Oracle® Fusion Middleware

Patching with OPatch

12*c* (12.2.1.2)

E76885-01

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Documentation for administrators that describes how to use OPatch in an Oracle Fusion Middleware environment.

ORACLE®

Oracle Fusion Middleware Patching with OPatch, 12*c* (12.2.1.2)

E76885-01

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Preface

This document describes how to use OPatch to patch an Oracle Fusion Middleware environment.

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Audience

This document is intended for administrators who are responsible for patching Oracle Fusion Middleware.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

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Patching Your Environment Using OPatch

The OPatch utility provides several commands that you can use to apply and roll back patches to Oracle software in your Oracle Fusion Middleware environment.

For more information about using OPatch commands in an Oracle Fusion Middleware environment, see the following topics:

About OPatch
> OPatch is a Java-based utility that runs on all supported operating systems and requires installation of the Oracle Universal Installer. It is used to apply patches to Oracle software.

Preparing to Use OPatch
> To ensure successful patching, there are several prerequisites you should complete to prepare your environment for running OPatch, such as obtaining the latest version of OPatch, obtaining required patches from My Oracle Support, and backing up the Oracle home.

Using OPatch to Patch Oracle Fusion Middleware
> Use OPatch to perform the necessary steps for applying a patch to an Oracle home.

1.1 About OPatch

OPatch is a Java-based utility that runs on all supported operating systems and requires installation of the Oracle Universal Installer. It is used to apply patches to Oracle software.

The following topics provide more information about OPatch for Oracle Fusion Middleware:

Type of Patches Used with OPatch
> Oracle provides several types of patches that you can use to patch your Oracle software with OPatch.

Information for Oracle WebLogic Server Smart Update Users
> Smart Update is a standalone Java application that you use to upgrade the software installations quickly and easily with maintenance patches and maintenance packs. For Oracle Fusion Middleware 12*c*, Smart Update is no longer supported.

1.1.1 Type of Patches Used with OPatch

Oracle provides several types of patches that you can use to patch your Oracle software with OPatch.

> **Note:**
>
> Oracle has recently implemented a new patch nomenclature for Oracle products. The new patch names, as well as the previous Oracle Fusion Middleware 11*g* names, are provided for reference.

Table 1-1   Patches that can be used with OPatch

New Name	Previously Used Name(s)	Description
Interim Patch	PSE MLR Exception release One-Off x-fix Hotfix Security One-Off	A patch containing one or more fixes made available to customers who cannot wait until the next patch set or new product release to get a fix.
Bundle Patch	Maintenance Pack Service Pack MLRs Cumulative Patch Update Release Bundle Patch	An iterative, cumulative patch that is issued between patch sets. Bundle patches usually include only fixes, but some products may include minor enhancements. Examples are the Database Windows Bundles and SOA Bundle Patches.
Security Patch Update (SPU)	Critical Patch Updates CPUs	An iterative, cumulative patch consisting of security fixes. Formerly known as Critical Patch Update. **Note**: The program name which delivers SPUs will still be called Critical Patch Update, as defined below: Critical Patch Update: Oracle's program for quarterly release of security fixes. Patches released as part of this program may be Patch Set Updates, Security Patch Updates, and Bundle Patches. Regardless of the patch type, the patches are cumulative.
Patch Set Updates (PSU)		Patch Set Updates are used to **patch Oracle WebLogic Server only.** Patch Set Updates are released on a quarterly basis, following the same schedule as the Critical Patch Updates (CPUs). These come out the closest Tuesday to the 15th of the months of January, April, July and October. Patch Set Update content is intended to address the top fifty critical bugs affecting the broad customer base.

1.1.2 Information for Oracle WebLogic Server Smart Update Users

Smart Update is a standalone Java application that you use to upgrade the software installations quickly and easily with maintenance patches and maintenance packs. For Oracle Fusion Middleware 12*c*, Smart Update is no longer supported.

In previous releases of Oracle WebLogic Server, you could patch your Oracle WebLogic Server software using a utility called Smart Update. In Oracle Fusion Middleware 12*c*, Oracle WebLogic Server users can use OPatch to apply patches for both Oracle WebLogic Server and for Oracle Fusion Middleware.

