



An Oracle White Paper
September, 2010

Advanced Uses of Oracle Enterprise Manager 11g

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Executive Overview

Business–Driven IT Management

In the modern business environment, many organizations depend on IT to deliver always on systems and mission-critical services. But behind the scenes, IT organizations are coping with more and more complexity than ever before—complexity from growing data volumes, to composite applications, to virtualization and the Cloud. Managing all these systems and services 24x7, in a global environment is one monumental challenge and constant battle for IT.

However, help is at hand. Today Oracle Enterprise Manager 11g, Oracle’s flagship enterprise-class systems management solution, helps IT organizations cut through the complexity and brings order to chaos through its unique business-driven IT management approach that encompasses IT management processes, business processes, and the Oracle community to enable true business-driven IT management. Oracle’s approach starts with management capabilities that are built right into applications and infrastructure. Oracle Enterprise Manager then provides an integrated console that gives IT departments business visibility and comprehensive IT management across the stack. In short, Oracle Enterprise Manager integrates IT management with business applications and systems. This integration enables IT to gain unobstructed views of business transactions and the business-user experience. As a result, IT professionals can focus their efforts where they will have the greatest positive impact on the business.

Along with being able to manage Oracle’s complete software and hardware stack, from applications-to-disk, Oracle Enterprise Manager 11g also offers an extensive array of management and monitoring capabilities for heterogeneous environments. For the complete list of available third-party plug-ins and connectors, please visit the [Oracle Enterprise Manager Extensions Exchange](#).

Unlocking Your Oracle Investment

The objective of this whitepaper is to help operational teams, administrators and IT Managers comprehend some of the more advanced features of Oracle Enterprise Manager 11g so you can take full advantage of all the features and capabilities within the software, in order to get the most out of your Oracle investment—rather than just use Oracle Enterprise Manager for basic capabilities, such as monitoring, metrics, thresholds, alerting and so on. While such capabilities are very useful, we need to go beyond monitoring into management of your applications, databases, middleware and server hosts.

This whitepaper gives you in a nutshell, a number of advanced techniques for setting up and working with Oracle Enterprise Manager 11g's centralized management console called Grid Control. We look at practical use cases from the experience of industry-leading Oracle experts. Tips and recommendations range from architecture for Grid Control, to setting up Oracle Recovery Manager (RMAN) backups, to creating and managing Oracle Active Data Guard standbys through Grid Control.

We also take a look at some advanced concepts and dive into real world techniques highlighted from the forthcoming book, [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](#).

Introduction

In the early years of the 21st century, Oracle introduced Oracle Enterprise Manager Grid Control (Release 1) as its flagship Enterprise Management product.

Grid Control featured a freshly re-designed interface and architecture, and was primarily intended to assist DBAs with their database management and monitoring tasks. This was achieved through the streamlining and automation of day-to-day DBA activities such as performance diagnosis and tuning, setting up and scheduling RMAN database backups, and setting up and managing Oracle Active Data Guard.

Other capabilities included; cloning and provisioning, configuration management and monitoring of the server, operating system and database management. Grid Control allowed DBAs to schedule and execute scripts at the database or operating system level.

The latest version of Oracle Enterprise Manager 11g Grid Control Release 1 was launched in April 2010, and built upon the Oracle WebLogic Server foundation, which offers improved performance and memory management. Now administrators can manage more than just databases, and manage the entire applications stack; from servers, storage, operating systems, middleware and of course databases—all from within Grid Control's centralized management console.

Scalable Architecture Tips

Before we talk about advanced uses, we need to consider some best practices regarding setting up a production Grid Control environment. As a real-life example, let us look at the first Oracle Enterprise Manager Grid Control production site in the world, which was a large telecommunications company in Australia.

The corporate database team was involved in this major project, in close association with Oracle Support consultants (from ACS—Oracle Advanced Customer Services) in Sydney and Melbourne who guided the client in on-site beta testing as well as the first production implementation of Grid Control Release 1, and subsequently upgrading to Release 2. The objective of the project was to set up a centralized Oracle Enterprise Manager Grid Control site at the company headquarters in Melbourne.

Normally when a DBA team or their management decides to implement Grid Control, they would use a test or development server to install the product, on Unix, Linux, or Windows. In this scenario all Grid Control components would be installed on a single server. This included the repository database, Oracle Management Service (OMS), and the Enterprise Manager agent.

However, this was the wrong approach. The main working component engine of Grid Control is the Oracle Management Service (OMS). This is a J2EE application previously deployed on Oracle Application Server, and now on Oracle WebLogic Server. As a result, only limited scalability would be achieved if all Grid Control components were placed on a single server. Doing this limits use to one Java Machine process with its inherent limits of memory and processor speed. If this process was under heavy load, it would reach its limits quickly and the process would slow down, not respond, or even reboot—however this would happen less frequently in the case of Oracle WebLogic due to its better memory management capabilities.

In production scenarios, it is generally not recommended to place all the Grid Control components on a single server, and these components should also not be shared with a production or test databases on the same server. Grid Control should preferably be allocated its own server, or its own set of servers as per a well architected and documented solution.

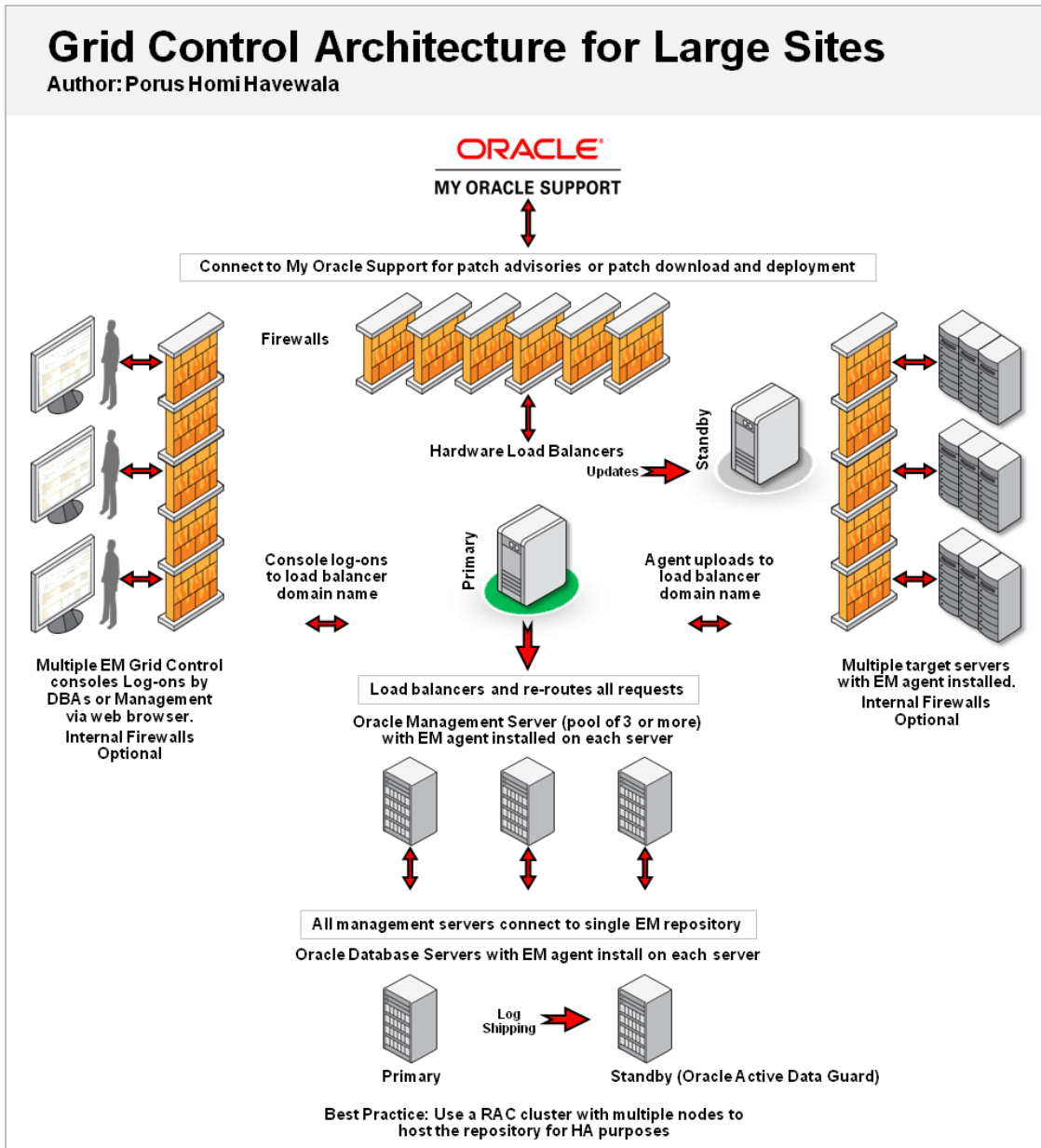
As time tested Oracle best practice suggests, spend quality time to plan and prepare any Grid Control installation meant for production, as a professional project, since it is a management solution for the enterprise—and should not be treated as a minor database tool to be implemented on a single workstation. For more Grid Control architecture tips, please visit the [Oracle Technology Network](#).

