An Oracle White Paper
April 2009

Patching of Oracle Databases and Real Application Clusters with Shared Oracle Homes using EM Deployment procedures integrated with MOPatch

Contents

Introduction

This paper illustrates orchestration of automated patching using deployment procedures for Oracle Databases and Oracle Real application Clusters on a shared Oracle Home infrastructure using the patch tool *MOPatch*.

MOPatch is a specially-packaged wrapper utility around OPatch for applying multiple interim patches (aka one-off patches) on Oracle Databases running SAP applications, in a single attempt.

MOPatch is developed by Oracle's SAP integration development team and is available for download from SAP Service Marketplace. SAP recommends usage of shared Oracle Home infrastructure for databases and the patches are typically repackaged and released from SAP Service Marketplace and are patched using the MOPatch utility. In this process, the MOPatch utility is integrated with the deployment procedures of Enterprise Manager Grid Control to automate the orchestration of patching on Oracle Databases.
The automation significantly reduces time and effort involved in the manual patching activity.

This document explains how you can customize a Enterprise Manager Grid Control 10.2.0.5 (10*g*R5) deployment procedure to integrate with MOPatch and orchestrate the automated patching task on Oracle Databases and Oracle Real Application Clusters.

Concepts

MOPatch

MOPatch is a utility specially packaged for applying multiple patches in a single run to Oracle Database running SAP applications. MOPatch utility enables you to apply multiple patches at a time on Oracle Databases; it internally invokes OPatch. MOPatch automates the process of unpacking and applying of one-off patches. The utility additionally has prerequisite checks specific for this genre of Oracle Database customers. The MOPatch utility is limited to UNIX platform and can only apply Interim (a.k.a One off) patches on Oracle Databases and Oracle Real Application Clusters. MOPatch doesn't support application of Critical Patch Updates (CPUs)

MOPatch is developed by Oracle's SAP Integration team and is available for download from SAP Service Market Place (For details refer to the note 1027012 - MOPatch - Install Multiple Oracle Patches in One Run)

Deployment procedures

Oracle Enterprise Manager Provisioning and Patch Automation Pack have a rich set of deployment procedures (DP) to provision and patch Oracle Databases. The patching DP is typically integrated with OPatch for applying interim patches on Oracle software. The procedure executes the task of upgrading OPatch in target OH, staging of patches to the OH of the targets selected , shutting down the services , applying the patch, starts up the services and automates SQL application ,if there are any SQLs associated with the patches.

The procedural framework is flexible, providing you with an easy way to customize and insert or edit steps to suit to your data center environment and practices.

To enable the application of interim patches to Oracle Databases running SAP applications, the DPs have to be customized to integrate with MOPatch. The DP automates the staging of MOPatch to the target Oracle Home and it also invokes MOPatch for applying interim patches, in addition to invoking OPatch for Critical Patch Updates (CPUs) and Oracle Universal Installer for Patchsets.

Patching Databases with Shared Oracle Home Infrastructure

Oracle Database can be installed in such a way that multiple standalone databases or multiple RAC databases across cluster nodes can share a common Oracle Home. The Oracle Home can be hosted on a shared infrastructure.

Normally, Oracle Homes are patched once and all services out of that Oracle Home are stopped prior to patching. In case of RAC, the nodes are patched typically once in a rolling manner for interim patches to achieve high availability of the database.
Patching an Oracle Database with shared Oracle Home is different from the normal infrastructure because all its shared services running out of the Oracle Home have to be shut down completely and the binaries of the patch have to be applied only once to the Oracle Home during the entire cycle.

The database patching DPs offered by Enterprise Manager 10g Grid Control Release 5 (10.2.0.5) are enriched to support patching of Oracle Databases with shared Oracle Homes.

Requirements

Software and Licensing Requirements
The following are the software and licensing requirements:
(1) Install Enterprise Manager 10g Grid Control Release 5 (10.2.0.5) to use the automated patching procedures described in this document.
(2) Obtain a valid license for "Provisioning and Patch Automation for Databases" pack.

Deployment Procedure Requirements

Configure the Software Library [1] along with Oracle Management Service (OMS).
For instructions on how to set up a software library, see, "Setting Up and Configuring a Software Library with Oracle Enterprise Manager" in the Oracle Enterprise Manager Advanced Configuration Guide.

Prerequisites

Deploying new DPs to Oracle Enterprise Manager

The DPs 'Patch Oracle Database' and 'Patch Oracle Real Application Clusters – All Nodes' support orchestration of patching on Databases with Shared Oracle Home infrastructure. (Multi Instances in an OH, in case of Standalone Database)

The out-of-box patching DPs are integrated with OPatch utility. Unlike the regular databases, the ones that support SAP application must be patched using the MOPatch utility. The current DPs are customized to integrate with MOPatch, so the MOPatch utility is transported to the local Oracle Homes and is invoked to apply patches.

The DPs are hot pluggable and can be either deployed from a Procedure Archive (PAR) file or created by customizing an existing DP. As part of this exercise, new customized DPs are created and are available for download as a PAR file from My Oracle Support (Metalink) Note 814845.1. Follow the instructions provided in the section for more information, see – section: A and B in Appendix-A.