OPatch offers many of the same features as Smart Update, but it has a different set of commands and command options. Oracle WebLogic Server users who are familiar with Smart Update should use this guide to get familiar with OPatch.

1.2 Preparing to Use OPatch

To ensure successful patching, there are several prerequisites you should complete to prepare your environment for running OPatch, such as obtaining the latest version of OPatch, obtaining required patches from My Oracle Support, and backing up the Oracle home.

For more information on preparing your environment, see the following topics:

Locating and Obtaining the Latest Version of OPatch
> Before you run OPatch, find the OPatch utility in the Oracle home, and verify that you have the latest version.

Obtaining Patches Required for Your Installation
> You can search for and download the patches required for your installation from My Oracle Support.

OPatch Environment Variables for Fusion Middleware
> Before you run OPatch, ensure that you set the ORACLE_HOME environment variable.

Backup and Recovery Considerations for Patching
> It is highly recommended that you back up the Oracle home before any patch operation. You can back up the Oracle home using your preferred method.

1.2.1 Locating and Obtaining the Latest Version of OPatch

Before you run OPatch, find the OPatch utility in the Oracle home, and verify that you have the latest version.

For more information, see the following topics:

Locating and Running OPatch in the Oracle Fusion Middleware Oracle Home
> You can find and run the OPatch utility in the `ORACLE_HOME`/OPatch directory after you install any Oracle Fusion Middleware product.

Identifying the Version of OPatch Included with Oracle Fusion Middleware 12c
> Oracle Fusion Middleware 12*c* (12.2.1.2) includes OPatch version 13.9.1.0.0. This version includes new features and capabilities that are designed to improve the experience of patching an Oracle Fusion Middleware 12*c* Oracle home.

1.2.1.1 Locating and Running OPatch in the Oracle Fusion Middleware Oracle Home

You can find and run the OPatch utility in the *ORACLE_HOME*/OPatch directory after you install any Oracle Fusion Middleware product.

To run OPatch, simply run the opatch command in this directory.

For example, to view the list of commands available for OPatch on a Unix system, enter the following:

```
./opatch -help
```

On Windows systems, use the following command:

```
opatch.bat -help
```

1.2.1.2 Identifying the Version of OPatch Included with Oracle Fusion Middleware 12*c*

Oracle Fusion Middleware 12*c* (12.2.1.2) includes OPatch version 13.9.1.0.0. This version includes new features and capabilities that are designed to improve the experience of patching an Oracle Fusion Middleware 12*c* Oracle home.

In general, there is a version of OPatch available for each version of the Oracle Universal Installer software.

To identify the version of OPatch:

1. Change directory to the following directory:

   ```
   cd ORACLE_HOME/OPatch/
   ```

2. Run the following command:

   ```
   ./opatch version
   ```

   For example:

   ```
   ./opatch version
   OPatch Version: 13.9.1.0.0

   OPatch succeeded.
   ```

1.2.2 Obtaining Patches Required for Your Installation

You can search for and download the patches required for your installation from My Oracle Support.

You can check for the latest patches available for your Oracle Fusion Middleware product or component by registering and logging in to My Oracle Support at:

http://support.oracle.com

After you log in to My Oracle Support, click the **Patches & Updates** tab, which provides various tools that allow you to quickly locate the patches most important to your Oracle software installation.

> **Note:**
>
> It important that you review the README file that is included with each patch. The README file includes important information about the requirements and procedures for applying the patch.

1.2.3 OPatch Environment Variables for Fusion Middleware

Before you run OPatch, ensure that you set the ORACLE_HOME environment variable.

OPatch uses the ORACLE_HOME environment variable to identify the Oracle home you are planning to patch.

1.2.4 Backup and Recovery Considerations for Patching

It is highly recommended that you back up the Oracle home before any patch operation. You can back up the Oracle home using your preferred method.

You can use any method such as `zip`, `cp -r`, `tar`, and `cpio` to compress the Oracle home.

If the Oracle home does not appear when you execute the `opatch lsinventory -detail` command, the Oracle home might be missing from the Central Inventory, or the Central Inventory itself could be missing or corrupted.