Scalability and Performance

With the release of Grid Control, Oracle altered the internal architecture and changed it to the N-tier model. Grid Control was then divided into three components—the Repository database, the Oracle Management Service (OMS), and the Enterprise Manager agent. The OMS which

was the main engine, ran on the application server as a Java Machine component, and therefore became inherently scalable.

The reason that makes this possible is that Grid Control is not tied to one single PC or one single server. It runs as a Java Machine application on the application server tier. Multiple Enterprise Manager applications can be placed on the application server running on numerous servers, and these can all be directed to the same Enterprise Manager repository. The following diagram illustrates a typical Grid Control Architecture for large sites.



Oracle Enterprise Manager 11g Grid Control Architecture for Large Deployments.

We should note at this point that the internal firewalls illustrated in the diagram are not necessary and may or may not be present, depending on the internal network security policies in force in each large site. However, externally facing firewalls are normally present.

In the case of Grid Control being heavily used for the advanced management tasks described in this article, performance scale-out could be more of a necessity on the management service level rather than the database level. In such scenarios, the Java Machine is where the bulk of the Grid Control work is performed; and scalability would be desirable on the management services. On the other hand, housekeeping jobs in the Grid Control repository are also a heavy burden, so scale-out on the database side using Oracle Real Application Cluster (RAC) may be required as well.

Load Balancing Grid Control

In the case of a large Grid Control setup; an example of a large scale Grid Control deployment would involve thousands of targets across multiple servers and tiers. For this architecture, three or more load balanced management servers should be included. We could use for this purpose as an example; a hardware load balancer—like F5 Networks' BIG-IP Application Switch Load Balancer.

Setting up the Load Balancer in the appropriate way and balancing requests from management servers is further discussed in the book, [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](#). This architecture, using hardware load balancers and multiple management servers, has proven to be extremely powerful. The concept sits well with Oracle's Grid vision of enabling groups of hardware and software targets to be pooled and provisioned, on demand, to meet the needs of business. At its core, Grid Control is the underlying management technology that makes it possible to manage, with ease, hundreds or even thousands of Grid targets and/or services within any given environment.

Oracle Maximum Availability Architecture (MAA) for Grid Control

What is Oracle's Maximum Availability Architecture recommendation for Grid Control? As best practice, an Oracle Real Application Cluster (RAC) database should be used for hosting the Grid Control repository for High Availability (HA) purposes. Multiple load balancers can be used to act as a primary and standby, with the latter load balancer taking over if the primary is down. Multiple management services when used also fulfill HA requirements by continuing to work if any one or more management services are down. This is illustrated in the above diagram.

For Disaster Recovery (DR) purposes, as should be done for any production system, the entire Grid Control setup should be duplicated at a remote location far enough not to be disturbed by a disaster at the primary site. Oracle Active Data Guard can be used for the purpose of a standby database for the repository, and the standby itself can be either a single instance database or a RAC database depending on the database used at the primary site. Likewise, the load balancers and the management servers should be set up in a similar configuration to production at the standby site.

Shared Storage is another important best practice when more than one management service is used. If the Grid Control agents upload to a shared directory, then all management services can process files that have been uploaded by any agent. The EMCTL command is used to configure the shared directory from each management service. Shared storage can also be used for the Software Library of Grid Control that is used in provisioning.

For further information on these MAA concepts and techniques for Grid Control, you can refer to [Part III “Oracle Enterprise Manager High Availability”](#) included in the Oracle Enterprise Manager 11g Administration book from Oracle’s documentation library.

The [Oracle Maximum Availability Architecture Website](#) is also an excellent reference site for MAA best practices, case studies and documentation. The MAA best practices for Grid Control are located [here](#).

Grid Control RMAN Tips

Installing and configuring Oracle Enterprise Manager Grid Control is covered in many books and even in the detailed Oracle installation manuals and README files, but what about the real use of Oracle Enterprise Manager Grid Control? How is it going to help the DBAs in their routine and daily activities? So a key question for many is; what is the practical use of Oracle Enterprise Manager in the real world?

Most DBAs worth their salt, know that Oracle has a powerful tool to backup and recover Oracle Databases. This tool is Oracle Recovery Manager, or better known as RMAN. Today’s DBA can make a very smart choice—he or she can set up and schedule RMAN backups via the modern approach of Grid Control, or choose instead the older, more time-consuming, manual method of Unix shell scripting and cron jobs.

RMAN Backups: Scripting vs. Grid Control

Let’s take a look at the traditional approach which consists of a number of manual steps. First, RMAN backup scripts need to be written, changed for each new system, and then tested, with changes made to the schedule in crontab. The estimates supplied by the DBA implementation team range from 3 to 4 hours to perform these steps, including customizing the backup script and testing out the backup script for each installation. This would have to be done on every new server that is provisioned in the organization. Compressing this time frame is possible, but a rush job could potentially introduce human error. Not wanting to tie up precious DBAs resources, IT management finally decides on an average time component of 3 hours per server, to allow sufficient time to the DBA team.

However, even 3 hours adds up to a lot—if there are a number of RMAN deployments happening on projects every week in a large sized company. DBAs are quite expensive and their time costs a lot to the business.

Besides these factors, management must also consider the maintenance cost aspect of the Unix shell scripts. DBAs familiar with Unix scripting need to be hired and retained, or if Perl

has been used as the scripting language, than Perl-literate resources are required. Other sites may use other scripting languages, and since there are no scripting standards in place, scripts may be written in totally different ways to do the same job. There may be little or no comments in the code, and little or no documentation.