The DP can also be created by customizing the existing out-of-box DPs by following the instructions detailed in the section: C "Customizing deployment procedures" in Appendix-A.

Creating MOPatch component in Oracle Software Library

MOPatch utility is available for download in SAP Service Marketplace. Oracle Enterprise Manager Grid Control is tightly coupled with Oracle's My Oracle Support site, so the MOPatch utility needs to be downloaded offline from SAP Service Marketplace and uploaded to the Software Library to be used in conjunction with the DPs. We utilized MOPatch version 1.9 for this exercise.

MOPatch component gets directly created in the Software library on uploading the PAR file or can be uploaded by the user (follow the instructions under the section D "MOPatch utility in software library" in Appendix-A

_____
[1] Software Library: Software library is a repository to store software images, patches and deployment procedure utilities used in Enterprise Manager Grid Control. Software library can be configured on any Network File System and has to be accessible by the OMS. For more details, see, "Setting Up and Configuring a Software Library with Oracle Enterprise Manager" under Oracle Enterprise Manager Advanced Configuration Guide

Uploading of Patches to Software Library

Patches for this type of Oracle Databases are repackaged and made available from SAP Service Marketplace. Enterprise Manager Grid Control does not support direct connection with SAP Service Marketplace to automate downloading of the patch. Therefore, the required patches must be downloaded separately and uploaded to the Software Library.

For more details on how to upload the patches to the Software Library, see section D – 'Uploading patches to software library' in Appendix-A

Automated Database Patching Orchestration using Deployment Procedures

The DPs orchestrate a particular task (say either patching or provisioning) on an Oracle target based on the best practice steps encompassed. The database patching DPs orchestrate patching of Oracle Databases by automating the regular tasks of shutting down the database, applying patches, starting databases, and applying the SQLs.

We customized the DPs to utilize MOPatch utility to apply interim patches on Oracle Databases rather than default behavior of invoking OPatch. The patching DPs, mainly "Patch Oracle Database" and "Patch Oracle Real Application Clusters – All Nodes" are selected for customization.

As a prerequisite, the MOPatch component has been created in the Software library with MOPatch version 1.9 and uploaded under a specific location (MOPatch under Components). Also, the database patches have been downloaded separately from SAP Service Marketplace (for this specific exercise) and uploaded to the Software library in offline mode.

Additionally, the Perl script associated with the Apply Patch step of the DP has been changed to invoke MOPatch rather than OPatch for one-off patches.

The DPs were customized to stage and invoke MOPatch.

Customization 1:
 A new custom step "Stage MOPatch" is inserted into the procedure prior to 'Shutdown Database' step to stage the MOPatch component from the Software Library to the Oracle Home of the database target selected for patching.

Customization 2:
The existing Apply Patch step of the procedure is edited to invoke MOPatch for interim patches (non-CPUs). The Perl script is customized to invoke MOPatch for interim patches.

The customized DP is saved with a new name (For example: Patch Oracle Database using MOPatch). For more information, see – section: C "Customizing deployment procedures" in Appendix-A

Following use cases illustrate the execution of the procedures.

Use Case 1 – Applying interim patches to standalone database using Deployment procedure with MOPatch.

Applying patches on standalone Oracle Databases sharing Oracle Home using MOPatch through deployment procedures. The DP on execution , shuts down all the database running out of the Oracle Home and applies the binary of the patch by invoking MOPatch on the Oracle Home and applies the SQL if present in the patch metadata across the all the databases.
The steps to execute the DP are explained below.

Navigate to 'Deployments' tab, select 'Patching through Deployment Procedures' under 'Patching' section. Select the Deployment Procedure (DP) "Patch Oracle Database using MOPatch". Click 'Schedule Deployment' to invoke the procedure.

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 [_____] (Go)   Advanced Search

(View) (Schedule Deployment...) (Edit) (Create Like) (Revert) (Delete) | (Upload)

Select	Procedure	Type	Description	Last Modified By▽	Version	Last Updated
⊙	Patch Oracle Database with MOPatch	Patch Oracle Software	MOPatch 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. ⓘ	SYSMAN	1.4	Apr 28, 2009 11:14:33 AM UTC
○	Patch Oracle RAC Database - All Nodes with MOPatch	Patch Oracle Software	MOPatch Procedure for patching an Oracle RAC Database (supports application of patchsets too). This procedure supports patching of shared Oracle Home RAC Database installations. All selected instances are patched in parallel. This procedure is not applicable for installations registered with different clusterware. Applicable for version 10.1, 10.2 and higher. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. ⓘ	SYSMAN	1.4	Apr 28, 2009 11:15:18 AM UTC
○	Patch Oracle RAC Database - All Nodes	Patch Oracle Software	Procedure for patching an Oracle RAC Database (supports application of patchsets too). This procedure supports patching of shared Oracle Home RAC Database installations. All selected instances are patched in parallel. This procedure is not applicable for installations registered with different clusterware. Applicable for version 10.1, 10.2 and higher. Note: Major upgrade for example, DB 10.1 to 10.2 is not supported. ⓘ	Oracle	5.0	Feb 18, 2009 6:56:22 PM UTC

Figure 1: Choose the Deployment Procedure-Patch Oracle Database with MOPatch

- First step is to select the patches to be applied. Click "Add" to select patches.