If the Oracle home is listed when you execute the `opatch lsinventory -detail` command, but the products and components within the Oracle home are not listed, the inventory within the Oracle home (local inventory) might be missing or corrupted.

If the local inventory is corrupted or lost for some reason, you must restore the entire Oracle home if it was backed up. If a backup does not exist, you may have to reinstall the software.

1.3 Using OPatch to Patch Oracle Fusion Middleware

Use OPatch to perform the necessary steps for applying a patch to an Oracle home.

The following topics describe how to use OPatch to patch Oracle Fusion Middleware:

Summary of the Steps For Using OPatch in a Fusion Middleware Environment
Applying a patch with OPatch involves a series of steps that must be performed to ensure successful patching.

Common OPatch Commands When Patching an Oracle Fusion Middleware Oracle Home
OPatch provides several commands that you can use to apply, roll back, and verify a patch for an Oracle home. You can use OPatch to apply and roll back a single patch or apply and roll back multiple patches.

Examples of Applying and Rolling Back Patches Using OPatch
After you obtain the patches required for your installation, use the appropriate OPatch commands to verify any patch prerequisites, apply a patch to an Oracle home, and if necessary, roll back the application of a patch.

Troubleshooting a Patch by Viewing the OPatch Log File
To understand how a patch is applied and to troubleshoot any problems with the application of a patch, you should review the log file for the OPatch session.

Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home

To verify what patches have been applied to an Oracle home, or to find out additional information about the Oracle home, use the opatch lsinventory command.

Verifying Your Installation After Applying a Patch

After you apply one or more patches successfully, use the WebLogic Administration Console, Fusion Middleware Control, and your organization's application testing to verify that your system is currently running successfully.

1.3.1 Summary of the Steps For Using OPatch in a Fusion Middleware Environment

Applying a patch with OPatch involves a series of steps that must be performed to ensure successful patching.

The following table summarizes the typical steps required to patch your existing Fusion Middleware environment using OPatch.

Table 1-2   Using OPatch with Oracle Fusion Middleware

Task	Description	Documentation
Acquire patches required for your installation	Log in, search for, and download the patches required for your specific installation.	Obtaining Patches Required for Your Installation
Review the README.txt file for the patch.	Each patch archive includes a README file that contains important information and instructions that must be followed prior to applying your patch. It is important to review the README file because it provides any unique steps or other information specific to the patch.	The README.txt file that is packaged within the patch archive
Check for patch prerequisites.	The OPatch apply -report command will identify that the prerequisites for the patch have been met.	Verifying the Prerequisites for a Patch
Apply the patch.	After you determine the Oracle home to which you need to apply the patch, and you have read the README file, then you should apply the patch with the opatch apply command.	Examples of Applying and Rolling Back Patches Using OPatch
Verify the patch was applied to the Oracle home successfully.	The OPatch lsinventory command will show what patches have been applied to the Oracle home. Use this command to verify the application of the patch.	Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home
Verify that your software runs properly after you apply the patch.	After the patching is complete and your servers are restarted, you should check your product software to verify that the issue has been resolved.	Verifying Your Installation After Applying a Patch
Troubleshoot the application of a patch.	If there are problems applying a patch, your first troubleshooting task is to review the log file for the OPatch session.	Troubleshooting a Patch by Viewing the OPatch Log File

Table 1-2   (Cont.) Using OPatch with Oracle Fusion Middleware

Task	Description	Documentation
Roll back the application of a patch.	If for some reason the result is not satisfactory, you can use the opatch rollback command to remove the patch from the Oracle home. If additional assistance is required, go to My Oracle Support (formerly OracleMeta*Link*).	Rolling Back a Patch You Have Applied

1.3.2 Common OPatch Commands When Patching an Oracle Fusion Middleware Oracle Home

OPatch provides several commands that you can use to apply, roll back, and verify a patch for an Oracle home. You can use OPatch to apply and roll back a single patch or apply and roll back multiple patches.