After the initial author of the scripts has moved on to bigger and better things in his career, other new DBAs inherit the scripts. These newcomers spend a lot of time first understanding the code and logic of the scripts, and when they feel confident, they try their own enhancements or code fixes. The scripts start to grow exponentially with every new DBA that comes on, as more and more maintenance work gets done, until finally these initially simple scripts start to resemble a multi-headed monster. Sounds familiar?

The very aim of Oracle Enterprise Manager Grid Control is to eliminate such issues. With Grid Control, DBAs don't need to know the detailed complexity of each customized backup script. Grid Control provides a step-by-step wizard to help guide administrators through the backup process as illustrated in the following screen shot.

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

Hosts Databases Middleware Web Applications Services Systems Groups Virtual Servers All Targets

Database Instance: db11or2.oracleleads.com >

Backup Settings

Device Backup Set Policy

Disk Settings

Parallelsim

Concurrent streams to disk drives

Disk Backup Location

The flash recovery area is the current disk backup location. If you would like to override the disk backup location, specify an existing directory or diskgroup.

Disk Backup Type

Backup Set
An Oracle backup file format that allows for more efficient backups by interleaving multiple backup files into one output file.

Compressed Backup Set
An Oracle backup set in which the data is compressed to reduce its size.

Image Copy
A bit-by-bit copy of database files that can be used as-is to perform recovery.

Tape Settings

Tape drives must be mounted before performing a backup. Use the Test Tape Backup button to verify the tape settings before saving them.

Tape Drives

Concurrent streams to tape drives

Tape Backup Type

Backup Set
An Oracle backup file format that allows for more efficient backups by interleaving multiple backup files into one output file.

Compressed Backup Set
An Oracle backup set in which the data is compressed to reduce its size.

Oracle Secure Backup Domain

Version on Database Server: **Unknown**

Oracle Secure Backup Domain Target: **Not Defined**

Backup Storage Selectors:

A backup storage selector is recommended when backing up the database to tape.

Media Management Settings

If you need to configure a media manager from a third-party vendor, specify the library parameters.

Media Management Vendor Library Parameters

Host Credentials

To save the backup settings, supply operating system login credentials to access the target database.

* Username:

* Password:

An example of RMAN backup settings in Oracle Enterprise Manager 11g Grid Control.

For those that absolutely need to run their Unix shell scripts or other type of scripts for that matter, Grid Control allows for that too. The tool provides capabilities to run customized scripts using Oracle Enterprise Manager Job System from within Grid Control. DBAs can specify which scripts to run and then schedule them in the Enterprise Manager Job System. Grid Control provides status tracking and notifications for backup success or failure.

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance **Jobs** Reports My Oracle Support

Job Activity | Job Library

Job Activity Page Refreshed Aug 24, 2010 1:54:24 PM PDT

Status: Active Name: Go [Advanced Search](#)
 TIP By default, results for the last 24 hours are displayed. Use 'Advanced Search' for more options.

View:

View Results Edit Create Like Copy To Library Suspend Resume Stop Delete Create Job Go

Select	Name	Status (Executions)	Scheduled	Targets	Target Type	Owner	Job Type
<input checked="" type="radio"/>	DAILY COLD BACKUP JOB	1 Scheduled	Aug 25, 2010 1:50:00 PM PDT	orcl112.us.oracle.com	Database Instance	SYSMAN	RMAN Script
<input type="radio"/>	REGULAR PS LOOKUP	1 Scheduled	Aug 25, 2010 12:00:00 AM PDT	dadvml0042.us.oracle.com	Host	ADEESHADMIN	OS Command

Home | Targets | Deployments | Alerts | Compliance | **Jobs** | Reports | My Oracle Support | Setup | Preferences | Help | Logout

Oracle Enterprise Manager 11g Job System can be used for automating Oracle Database backups.

Oracle offers a wealth of knowledge and resources on how to use Grid Control for setting up and scheduling RMAN backups without hand-written or borrowed scripts, and without the use of Cron. For more information and to learn more about Oracle Enterprise Manager Grid Control and RMAN, please visit the [Oracle Technology Network](#).

Security Concerns

Security teams often voice their concerns when they are informed about a central management site being setup in their company. They fear that database administrators will be able to access any databases which are not in their domain. However, this fear is unfounded—just the fact that Grid Control is a central site doesn't mean everything is accessible to everyone.

Grid Control imposes full security via the creation of target groups whose rights can be assigned to different Grid Control administrators. So, when disparate database teams login to the Grid Control console, they have access only to their own target groups in which the databases, listeners, hosts and application servers managed by that particular team have been placed. The access to the targets can also be controlled—full management rights or only view access.

For example, if the accounting department DBA team is responsible for the production PRD1FIN database and its listener, they would be assigned their own target group and a new administrator login to Grid Control.

When any of the DBAs from this team would log onto the console, the PRD1FIN database and associated targets would be available to them, but not any of the targets handled by other DBA teams.

Managing Oracle Secure Backup Through Grid Control

Oracle Secure Backup (OSB) is an integrated secure tape backup management system from Oracle. It is a welcome alternative to third-party tape backup solutions that are highly priced and are not tightly integrated with Oracle.

Oracle Secure Backup protects not only Oracle Database 9*i*, 10*g* and 11*g*, but also the entire environment including heterogeneous application file systems (from OSB 10.2 onwards). It is the fastest backup for Oracle Databases, at least 25-40% faster than the competition.

Most importantly, Oracle Secure Backup is the only media management software that is fully integrated with Oracle Enterprise Manager 11*g* Grid Control, which can now manage tape backup administrative tasks such as managing volumes (tapes) and tape devices.

OSB can perform offline backups of 3rd party databases as part of a file system backup operation. Or, the 3rd party databases can perform an online backup using their own backup utilities to disk, and OSB can backup their backup files.

The other advantage is that OSB encrypts data before it leaves the database. The database engine handles the encryption; the data never leaves the database in unencrypted format. The encryption keys are transparently managed by the database.

There is also an Express version of OSB available, and this is bundled with the Oracle Database. OSB Express is free with the database for protecting one server with one attached tape drive. There is no encryption possible with the Express version.

Backup Strategies Using Grid Control

Executing a full database backup every night is fine for small or medium sized databases and no one complains about the small amount of disk space the backup requires or why the backup executes in a very short time.

However, when the database size is more than say 200 GB, it is time to rethink your backup strategy. In most of the real world database scenarios, having a proper and validated backup strategy is very important—even for small databases. And regular testing of your RMAN backup of all your databases is one of the DBA's mandatory responsibilities.

Consider a larger database with 500 GB in total of database files. Obviously, it will not be appropriate to take a full database backup each day. You can adopt a better backup strategy by taking a full database backup once a week on a Sunday and then an incremental database backup Monday through Saturday.

This will enable you to recover the database to any point in time during the previous week by first restoring Sunday's full database backup and then applying the appropriate incremental backups. The different backup types for this kind of strategy can be easily set up using Enterprise Manager Grid Control, and scheduled using the Enterprise Manager job scheduler. After the jobs execute overnight, their output is visible by drilling down into the job logs from

the console, and if any of the backup jobs fail, a notification can be sent to any of the DBAs on roster duty.