Figure 2: Step 1 -Select the patches to apply

- Patches are pre-staged in Software library , Select 'Search Software Library' option and Click 'Go'. Optionally, the search can be narrowed down by using the search attributes.

- Select the patches to be applied and Click 'Select'. In this exercise we choose 3 patches to be applied on a 10.2.0.4 Database running on Linux x86 platform.

Figure 3: Select pre-staged patches from Software Library

- Click Next

Figure 4: Multiple patches selected to apply

- Select the database Targets to be patched. Click 'Add'. The page displays the suitable targets based on the patch attributes. Select the targets required to be patched.

Figure 5: Step 2- Select Targets to apply patches.

- Click 'Next'. "Oracle Configuration Manager Page" is an optional configuration step, which configures your target with My Oracle Support. In this exercise, we will skip configuring. Click 'Next' and Click 'Yes' for confirmation.

General | Provisioning

Software Updates — Target List — Library Step Properties — **Oracle Configuration Manager Page** — Credentials — Schedule — More

Cancel | Back | Step 4 of 7 | Next

Provide your email address to be informed of security issues, install the product and initiate configuration manager.

Email [   ]
Easier for you if you use your My Oracle Support Email Address/User Name

☐ I wish to receive security updates via My Oracle Support

My Oracle Support Password [   ]

Connection Details

Specify proxy server information

Proxy Server [   ]
Proxy Port [80]
Proxy Username [   ]
Proxy Password [   ]
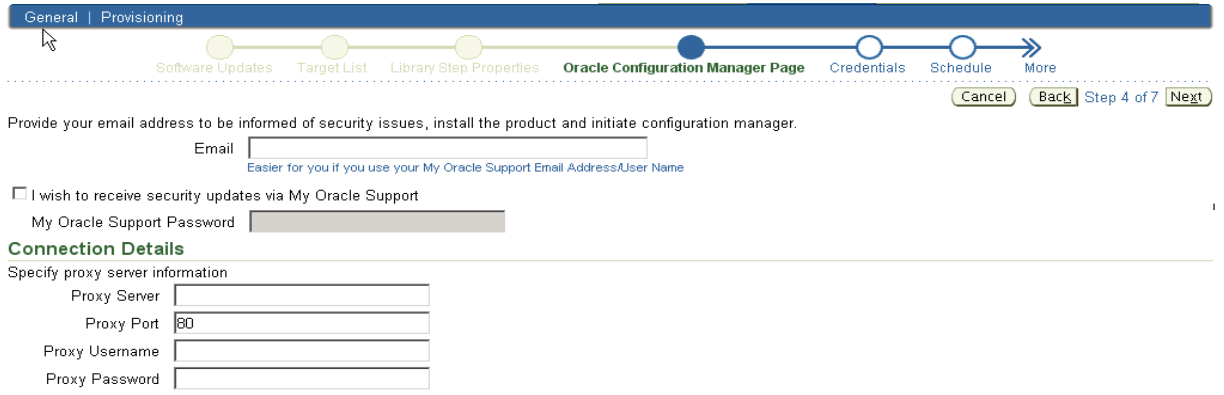
Figure 6: OCM Configuration

- Click 'Next'. Provide the credentials for the Oracle Home of the target to be patched. Credentials can be saved to OMS with 'Save OH Credential' to be used as a preferred credential for successive executions.

Software Updates — Target List — Library Step Properties — Oracle Configuration Manager Page — **Credentials** — Schedule — More

MOPatch Oracle Database: Credentials

Cancel | Back | Step 5 of 7 | Next

The Deployment Procedure can have phases that loop across hosts and homes. Credentials need to be captured for hosts and homes as needed.

Home Credentials

○ Use Oracle Home Preferred Credentials   ⦿ Override Oracle Home Preferred Credentials

Specify For [Each Home ▼]

Oracle Home	Host	Target	Username	Password	Save OH Credential
/scratch/nagrawal/OracleHomes/product/11.1.0/db_1	stadd06.us.oracle.com	emscale	nagrawal	******	☐

Figure 7 : Step 3: Specify the Credentials.

- Click 'Next' and schedule the execution. In this exercise, the execution is left to the default option – Immediately. Optionally, you can update the default Instance Name with RFC number or any other identifier of your own.

Previous — Credentials — **Schedule** — Review

MOPatch Oracle Database: Schedule

Cancel | Back | Step 6 of 7 | Next

Specify when you would like the patch to be applied. You can apply the patch now or schedule a future date and time.