Table 1-3   Common OPatch Commands Used When Patching an Oracle Fusion Middleware Environment

Command	Description	Example
opatch apply	This command applies an interim patch to an Oracle home from the current directory. The ORACLE_HOME environment variable must be set to the Oracle home to be patched.	Verifying the Prerequisites for a Patch Applying a Single Patch Using the Apply Command
opatch napply	This command applies multiple patches.	Applying Multiple Patches Using the OPatch napply Command
opatch lsinventory	This command lists the inventory for a particular Oracle home, or displays all installations that can be found. This command does not have any required options.	Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home
opatch rollback	This command removes an existing one-off patch from the appropriate Oracle home directory indicated by the reference ID.	Rolling Back a Patch You Have Applied
opatch nrollback	This command rolls back multiple interim patches at the same time.	Rolling Back Multiple Patches You Have Applied

1.3.3 Examples of Applying and Rolling Back Patches Using OPatch

After you obtain the patches required for your installation, use the appropriate OPatch commands to verify any patch prerequisites, apply a patch to an Oracle home, and if necessary, roll back the application of a patch.

The following topics provide some examples of using OPatch to patch an Oracle Fusion Middleware installation:

Verifying the Prerequisites for a Patch
To verify that a patch can be applied to a specific Oracle home, use the – report argument to the opatch apply command.

Applying a Single Patch Using the Apply Command
>   To apply a single patch to an Oracle Fusion Middleware Oracle home,
>   use the `opatch apply` command.

Applying Multiple Patches Using the OPatch napply Command
>   To apply multiple patches to an Oracle Fusion Middleware Oracle home,
>   use the `opatch napply` command.

Rolling Back a Patch You Have Applied
>   To roll back a patch that was applied to an Oracle Fusion Middleware
>   Oracle home, use the `opatch rollback` command.

Rolling Back Multiple Patches You Have Applied
>   To roll back multiple patches that were previously applied to an Oracle
>   Fusion Middleware Oracle home, use the `opatch nrollback`
>   command.

1.3.3.1 Verifying the Prerequisites for a Patch

To verify that a patch can be applied to a specific Oracle home, use the `-report` argument to the `opatch apply` command.

For example:

```
opatch apply path_to_patch_directory -report
```

This command displays the actions that will be taken by the patch, but does not actually apply the patch. As a result, it allows you to verify that the prerequisites for the patch have been met.

1.3.3.2 Applying a Single Patch Using the Apply Command

To apply a single patch to an Oracle Fusion Middleware Oracle home, use the `opatch apply` command.

Example 1-1 shows how to use the `opatch apply` command to apply a patch to an Oracle Fusion Middleware Oracle home.

This example assumes that:

- The patch you have downloaded has been saved to a directory that is named for the patch number in My Oracle Support. In this case, the patch number is 15941858.

- The user changes directory to the patch directory and then runs the OPatch apply command. Alternatively, you can run the OPatch command from the `ORACLE_HOME`/`OPatch` directory and include the location of the patch as an argument to the command. For example:

  ```
  opatch apply /opt/patches/15941858/
  ```

- The OPatch directory is already included in the PATH variable on the host computer.

Example 1-1   Using the OPatch apply Command to Apply a Patch to an Oracle Fusion Middleware Oracle Home

```
> cd /opt/patches/15941858
> opatch apply
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
```

```
Central Inventory : /opt/Oracle/oraInventory
   from           : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2016-09-19_08-09-15AM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Verifying environment and performing prerequisite checks...
OPatch continues with these patches:   15941858

Do you want to proceed? [y|n]
y
User Responded with: Y
All checks passed.

Please shutdown Oracle instances running out of this ORACLE_HOME on the local system.
(Oracle Home = '/opt/Oracle/products/fmw12c')

Is the local system ready for patching? [y|n] y
User Responded with: Y
Backing up files...
Applying interim patch '15941858' to OH '/opt/Oracle/products/fmw12c'

Patching component oracle.wls.core.app.server 12.2.1.2.0...

Patching component oracle.wls.core.app.server 12.2.1.2.0...
Patch 15941858 successfully applied
Log file location: /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2016-09-19_08-09-15AM_1.log

OPatch succeeded.
```

1.3.3.3 Applying Multiple Patches Using the OPatch napply Command

To apply multiple patches to an Oracle Fusion Middleware Oracle home, use the
opatch napply command.

Example 1-2 shows how to use the opatch napply command to apply multiple
patches to an Oracle Fusion Middleware Oracle home.