The whole database, or individual tablespaces or data files, and/or archive logs can be backed up via the backup screens in Grid Control. An Oracle suggested backup strategy is also available, which is based on creating an image copy of the database which is then rolled forward using incrementally updated backups that are taken on the succeeding days. It is then possible to switch to this updated image copy of the database at any time without incurring any restore time lags—there is no need to restore the backup files to the database location. Such techniques are useful in the case of very large databases that would take a long time to restore.

These advanced techniques of RMAN like incrementally—updated image copies, and also the new features in Oracle Database 10g and 11g, such as compressed backups and encrypted backups, are easily available via the Enterprise Manager Grid Control interface. Even less-experienced DBAs can easily exploit the modern features of the database using Oracle Enterprise Manager, and feel confident in doing so.

Integrated System Management and Support

Automating Patching with My Oracle Support

Oracle Enterprise Manager Grid Control Release 2 (10.2.0.2) formally introduced the Configuration Management Pack, and the Provisioning and Patch Automation Pack, which allows DBAs to automate the task of configuring, patching and provisioning Oracle software across multiple IT environments.

By automating the configuration management, patching and deployment processes, Oracle not only helps reduce deployment time, but helps eliminate redundant often errors-prone manual tasks that DBAs face, day in, day out. And with the recent integration of Oracle Enterprise Manager and My Oracle Support, it now gives DBAs and system administrators a powerful and comprehensive management tool that bridges the gap between IT management and customer support—all from within Grid Control's centralized console.

Integration with My Oracle Support

A task that DBAs have to perform all the time is patching. Many find patching a mundane and repetitive task that has to be done. Oracle Enterprise Manager helps alleviate the pain with its ability to connect to My Oracle Support (formerly Oracle Metalink) from within Grid Control. DBAs can now effectively analyze and download patches they need, apply them in a test environment, promoted them to a staging area, and then deploy them into production. Once deployed, Enterprise Manager verifies that the patches were applied correctly. Also, with Oracle Real Application Clusters (RAC), certain patches can be applied in a rolling fashion to each node in the cluster to eliminate downtime. With Oracle Enterprise Linux, the ability to download and apply operating system patches is totally automated from beginning to end requiring no intervention at the console.

Patch ID	Classification	Description	Target	Type	Oracle Home	Host	Release	Detected
9209238	Other Recommendations	DATABASE PSU 11.1.0.7.2 (INCLUDES CPUJAN2010)	upg9i	Database Instance	/scratch/aimc/11...	stapj60.us.oracle...	Oracle 11.1.0.7.0	5 days ago
9207257	Other Recommendations	NEW 11.1.0.7.2 CRS PSU TRACKING BUG	upg9i	Database Instance	/scratch/aimc/11...	stapj60.us.oracle...	Oracle 11.1.0.7.0	5 days ago
9162498	Other Recommendations	ENTERPRISE MANAGER AGENT 10.2.0.5.2 PSU	stam01.us.or...	Agent	/scratch/frajanal/a...	stam01.us.oracle...	Oracle 10.2.0.5	6 days ago
9162498	Other Recommendations	ENTERPRISE MANAGER AGENT 10.2.0.5.2 PSU	stam02.us.or...	Agent	/scratch/frajanal/a...	stam02.us.oracle...	Oracle 10.2.0.5	6 days ago
9119284	Other Recommendations	DATABASE PSU 10.2.0.4.3 (INCLUDES CPUJAN2010)	db102	Database Instance	/scratch/frasthur/...	adc2170423.us.or...	Oracle 10.2.0.4	Yesterday
9119284	Other Recommendations	DATABASE PSU 10.2.0.4.3 (INCLUDES CPUJAN2010)	sid1	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	5 days ago
9119284	Other Recommendations	DATABASE PSU 10.2.0.4.3 (INCLUDES CPUJAN2010)	sid2	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	5 days ago
9119284	Other Recommendations	DATABASE PSU 10.2.0.4.3 (INCLUDES CPUJAN2010)	sid3	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	5 days ago
9119226	Security	CPUJAN2010 DATABASE 10.2.0.4	sid1	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	Today
9119226	Security	CPUJAN2010 DATABASE 10.2.0.4	sid2	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	Today
9119226	Security	CPUJAN2010 DATABASE 10.2.0.4	sid3	Database Instance	/scratch/demo/db...	adc2190511.us.or...	Oracle 10.2.0.4	Today
9114072	Security	CPUJAN2010 DATABASE 11.1.0.7	upg9i	Database Instance	/scratch/aimc/11...	stapj60.us.oracle...	Oracle 11.1.0.7.0	5 days ago
8855425	Other Recommendations	PATCH REQUEST FOR MLR BUG 8855424 ON TOP OF 1...	as0219.adc21...	Oracle Applicatio...	/scratch/pragotha...	adc2110697.us.or...	IAS 10.1.2.0.2	5 days ago
8521282	Security	MLR ON TOP OF LDAP 10.1.4.3 FOR CPUJUL2009	im10143.stbd...	Oracle Applicatio...	/scratch/frakrania...	stbd003.us.oracle...	IAS 10.1.4.3.0	5 days ago

Integration of Oracle Enterprise Manager 11g and My Oracle Support

Let's take a look at the benefits of the Oracle Enterprise Manager and My Oracle Support integration:

INTERGRATED SYSTEM MANAGEMENT AND SUPPORT—SUMMARY

FEATURES BENEFITS

FEATURES	BENEFITS
Analyze	<p>The integration of Oracle Enterprise Manager and My Oracle Support gives administrators, the ability to leverage proactive support advisories, recommendations, and analysis of their systems in order to streamline the support process and improve overall customer experience.</p> <p>Highlights:</p> <ul style="list-style-type: none"> • One centralized management console with My Oracle Support connection • Proactive patch advisories and recommendations • Best practices for system health checks and diagnostic tools • Service request processing and management • Get answers, tips and techniques using Oracle's vetted and secure peer-to-peer support community • Comprehensive knowledge articles from Oracle • Pre-flight dependency analysis
Patch	<p>Patching systems on mass scale using automation helps boost operational efficiencies and saves administrator's time and effort</p> <p>Highlights:</p> <ul style="list-style-type: none"> • Full patch automation for Oracle software and hardware reduces error-prone manual tasks • Downloads for Critical Patch Updates, one-off patches and patch set • Zero downtime patching for RAC • Automatic download and lights-out patching for Oracle Enterprise Linux • Streamlined conflicts and merge patch process
Test	<p>Thorough end-to-end testing prior to deployment not only helps ensure service quality but also ensures your applications and underlying infrastructure are configured and optimized for performance</p> <p>Highlights:</p> <ul style="list-style-type: none"> • Test infrastructure and system changes using real production workloads • Proper test data management, enables secure, production-scale testing • Test and predict the impact of patches on performance before production deployments helps mitigate risks

- Provision** System Administrators can save time and effort by staging changes and patches prior to production by using Enterprise Manager's out-of-box "gold" configuration management best practices and policies. This helps lower deployment costs while maintaining service quality and consistency.
- Highlights:**
- [Deploy Oracle Applications 95% faster](#) across test and production
 - Drive IT efficiencies with out-of-box "gold" configuration standards
 - Reduce patch management efforts by using standardized deployment processes
 - Integrated patch management and deployment automation helps lower operational risks
- Reporting** Meet regulatory compliance requirements through Enterprise Manager's comprehensive dashboard and reporting capabilities
- Highlights:**
- Automated compliance management, and streamlined configuration management enforces compliance with corporate and security standards
 - Comprehensive performance analysis and reporting maximizes resource utilization
 - Rich compliance reporting dashboards and out-of-the-box policy frameworks for popular industry and regulatory requirements accelerate IT compliance and drives down costs

"Oracle Enterprise Manager helped to standardize our process for provisioning and patching in a completely automated, repeatable, and reliable manner. As a result, we have been able to reduce costs, increase staff productivity, and ensure compliance."