▶**Schedule (Immediately)**

Instance Name [MOPatch Oracle Database SYSMA]
Enter an instance name for the Deployment Procedure execution. Default Value syntax : Procudure Name_UserName_TimeStamp
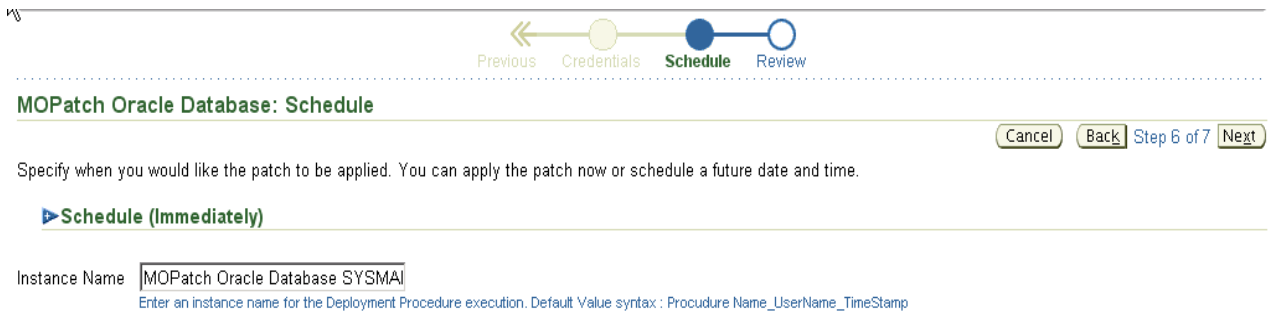
Figure 8: Step - 4 – Set the Schedule for the execution. Defaults to Immediate.

- Click 'Next'. On "Review" screen, review the selections and click "Finish" to initiate the execution of the procedure.

Figure 9: Review Page to review the selection

- The procedure instance execution can be tracked in real time from the "Procedure Completion Status" of the procedure. Select the procedure and drill down to see the step level status and execution logs.

Figure 10: Procedure Completion Status - Real time status of procedure instance execution status

Use Case 2 – Applying interim patches to Oracle RAC database using Deployment procedure with MOPatch.

Applying patches on Oracle Real Application Clusters with shared Oracle Home using MOPatch through deployment procedures. The DP on execution, shutdowns RAC databases across all the Nodes and applies the binary of the patch by invoking MOPatch on the shared Oracle Home and executes the SQL across the RAC databases on the SQL node selected. The steps to execute the DP are explained below.

- Navigate to 'Deployments' tab, select 'Patching through Deployment Procedures' under 'Patching' section.

- Select the Deployment Procedure (DP) "Patch Oracle RAC Database – All Nodes using MOPatch". Click 'Schedule Deployment' to invoke the procedure.

Figure 11: Select the procedure for RAC environments

- First step is to select the patches to be applied. Click "Add" to select patches.
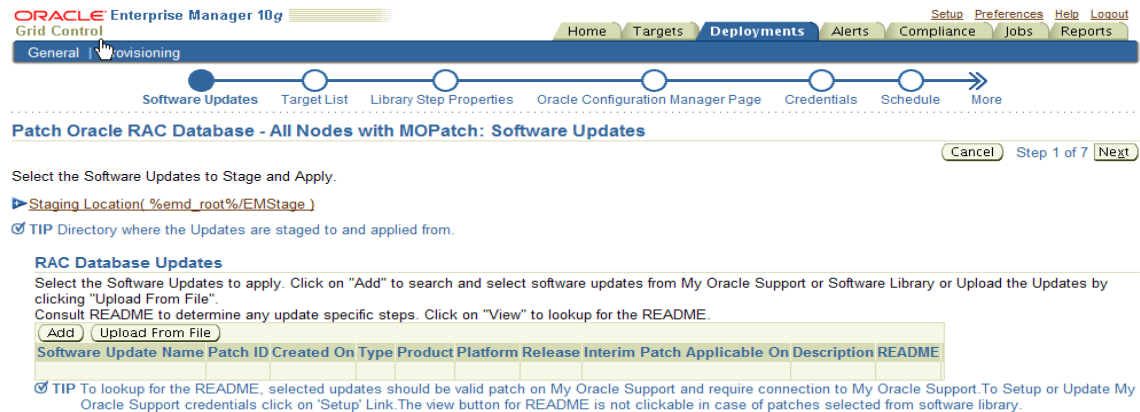

Figure 12 :Step1- Select patches to apply

- Patches are pre-staged in Software library, Select 'Search Software Library' option and Click 'Go'. Optionally, the search can be narrowed down by using the search attributes.