This example assumes that the patches you have downloaded have been saved to a
staging directory, such as:

```
/opt/patches
```

It also assumes you have changed directory to the staging directory and the staging
directory contains a directory for each patch. For example:

```
/opt/patches/15941858
/opt/patches/15955138
```

*Example 1-2   Using the OPatch napply Command to Apply Multiple Patches to an
Oracle Fusion Middleware Oracle Home*

```
> /opt/Oracle/products/fmw12c/OPatch/opatch napply -id 15941858,15955138
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
Central Inventory : /opt/Oracle/oraInventory
```

```
    from            : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-11_07-36-40AM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Verifying environment and performing prerequisite checks...
OPatch continues with these patches:   15941858  15955138

Do you want to proceed? [y|n]
y
User Responded with: Y
All checks passed.

Please shutdown Oracle instances running out of this ORACLE_HOME on the local system.
(Oracle Home = '/opt/Oracle/products/fmw12c')

Is the local system ready for patching? [y|n]
y
User Responded with: Y
Backing up files...
Applying interim patch '15941858' to OH '/opt/Oracle/products/fmw12c'

Patching component oracle.wls.core.app.server,12.2.1.2.0...

Patching component oracle.wls.core.app.server,12.2.1.2.0...
Applying interim patch '15955138' to OH '/opt/Oracle/products/fmw12c'

Patching component oracle.wls.core.app.server,12.2.1.2.0...

Patching component oracle.wls.core.app.server,12.2.1.2.0...
Patches 15941858,15955138 successfully applied.
Log file location: /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-11_07-36-40AM_1.log

OPatch succeeded.
```

1.3.3.4 Rolling Back a Patch You Have Applied

To roll back a patch that was applied to an Oracle Fusion Middleware Oracle home, use the opatch rollback command.

Example 1-3 shows how to use the opatch rollback command to roll back a patch that was applied to an Oracle Fusion Middleware Oracle home.

This example assumes that the OPatch directory is already included in the PATH variable on the host computer.

Example 1-3   Using the OPatch rollback Command to Roll Back a Patch

```
> opatch rollback -id 15941858
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
Central Inventory : /opt/Oracle/oraInventory
   from           : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
```

```
opatch2016-09-19_08-31-35AM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Patches will be rolled back in the following order:
   15941858
The following patch(es) will be rolled back: 15941858

Please shutdown Oracle instances running out of this ORACLE_HOME on the local system.
(Oracle Home = '/opt/Oracle/products/fmw12c')

Is the local system ready for patching? [y|n]
Y
User Responded with: Y

Rolling back patch 15941858...

RollbackSession rolling back interim patch '15941858' from OH '/opt/Oracle/products/
fmw12c'

Patching component oracle.wls.core.app.server, 12.2.1.2.0...

Patching component oracle.wls.core.app.server, 12.2.1.2.0...
RollbackSession removing interim patch '15941858' from inventory
Log file location: /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2016-09-19_08-31-35AM_1.log

OPatch succeeded.
```

1.3.3.5 Rolling Back Multiple Patches You Have Applied

To roll back multiple patches that were previously applied to an Oracle Fusion Middleware Oracle home, use the opatch nrollback command.

Example 1-4 shows how to use the opatch nrollback command to roll back multiple patches that were previously applied to an Oracle Fusion Middleware Oracle home.

This example assumes that the patches you applied were patch numbers 15941858 and 15955138.

Example 1-4   Using the OPatch nrollback Command to Roll Back Multiple Patches

```
> /opt/Oracle/products/fmw12c/OPatch/opatch nrollback -id 15941858,15955138
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
Central Inventory : /opt/Oracle/oraInventory
   from           : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-10_14-24-54PM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Patches will be rolled back in the following order:
   15941858   15955138
The following patch(es) will be rolled back: 15941858  15955138

Please shutdown Oracle instances running out of this ORACLE_HOME on the local system.
```

```
(Oracle Home = '/opt/Oracle/products/fmw12c')

Is the local system ready for patching? [y|n]
Y
User Responded with: Y

Rolling back patch 15941858...

RollbackSession rolling back interim patch '15941858' from OH '/opt/Oracle/products/
fmw12c'

Patching component oracle.wls.core.app.server, 12.2.1.2.0..

Patching component oracle.wls.core.app.server, 12.2.1.2.0..
RollbackSession removing interim patch '15941858' from inventory

Rolling back patch 15955138...

RollbackSession rolling back interim patch '15955138' from OH '/opt/Oracle/products/
fmw12c'

Patching component oracle.wls.core.app.server, 12.2.1.2.0...

Patching component oracle.wls.core.app.server, 12.2.1.2.0...
RollbackSession removing interim patch '15955138' from inventory
Log file location: /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-10_14-24-54PM_1.log

OPatch succeeded.
```