Raymond Payne, Johns Hopkins University Applied Physics Laboratory
[Read the success story](#)

Best Practices Using Deployment Procedures

Many companies restrict Internet access to production servers for security reasons. In such cases, the Oracle Enterprise Manager Grid Control site will not have a direct (or even proxy) Internet connection to the My Oracle Support site. Conveniently, Oracle allows you to perform offline updates to overcome this restriction. The official reference on how to achieve this is provided in FAQ #8, "How can I patch if my OMS [Oracle Management Service] is Offline or Disconnected from the Internet?" This FAQ is posted on the Oracle Technical Network article, "[Achieving Grid Automation with Deployment Procedures](#)".

For the actual patching, we recommend the new and extremely powerful Deployment Procedures functionality in Oracle Enterprise Manager Grid Control that allows you access to a number of advanced features including multiple patch application, patch flow customization, sudo, and also pluggable authentication modules (PAM) support. These deployment procedures are based on best practices and Oracle experience over the years. Examples of the out-of-the box deployment procedures that Oracle provides are seen in the following screen shot:

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

General Provisioning Patches & Updates

Deployment Procedure Manager

Procedures Procedure Completion Status Recycle Bin

Deployment procedures are best practices provided by Oracle for various Provisioning and Patching tasks. Procedures created by Oracle cannot be edited, but can be extended using 'Create Like', so that you can customize the procedure to fit your environment. For more details click Help.

Search Text Fields [Advanced Search](#)

View Schedule Deployment... Edit Create Like Revert Delete Upload

Previous 1-25 of 46 Next 21

Select	Procedure	Type	Description	Last Modified By	Version	Last Updated
<input checked="" type="radio"/>	SOA Artifacts Provisioning	FMW Provisioning	Deployment procedure to provision SOA artifacts. [D]	Oracle	1.1	May 28, 2010 12:11:40 PM CDT
<input type="radio"/>	Fusion Middleware Provisioning	FMW Provisioning	Fusion Middleware Home and Domain Provisioning. [D]	Oracle	4.1	May 28, 2010 12:10:48 PM CDT
<input type="radio"/>	Fusion Middleware Domain Scale Up	FMW Provisioning	Fusion Middleware Domain Scale Up. [D]	Oracle	4.1	May 28, 2010 12:10:48 PM CDT
<input type="radio"/>	Deploy SOA composites	FMW Provisioning	Procedure for provisioning SOA Composites on a selected soainfra domain. [D]	Oracle	1.1	May 28, 2010 12:10:47 PM CDT
<input type="radio"/>	Virtual Machine Cloning	Virtualization	Clone a virtual machine to one or more virtual machines.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Virtual Machine Provisioning Using PXE	Virtualization	Create new guest virtual machines using Preboot Execution Environment. The new guest virtual machines will be PXE-booted and they will get provisioned via network.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	CloneVMM	Virtualization	Clone a virtual machine to one or more virtual machines.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Discover Shared Disks	Virtualization	Discover shared disks and register them with the server pool.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Edit Virtual Machine	Virtualization	Edit virtual machine configuration.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Import Guest Virtual Machine (P2V)	Virtualization	Convert a physical machine to an Oracle virtual machine on a server pool	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Import Template From P2V	Virtualization	Import an OracleVM template into a server pool by converting a Physical Machine(P2V).	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Import Template From V2V	Virtualization	Import an OracleVM template into a server pool by converting a VMWare or VI Machine(V2V).	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Import Guest Virtual Machine (V2V)	Virtualization	Convert a virtual machine to an Oracle virtual machine on a server pool	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Live Migration	Virtualization	Perform live migration of a particular virtual machine or live migrate all virtual machines in a particular virtual server.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Create Shared Disk	Virtualization	Create a shared disk image and register it with the server pool.	Oracle	1.0	May 28, 2010 12:10:41 PM CDT
<input type="radio"/>	Virtual Machine Provisioning Using ISO	Virtualization	Create new guest virtual machines using an ISO image.	Oracle	1.0	May 28, 2010 12:10:40 PM CDT
<input type="radio"/>	Virtual Machine Provisioning Using Template	Virtualization	Create new guest virtual machines using template. The new virtual machines will be based on the template.	Oracle	1.0	May 28, 2010 12:10:40 PM CDT
<input type="radio"/>	Import Template	Virtualization	Import an OracleVM template into a server pool.	Oracle	1.0	May 28, 2010 12:10:40 PM CDT
<input type="radio"/>	Import ISO Image	Virtualization	Import an ISO Image into a server pool.	Oracle	1.0	May 28, 2010 12:10:40 PM CDT
<input type="radio"/>	Save Virtual Machine as Template	Virtualization	Save a virtual machine as template and export the template to external location, if provided.	Oracle	1.0	May 28, 2010 12:10:40 PM CDT
<input type="radio"/>	Oracle Database Provisioning	Database Provisioning	This procedure installs or clones a single instance database home and configures a database on the selected hosts. It follows the best practices specified by the Oracle Database Installation Guide. [D]	Oracle	6.1	May 24, 2010 1:42:29 AM CDT
<input type="radio"/>	Oracle Database Replay Client	Database	This procedure installs or clones a database replay client on the selected hosts. It follows the best practices specified by	Oracle	6.1	May 24, 2010 1:42:28 AM CDT

Using Out-of-the box Deployment Procedures in Oracle Enterprise Manager 11g

As an example, the deployment procedure “Patch Oracle Database” performs the following actions in order:

1. Upgrade the Oracle OPatch utility, which is the actual database-level mechanism for patching Oracle databases. This upgrade of OPatch is optional but is always recommended.
2. Stage the selected patch in a staging location.
3. Initiate a blackout for the database in Oracle Enterprise Manager—since this downtime has been planned in advance, no alerts should be raised when the database is brought down.
4. Shut down the database.
5. Apply the database patch.
6. Execute any applicable root script.
7. Restart the database in the upgrade or migrate mode.
8. Apply any applicable SQL script in the case of a patch set or a CPU.
9. Apply a post-SQL script.
10. Shut down the database.
11. Restart the database.
12. Apply additional SQL scripts as required.
13. Stop the Enterprise Manager blackout for the database so that EM can begin raising alerts again.
14. Refresh the host configuration collection.