- Select the patches to be applied and Click 'Select'. In this exercise we choose 2 patches to be applied on a 10.2.0.4 Database running on Linux x86 platforms.
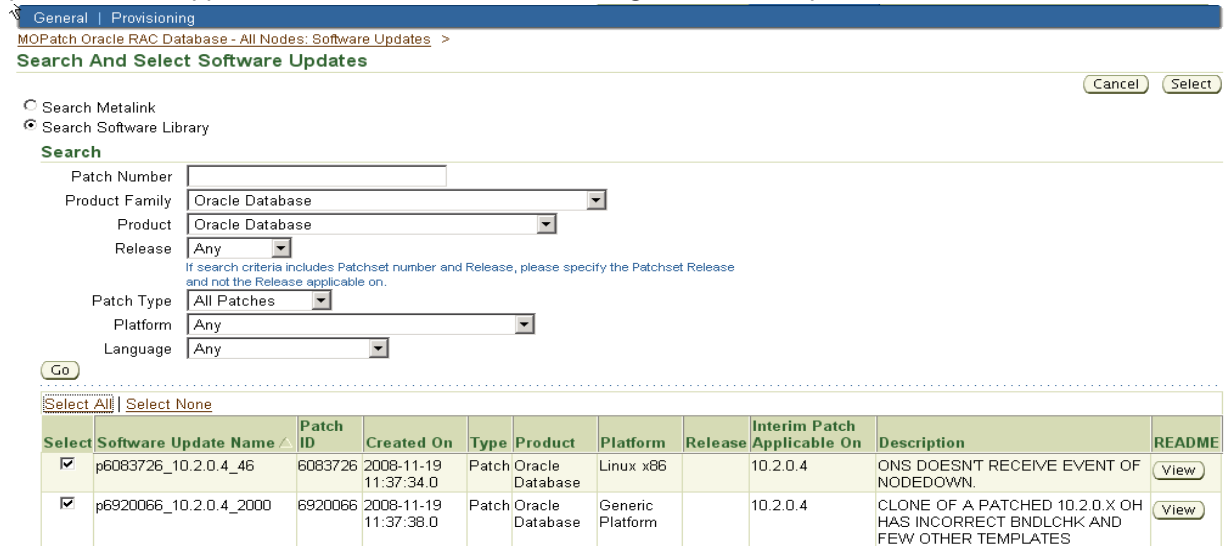
Figure 13: Select pre-staged patches from Software Library
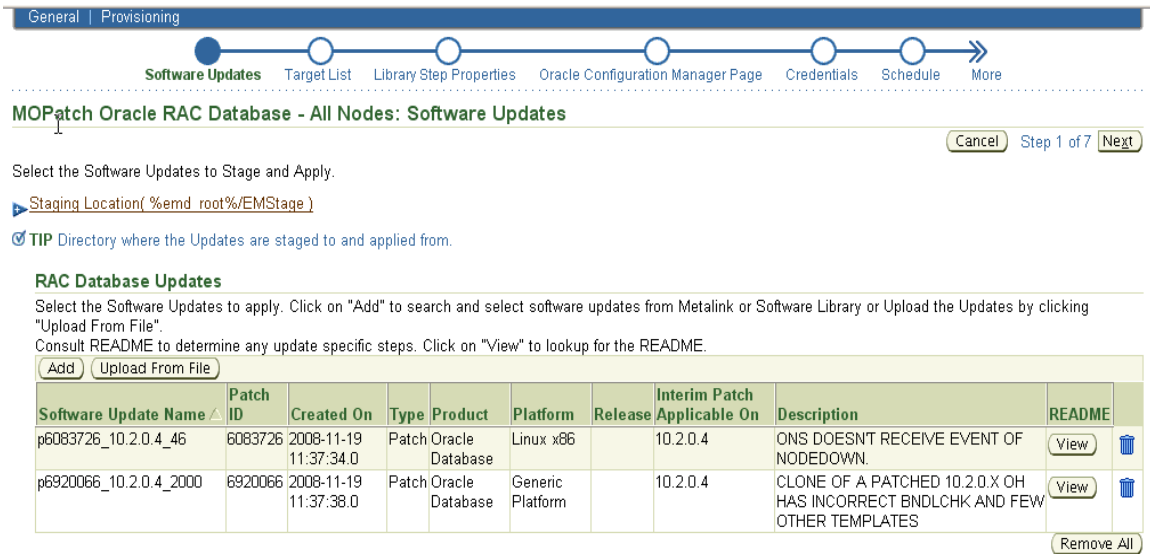
- Click 'Next'

Figure 14: Selected Patches

- Select the Cluster database Targets to be patched. Click 'Add'. The page displays the suitable targets based on the patch attributes. Select the targets required to be patched
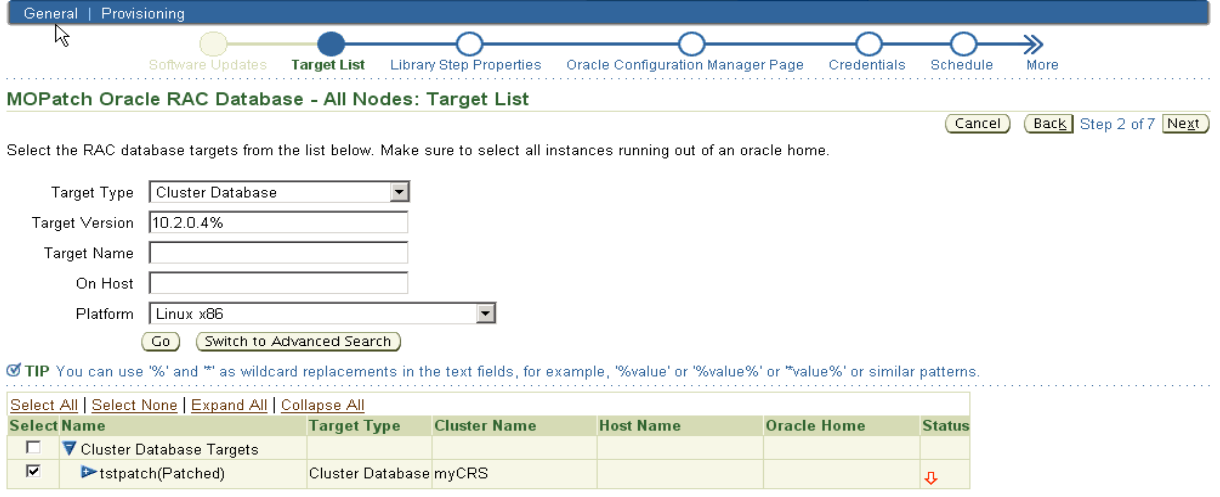

