching window.

Conclusion

Oracle Enterprise Manager enhances the value of business applications with a business-driven approach to IT Management.

Business-Driven Application Management helps IT operations staff focus on the activities that will have the highest business impact by providing them with insight into complex business processes and giving them visibility of business related metrics for individual transactions.

Enterprise Managers Integrated Application-to-Disk Management provides an integrated, end-to-end management solution for physical, virtual and private cloud environments that spans all stages of an application lifecycle

Integrated Systems Management and Support enhances the support experience with accelerated problem resolution, proactive problem avoidance and advanced patch management for Oracle systems.



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Author: Mark McGill
Contributing Authors: Rakesh Dhoopar,
Sandra Cheevers

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200
oracle.com



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