These steps can be seen in the following screen shot:

ORACLE Enterprise Manager
Grid Control 11g

Home Targets Deployments Alerts Compliance Jobs Reports My Oracle Support

General Provisioning Patches & Updates

Procedures >

View Procedure

Edit Create Like Revert Schedule Deployment... Done

Name: Patch Oracle Database
Description: Procedure for patching standalone Oracle Database installations with Critical Patch Updates, interim patches, and patchsets. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported.
Type: Patch Oracle Software
Last Modified By: Oracle
Procedure Utilities Staging Path: %emd_root%/EMStage
Sudo Command: sudo
PAM Command: pbrun
Preferred Command Interpreter for PAM and sudo Environment Variables for sudo or PAM:

```
## set Common environment variables
umask 0022;
setenv("LD_LIBRARY_PATH_SNM0","$ENV
setenv("PERLSLIB","$ENV{EMDR00T}"/pe
setenv("PERL_BIN","$ENV{EMDR00T}"/p/
setenv("JRE_HOME","$ENV{EMDR00T}"/j
setenv("LD_LIBRARY_PATH","$ENV{EMDF
```

Run as (Privilege Delegation Settings) Profile (Privilege Delegation Settings) Enable Notification
Procedure Status Notification Job Tag Status for which Notification is to be Sent Last Updated: Mar 31, 2010 8:00:57 PM CDT Note

Name	Type	Description
▼ Patch Oracle Database		Procedure for patching standalone Oracle Database installations with Critical Patch Updates, interim patches, and patchsets. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported.
Initialize	Computational	Initializes the runtime data. The step also downloads patch from My Oracle Support and creates software library components, for all patches selected to run from My Oracle Support. Do not disable or delete this step.
Check for Supported configurations	Computational	Does a set of checks to validate if the targets are supported for patching
Check for Target Properties	Computational	Check if all the required target properties are present and associations are proper. Do not disable or delete this step.
▼ For all hosts	Parallel	Iterates over a list of Hosts.
▼ For all homes	Rolling	Iterates over a list of Oracle Homes.
Check for Target Status	Directive	Checks for target tools, commands and permissions
Check if the user has sudo privileges	Directive	Check if the user has sudo privileges
Upgrade OPatch	Job	Upgrades opatch to the latest version
Stage Patches	Job	Stages selected patches into Oracle Homes. Please ensure that the patching user has staging / write permissions in the Staging Location. Stage Location Example: %emd_root%/EMStagedPatches.
Stage OUI and OPatch	Job	Stages OUI and OPatch into Oracle Homes, if required. Ensure that the patching user has write permissions in the Stage location. Stage location Example: %emd_root%/EMStagedPatches.
Run Prerequisite Checks	Directive	Performs patching prerequisite checks.
▼ For all hosts	Parallel	Iterates over a list of Hosts.

“Patch Oracle Database” Deployment Procedure in Oracle Enterprise Manager 11g Grid Control

In the book [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](#), we proceed to test this deployment procedure, observe a locking issue in Windows, and find a workaround. The workaround is then used in a customized deployment procedure to allow seamless patching of an Oracle Database running on Windows, thereby demonstrating the power of the customized deployment procedures.

Configuring Oracle Active Data Guard using Oracle Enterprise Manager 11g

One other interesting possibility is Oracle Data Guard (Active or Normal) using Oracle Enterprise Manager. It is possible to easily set up, manage and monitor standby databases for any primary database using Oracle Enterprise Manager Grid Control. The standby databases

can be Active Data Guard or normal Data Guard databases, the difference being that the Active Data Guard standby is open for reporting all the time, as opposed to normal Data Guard standby which is not open for reporting when applying redo information. Many companies therefore prefer Active Data Guard to be able to use their standby systems for reporting, reducing the production workload and also move their database backup to the standby. The advanced web interface provided by Oracle for creating and managing Active Data Guard configurations, is an easy to use tool and provides common functionality for many Active Data Guard applications.

"Thanks to Oracle, we are saving US\$49,000 each year, and reducing backup times by five hours. We have also become much more proactive, in terms of troubleshooting."

Edward A. Woolls, IT Operations Manager, Foschini Group

[Read the success story](#)

DBAs can also easily use Oracle Enterprise Manager for day-to-day monitoring and management of Active Data Guard configurations. They can also easily perform Switchovers or Failovers to the standby, in case of planned or unplanned downtime, and they can do all this from the Grid Control console.

Grid Control supplies a common, standard interface to set up and manage Oracle Data Guard for Oracle Database 9i, 10g and 11g databases. Advanced features of Oracle Data Guard in different database releases are visible corresponding to the release, and automatically offered to the DBA, thus reducing the learning curve. Oracle Enterprise Manager can therefore be very useful in implementing Oracle Data Guard for various Oracle Database releases. Active Data Guard is available in Oracle Database 11g onwards in the Enterprise Edition.

Virtual Server Monitoring/Management Capabilities

Oracle Enterprise Manager 11g has two powerful packs for monitoring and managing virtual servers. The first is Oracle VM Management Pack. If Oracle Virtual Machine (VM) is the virtual engine used to virtualize your IT environment, then the Oracle VM Management Pack can be deployed to manage the virtualized environments. Using this Pack, you can monitor the availability as well as performance of the virtual machines, manage their configuration, set up a software library of Oracle VM templates, provision new virtual machines from this library, perform live migration of a guest machine to a different server so that maintenance activities can be performed, and patch these machines.

The second pack to do with virtualization, is the Oracle Ops Center Virtualization Management Pack. Using this pack, you can manage the full lifecycle of virtual guests that use the Oracle Sun Virtualization technology (such as Solaris Containers and LDOMs (Oracle VM for Sparc)). This includes Hot and Cold migration, Guest Provisioning, Guest creation and deletion, virtual resource Pools (resource management) and also Storage and Network Management. Please note, that the Ops Center Provisioning and Patch Automation Pack is a pre-requisite pack for the Ops Center Virtualization Management Pack. Combining the Ops Center Provisioning and Patch Automation Pack with the Ops Center Virtualization Management Pack, provides a very

effective solution for managing the entire lifecycle of Oracle Sun physical and virtual systems—the two packs together are therefore a very powerful and effective systems management solution to manage Oracle’s Sun infrastructure.

Managing Heterogeneous Environments Using Grid Control

Today, you’ll find more and more IT organizations using multiple software vendors’ solutions across their data centers. This provides additional challenges to system administrators and DBAs.