Figure 15: Select Cluster Database Targets

- Click 'Next'. "Oracle Configuration Manager Page" is an optional configuration step, which configures your target with My Oracle Support. In this exercise, we will skip configuring. Click 'Next' and Click 'Yes' for confirmation.
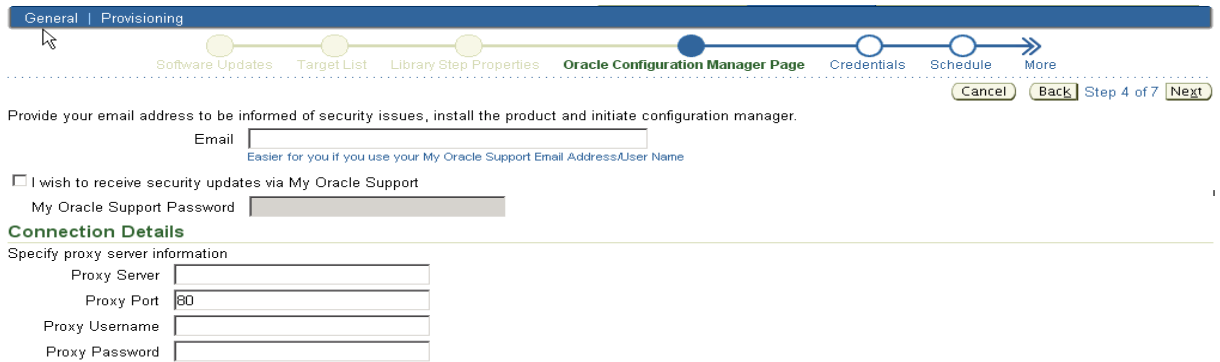

Figure 16: OCM Configuration page

Figure 17: Confirmation on opting out of the OCM configuration

- Provide the credentials for the Oracle Home of the target to be patched. Credentials can be saved to OMS with 'Save OH Credential' to be used as a preferred credential for successive executions.
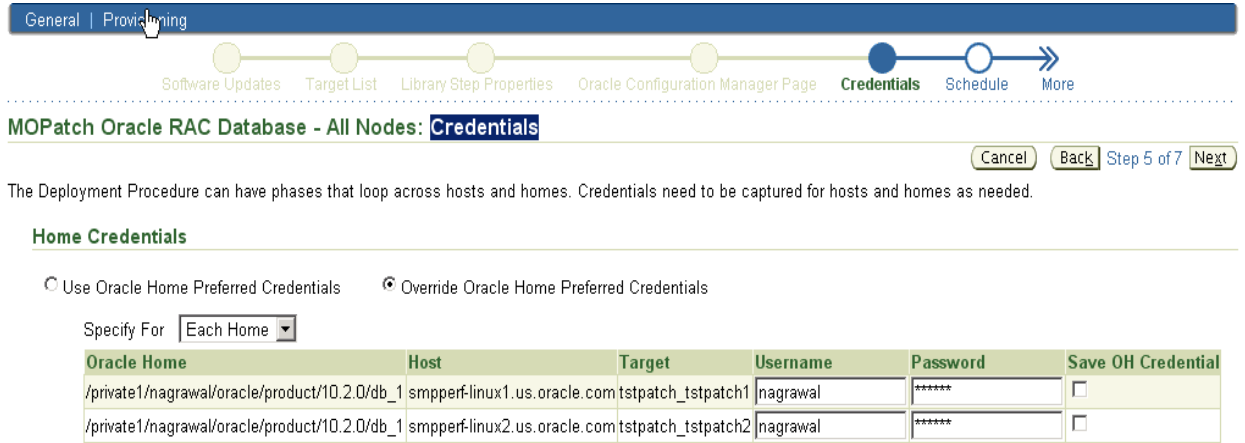

Figure 18: Provide Credentials

- Click 'Next' and schedule the execution. In this exercise, the execution is left to the default option – Immediately. Optionally, you can update the default Instance Name with RFC number or any other identifier of your own.
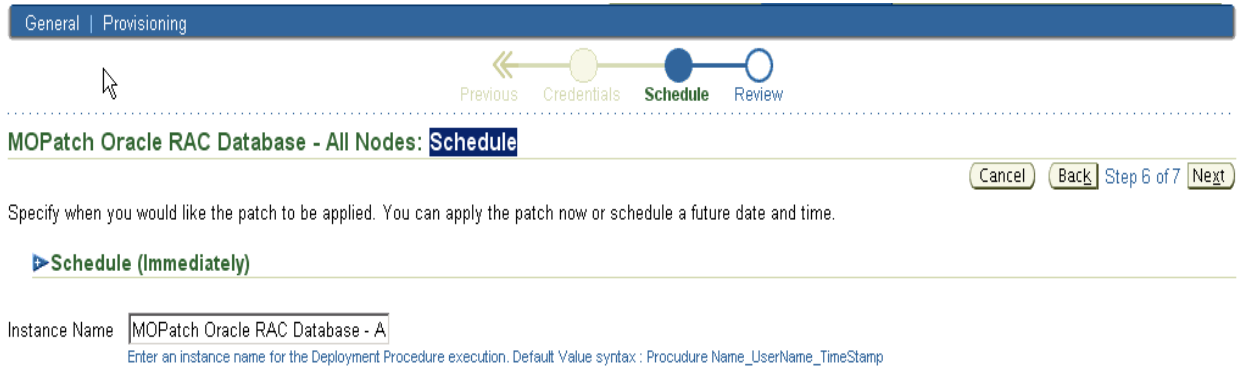