1.3.4 Troubleshooting a Patch by Viewing the OPatch Log File

To understand how a patch is applied and to troubleshoot any problems with the application of a patch, you should review the log file for the OPatch session.

The log file location is usually saved to the following directory or a subdirectory within this location:

```
ORACLE_HOME/cfgtoollogs/opatch/
```

Subdirectories within this location are identified by the patch number or by the command you ran (such as lsinv).

The file name for each log file identifies the date and time it was executed. For example:

```
opatch2013-06-10_14-24-54PM_1.log
```

You can also locate the log file by viewing the output of the opatch command. The log file name and location is included in the output of the command. For example:

```
Log file location: /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-10_14-24-54PM_1.log
```

1.3.5 Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home

To verify what patches have been applied to an Oracle home, or to find out additional information about the Oracle home, use the opatch lsinventory command.

The following example shows sample output of the `lsinventory` command, which indicates that a specific interim patch has been applied.

Example 1-5   Running the opatch lsinventory Command to Obtain the Oracle Home Information

```
> opatch lsinventory
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
Central Inventory : /opt/Oracle/oraInventory
   from           : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-10_12-32-37PM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Lsinventory Output file location :
/opt/Oracle/products/fmw12c/cfgtoollogs/opatch/lsinv/
lsinventory2013-06-10_12-32-37PM.txt


--------------------------------------------------------------------------------
Local Machine Information::
Hostname:
ARU platform id: 226
ARU platform description:: Linux x86-64

Interim patches (1) :

Patch  15941858     : applied on Mon Jun 10 12:39:07 PDT 2013
Unique Patch ID:  150220
Patch description:  "TEST PATCH FOR WLS 12.2.1.2.0 - JAVA CLASSES PATCH"
   Created on 17 May 2013, 11:54:20 hrs PST8PDT
   Bugs fixed:
     783169, 15941850


--------------------------------------------------------------------------------

OPatch succeeded.
```

1.3.6 Verifying Your Installation After Applying a Patch

After you apply one or more patches successfully, use the WebLogic Administration Console, Fusion Middleware Control, and your organization's application testing to verify that your system is currently running successfully.

To verify your installations in an Oracle Fusion Middleware 12*c* environment:

1. Start all the servers in all the domains associated with the Oracle home you just patched.

2. Open the WebLogic Server Administration Console for each domain to verify the Administration Server and to view the status of the components in the domain.

   • Also, in any Oracle Fusion Middleware domain (where the Oracle Fusion Middleware Infrastructure is installed), open the Oracle Enterprise Manager Fusion Middleware Control console to view the status of the components in the domain.

From either console, you can verify that the servers and applications are up and running correctly. For more information, see the following topics in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*:

- Starting and Stopping Oracle Fusion Middleware

- Overview of Oracle Fusion Middleware Administration Tools

If the software does not work as expected, follow the roll back instructions in Rolling Back a Patch You Have Applied.

2

Patching Your Environment Using OPatchAuto

OPatchAuto, which is automatically installed with the OPatch utility as a part of your installation, provides several commands that you can use to automate the application and roll back of a patch for a single host or multi-host environment.

For more information about patching with OPatchAuto, see the following topics:

About Zero Downtime Patching with OPatchAuto
> If you are patching a multi-host topology, one of the first steps after downloading a patch is to identify whether the patch is suitable for Zero Downtime (ZDT) patching. If it is, you can use one of two methods to apply the patch with OPatchAuto.

Preparing to Use OPatchAuto
> To ensure successful patching, there are several prerequisites you should complete to prepare your environment for running OPatchAuto, such as obtaining the latest version of OPatch, obtaining required patches from My Oracle Support, and backing up the environment.