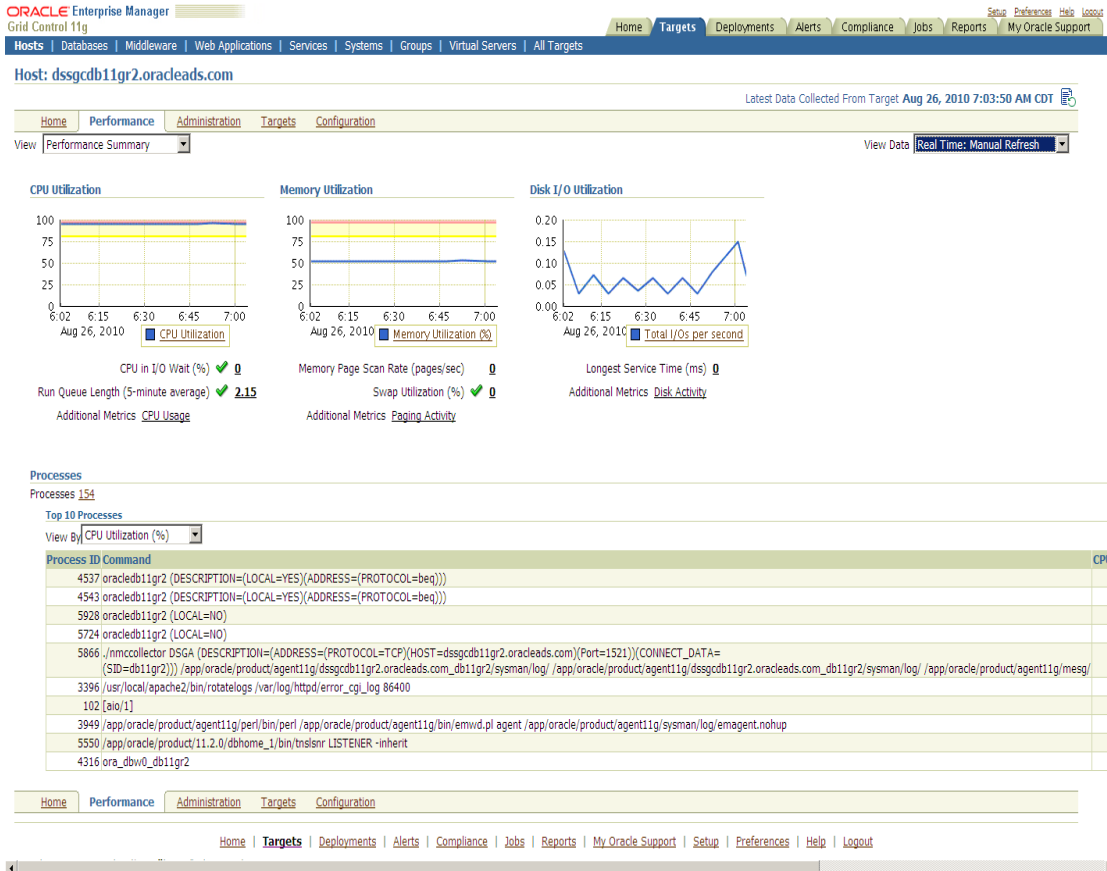
Monitoring and managing all of these various components and infrastructure pieces is difficult at best, especially when each vendor provides their own management tools. Keeping track of which vendor’s technology is impacting application performance or services is a never ending battle. This can be a very silo’d approach.

With Oracle Enterprise Manager, IT operational teams have the ability to manage and monitor non-Oracle technologies including; hosts, OS, databases, middleware and applications. Using Enterprise Manager’s open and extensible framework to extend Grid Control beyond Oracle software, is a huge benefit to administrators, who now can manage and monitor heterogeneous technologies in their data center from one console.

Let’s take a quick look at the benefits of Grid Control to the Unix system administrator for Unix host monitoring, the company auditors and regulators for compliance, and also IT management for managing ‘service level agreements’. More details are in the book [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](#).

Unix Host Monitoring for System Administrators

Oracle Enterprise Manager 11g Grid Control captures host performance metrics in the Enterprise Manager repository and these details can be accessed from Grid Control by selecting the Host target and moving to the performance tab. This displays a graphical view of the Host performance metrics as can be seen in the screenshot below. It is possible to display host performance data for the last 31 days by selecting the appropriate option from the drop-down box. As can be seen, CPU utilization, memory utilization, disk i/o utilization, swap utilization and the top processes can be seen.



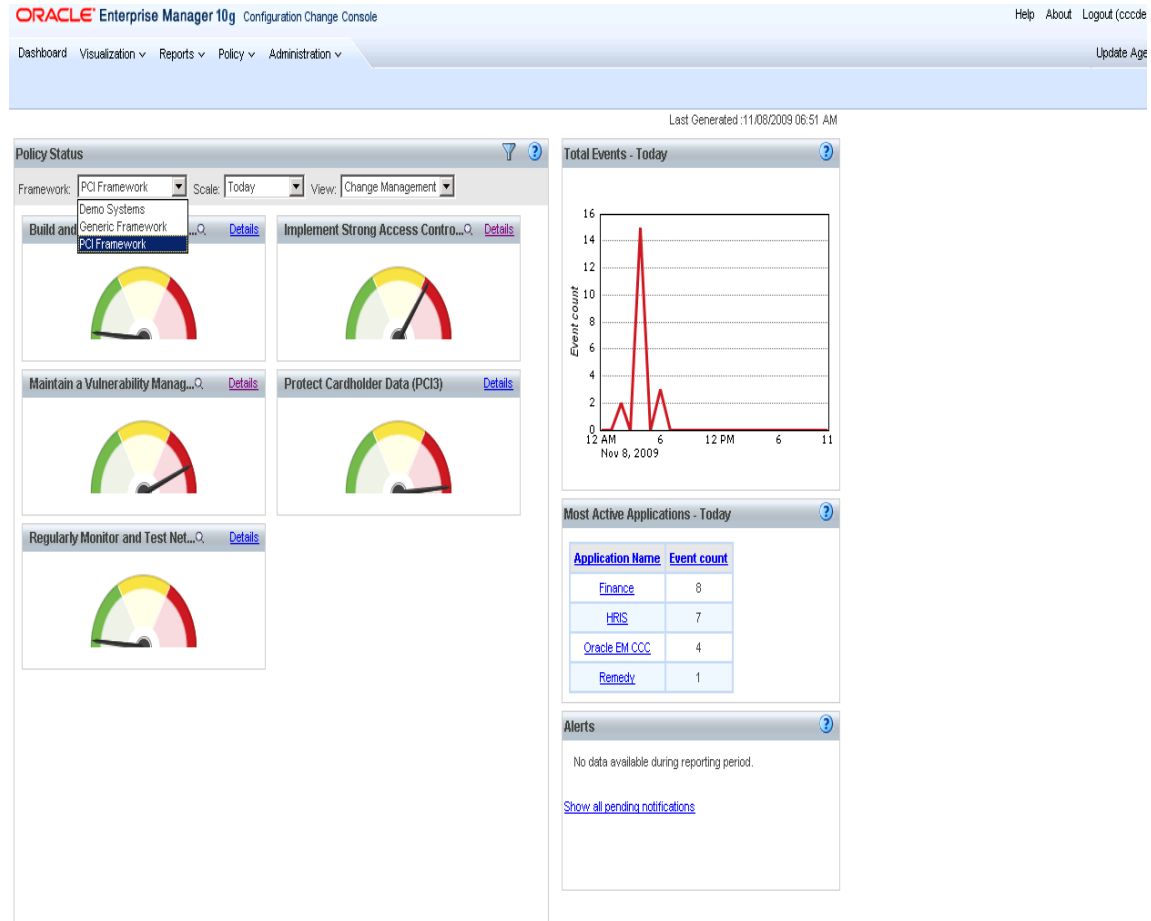
Oracle Enterprise Manager 11g Grid Control Performance Metrics for Host Targets

Real-Time Configuration Change Control and Compliance for Auditors

Oracle Enterprise Manager 11g Configuration Management Pack captures configuration metrics for many components such as host servers and can compare them to one another, thus enabling system administrator to pinpoint configuration drift in their environments. The Pack now also includes real-time configuration monitoring. There is a separate download available on the OTN Enterprise Manager downloads page for [Oracle Configuration Change Console](#). You need to download this and install it separately from the main Grid Control install. The Configuration Change Console provides continuous detection, validation and reporting associated with any authorized and unauthorized configuration change across applications-to-disk. This kind of change control is in accordance with regulatory and industry standards like Sarbanes-Oxley, PCI and ITIL, which is being implemented today by many organizations.