Figure 19: Schedule Execution of the procedure

- Click 'Next'. On "Review" screen, review the selections and click "Finish" to initiate the execution of the procedure.

- The procedure execution can be tracked in real time from the "Procedure Completion Status" of the procedure. Select the procedure and drill down to see the step level status and execution logs.

Handling Failures

If patch application fails due to some reason, the Step in question is highlighted with 'Failed' status. You can drill down to view the logs for failure details. You can opt to rectify the problem or decide to ignore or retry directly from the step. You need not re-start the instance from the beginning, thus saving time.

Automating Patch Application of Other Patch Types

The other type of patches like Quarterly Critical Patch Updates (CPUs) and Patchsets can be applied using the same procedures. The DP steps holds the intelligence to call appropriate tools like OPatch or OUI as per the patch type.

Conclusion

Deployment procedures provide flexibility to incorporate the changes rising out of environmental conditions and technical requirements in one's environment. This unique ability provides the user with the advantage of combining the best practices defined for a task from Oracle and user practices to deliver automated solutions for complex, error prone manual tasks.

Oracle Enterprise Manager Provisioning and Patch Automation pack also provides a whole set of best practice provisioning and patching procedures for various operations in a data centers. Thus defining standardization in the process, and reducing time, effort and total cost of operation. This eliminates any chances of human errors in the monotonous process, thus increasing the productivity of DBAs managing complex data centers.

Appendix – A

A. DP for applying patches to standalone Oracle database using MOPatch

Download the procedure archive (PAR) file 'MOPatch.par' from the attachments list of My Oracle Support (Metalink) Note 814845.1.

Deploy PAR file directly from Enterprise Manager Grid Control:
- Navigate to 'Deployments' -> 'Deployment Procedures' under 'Deployment Procedure Manager'. Click on 'Upload' Button on this screen
- Provide the par file location on either local machine or one of agent machines wherever par file is located -> Click on 'Upload' Button

PAR file can also be deployed in command line mode,by running the following commands from OMS machine.
- setenv ORACLE_HOME <OMS_ORACLE_HOME>
- $ORACLE_HOME/bin/PARDeploy -action deploy -parFile <directory where MOPatch.par is downloaded>/ MOPatch.par –force

B. DP for applying patches to RAC Oracle database using MOPatch

Download the PAR file 'MOPatch_RAC.par' from the attachments list of My Oracle Support (Metalink) Note 814845.1.

Deploy PAR file directly from Enterprise Manager Grid Control:
- Navigate to 'Deployments' -> 'Deployment Procedures' under 'Deployment Procedure Manager'. Click on 'Upload' Button on this screen
- Provide the par file location on either local machine or one of agent machines wherever par file is located -> Click on 'Upload' Button

PAR file can also be deployed in command line mode, by running the following commands from OMS machine.
- setenv ORACLE_HOME <OMS_ORACLE_HOME>
- $ORACLE_HOME/bin/PARDeploy -action deploy -parFile <directory where MOPatch_RAC.par is downloaded>/ MOPatch_RAC.par –force

C. Customizing Deployment Procedures

The Out of Box DPs , 'Patch Oracle Database' and 'Patch Oracle RAC Database – All Nodes' are customized to incorporate the steps required for MOPatch based patching.

Customization 1: Staging MOPatch
 A new custom step "Stage MOPatch" is inserted into the procedure to stage the MOPatch component from the Software Library to the Oracle Home of the database target selected for patching.

Customization 2: Integrating with Apply Patch Step
The existing Apply Patch step of the procedure is edited to invoke MOPatch for interim patches (non-CPUs). The Perl script is customized to invoke MOPatch for interim patches.

The customized DP is saved with a new name (For example: Patch Oracle Database using MOPatch). For more details see, My Oracle Support (Metalink) Note 814845.1.

D. MOPatch utility in Software Library

MOPatch version 1.9 is uploaded automatically to the Software Library under Components > MOPatch > MOPatch, as the user deploys the PAR file for the deploying the DPs. Refer to the figure below

If you want to manually upload MOPatch, follow the instructions below:
- Download MOPatch from SAP Service Marketplace. For details refer to the note 1027012 - MOPatch - Install Multiple Oracle Patches in One Run.
- Navigate to Software Library (Deployment > Provisioning).
- Under Components > Create Folder and provide the folder name 'MOPatch'.
- Select the new folder created and Click 'Create Component'.
- Run through the wizard and upload the MOPatch.