The Configuration Change Console Dashboard, seen below in the next screenshot, shows you at a glance the compliance status of the entire company, with its out-of-the-box frameworks such as the PCI framework, or as per your own defined Compliance framework. The PCI DSS standard is the worldwide Payment Card Industry Data Security Standard from the PCI

Security Standards Council. The five key policies that make up PCI are displayed on the Dashboard.



Oracle Enterprise Manager Configuration Change Console Dashboard

The Configuration Change Console allows you to create custom policies, in addition to the predefined policies pertaining to the different frameworks that are displayed in Figure 8.25. There are over 200 out of the box Policies.

The compliance dashboard thus offers a view at a glance, of how the company systems are complying with best practices, security policies, storage policies, and other user defined policies. This would be quite useful to company auditors and regulators.

Service Level Management for IT Managers

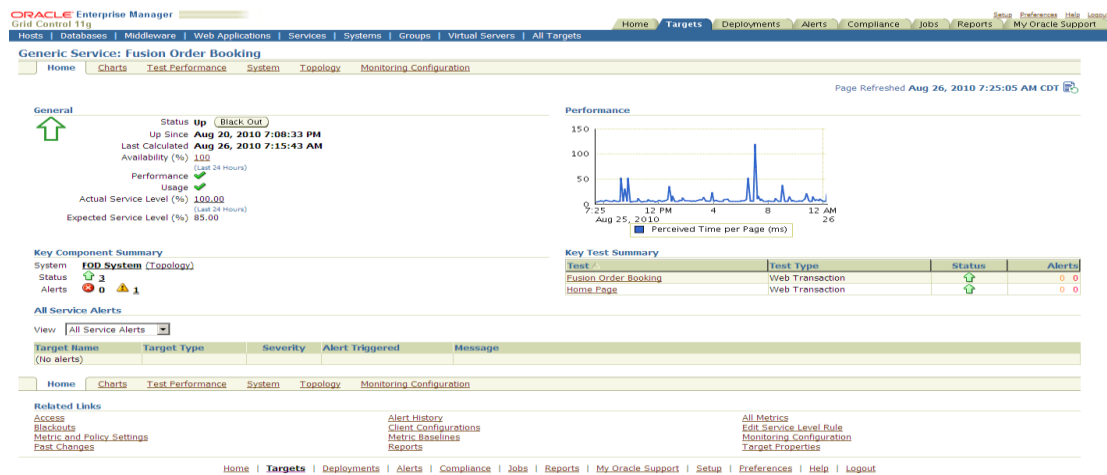
In the case of IT Managers, they would be interested in how Grid Control can help them achieve an overall end-to-end, corporate view of its infrastructure system, such as the availability of the systems, the database versions in use, Oracle licensing aspects, and the

different hardware systems out there in the organization. They would like to see the dashboards that display the performance of the application system components as a whole, including the databases, listeners, application server instances, hosts, and other components that make up the application in total. If any of these components were to stagger and fail, the entire application system would be adversely affected.

IT Managers are interested in the proper use or wastage of expensive storage space, and they would also appreciate the automation of jobs without scripts, removing much of the dependence on Unix shell scripts and cron jobs. This allows their DBAs to focus on high business value projects and tasks, like capacity planning and service quality improvements.

They would be interested to see if the security compliance requirements and the SLAs (service level agreements) for the various systems in the company are being achieved—just as the managers of [Oracle's next generation data center](#) in Austin Texas do. All the mentioned aspects are in Oracle Enterprise Manager Grid Control.

Oracle itself uses Enterprise Manager to manage its entire data center, meeting the service level agreements to the various departments throughout Oracle. The following screenshot shows a monitored service that has been defined in Enterprise Manager Grid Control.



Oracle Enterprise Manager 11g Target Service Level View.

The topology of the service can be seen in the next screenshot.



Oracle Enterprise Manager's Topology View with Drill-Down Diagnostic Capabilities.

For a more thorough explanation of these aspects of Oracle Enterprise Manager Grid Control capabilities, please read the book, [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](http://www.rampant-books.com/book_1001_advanced_techniques_oem_grid_control.htm) available at the website, http://www.rampant-books.com/book_1001_advanced_techniques_oem_grid_control.htm.

Conclusion

Based on the backbone of the industry-leading Oracle Enterprise Edition Database and Oracle WebLogic Server, Oracle Enterprise Manager 11g Release 1 is a very powerful and comprehensive solution, capable of managing your entire data center from end-to-end with a business-driven IT management approach. And the sky is truly the limit for future versions of the fantabulous Oracle Enterprise Manager product.

In the whitepaper, we discussed how DBAs can benefit from Oracle Enterprise Manager Grid Control, by using the solution to automate many of the practical database tasks in their daily routines.

We looked at how database backups, and the creation of standby databases can be streamlined, and how entire database systems and their underlying infrastructure can be automatically patched and provisioning with the newly integrated Oracle Enterprise Manager and My Oracle Support.

These are nitty-gritty tasks but they combine to take up a lot of DBA's time and effort. Not only by using Grid Control's automation and its Manage Many as One approach, can DBAs now devote their efforts to higher value tasks like improving service quality and system availability.

The benefits of Grid Control to the system administrators, the compliance officer, and even IT executives are well defined and quantifiable, with Enterprise Manager delivering superior

return on investment and business value. And as we see the number of Enterprise Manager Management Packs, Management Connectors and System Monitoring Plug-ins steadily grow with capabilities—for all its ambition to be the Enterprise Management System of choice, it truly can be said that Oracle Enterprise Manager 11g has progressed well on that path.

For more in-depth technical information and resources, please visit Oracle Enterprise Manager on the [Oracle Technology Network](http://www.oracle.com/technetwork/oem/grid-control/overview/index.html) at <http://www.oracle.com/technetwork/oem/grid-control/overview/index.html> where you can download demos, whitepapers, webcasts and more!

About the Author

Porus Homi Havewala works as a Senior Manager (Enterprise Technology) at Oracle Corporation Singapore, and was previously a Principal Consultant at S&I Systems Singapore (Oracle Platinum Partner). He was awarded the Oracle ACE Director title by Oracle HQ in 2008 and is currently an Oracle Employee ACE. He has extensive experience in Oracle technology since 1994, including as a Senior Production DBA, Principal Database Consultant, Database Architect, E-Business Technical DBA, Development DBA, and Database Designer Modeler (using Oracle Designer of course). He has also worked in Oracle India in the ACS (Advanced Customer Services) department and is an enthusiast for Oracle technology, especially Oracle Enterprise Manager Grid Control, on which he has conducted seminars for large MNCs and Financial Institutions in India and Singapore and implemented this powerful enterprise tool. In the early 2000s Porus was the Technical team leader with the first production Grid Control project in the world, Telstra the largest telecommunications company in Australia. He has published numerous articles on Grid Control on OTN, and created the world's first blog dedicated to Grid Control. Porus is currently awaiting the publication of his first Oracle book titled [Oracle Enterprise Manager Grid Control—Advanced Techniques for the Real World](#). You can also regularly visit Porus' Oracle Enterprise Manager Blog to comment on the book or on Oracle Enterprise Manager in general: <http://enterprise-manager.blogspot.com/>



Advanced Uses of
Oracle Enterprise Manager 11g
September 2010
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