If you need to update the MOPatch to latest available version, please follow the steps mentioned below
- Download the latest (or required) version of MOPatch utility from SAP Service Marketplace.
- From Enterprise Manager Grid Control, navigate to Deployments -> Provisioning -> Component

Figure 20 : MOPatch Component in Software Library Component's page

- Select the MOPatch component and click 'Edit'

Figure 21: Edit Component

- Select "Upload File" tab. Select the option "Upload From Local Machine". Browse
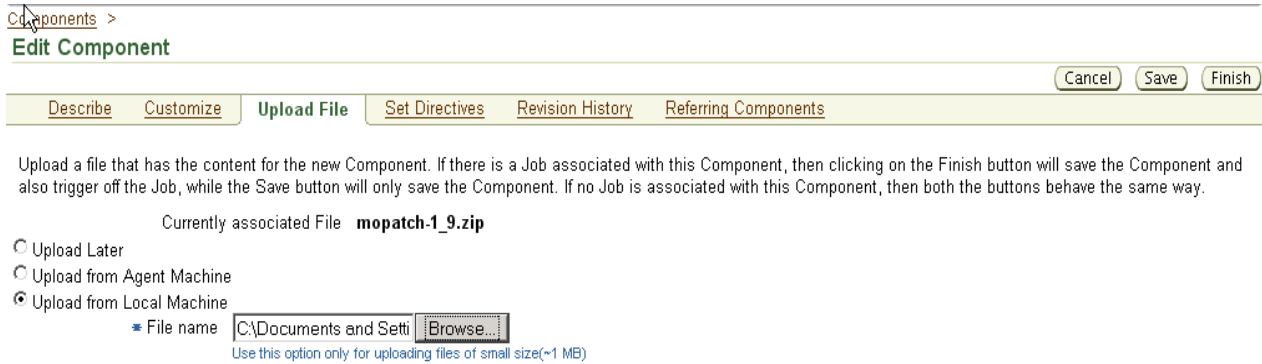Select the latest version of the MOPatch utility you downloaded.

Figure 22: Upload a new Version of the MOPatch component to Software Library

- Click 'Finish'. A job is triggered to upload the new file, upon update the version number of the component gets updated.

E. Uploading Patches to Software Library

1. Download the Patch from SAP Service Marketplace from any box that has online connection and upload it to the Software Library from local system.
2. Click 'View/Upload Patch' link from the 'Patching' section under the 'Deployments' Tab.
3. Select 'Upload Patch' option available in the 'Patch Cache'.
4. Upload the patch zip file available locally and provide all mandatory attributes regarding the patch. Refer to the patch README for the values of the parameters mentioned in the page.
5. Add a pre-fix to the Description and Comments as 'SAP specific' for ease of identification.
6. The patch is uploaded directly to the Software Library. Optionally in cases of Agent Patching or Oracle Home only cases choose 'Add Patch File to Patch Cache' option.
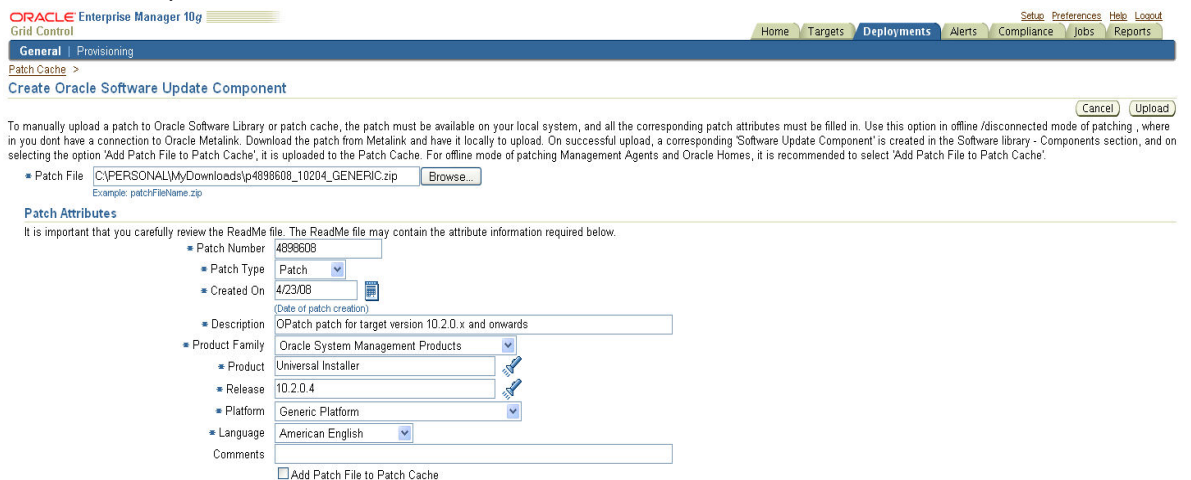

Figure 23: Uploading patch to Software Library with all mandatory attributes.

References

For Best practices around DP based Automation, refer to:
 Achieving Grid Automation with Deployment Procedures

For more information, see 10 Using Enterprise Manager For Grid Automation With Deployment Procedures of 'Oracle Enterprise Manager Advanced Configuration Guide'
in Oracle Technology Network

ORACLE®

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