Using OPatchAuto to Patch Oracle Fusion Middleware
> You can use OPatchAuto to automate the necessary steps for applying or rolling back a patch on a single host or multi-host environment.

An Example of Creating A Topology File Using FMW Composer
> For multi-host patching, a prerequisite is to define the elements of your topology in a topology file. You'll need to use FMW Composer to create this file and provide information about your environment to OPatchAuto. This allows OPatchAuto to automatically perform the patching steps without manual intervention.

2.1 About Zero Downtime Patching with OPatchAuto

If you are patching a multi-host topology, one of the first steps after downloading a patch is to identify whether the patch is suitable for Zero Downtime (ZDT) patching. If it is, you can use one of two methods to apply the patch with OPatchAuto.

What is a Zero Downtime Patch?
> Zero Downtime (ZDT) patching provides a process and mechanism for rolling out a patch across a domain while allowing applications to continue to service requests.

Identifying a Zero Downtime Patch
> You can identify a Zero Downtime (ZDT) patch by the value of the patch uptime option in the patch metadata.

About the Available Patch Plans

After you identify whether a patch is suitable for ZDT patching, you need to identify and select a patch plan. As a result, it is important you review and understand the characteristics and limitations of the patch plans available for applying a patch.

2.1.1 What is a Zero Downtime Patch?

Zero Downtime (ZDT) patching provides a process and mechanism for rolling out a patch across a domain while allowing applications to continue to service requests.

You can apply a ZDT patch using OPatchAuto, which rolls out the change to one node at a time and allows a load balancer (typically, Oracle Traffic Director (OTD)) to redirect incoming traffic to the remaining nodes until the change is complete.

The recommended way to identify whether a patch is suitable for ZDT patching is to determine the value of the patch uptime option in the metadata of the patch. To identify a ZDT patch, see Identifying a Zero Downtime Patch.

2.1.2 Identifying a Zero Downtime Patch

You can identify a Zero Downtime (ZDT) patch by the value of the patch uptime option in the patch metadata.

After you download a patch, open up `patchdeploy.xml` in the *PATCH_HOME*/etc/ `config` directory, where *PATCH_HOME* is the location of the patch directory that contains the patch.

If the value of `patch-uptime-option` is `FMW_ROLLING_ORACLE_HOME`, as shown in the following example:

```
<patch-uptime-option>FMW_ROLLING_ORACLE_HOME<patch-uptime-option>
```

OR the value is `FMW_ROLLING_SESSION`:

```
<patch-uptime-option>FMW_ROLLING_SESSION<patch-uptime-option>
```

Then, the patch is suitable for ZDT patching.

If `FMW_ROLLING_ORACLE_HOME` or `FMW_ROLLING_SESSION` does not appear in the patch metadata, then you know that the patch is *not* suitable for ZDT patching, and as a result, not compatible with a ZDT patch plan. The value of the patch uptime option will help you select the appropriate patch plan for applying the patch. For information on selecting a patch plan, see About the Available Patch Plans.

2.1.3 About the Available Patch Plans

After you identify whether a patch is suitable for ZDT patching, you need to identify and select a patch plan. As a result, it is important you review and understand the characteristics and limitations of the patch plans available for applying a patch.

A patch plan describes the sequence of steps to execute in order to deploy a patch. To execute a plan, you specify the plan name on the command line using the `-plan` option. For more information, see Patch Plans in *Oracle OPatch User's Guide for Windows and UNIX*.

To discover the plans available in an Oracle home, use the `opatchauto lsplans` command. The following example shows sample output of this command, which lists and describes the available plans:

```
cd ORACLE_HOME/OPatch
./opatchauto lsplans

Oracle OPatchAuto Version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

  OPatchAuto available patch plan information:

    Product Name: OPatchAuto Core
      Patch Plan Name: rolling (Default)
        Description: Process patch targets on a per-home basis and tries to minimize
downtime.
      Patch Plan Name: parallel
        Description: Process patch targets in parallel and does not attempt to
minimize downtime.

    Product Name: Oracle Fusion Middleware
      Patch Plan Name: wls-zdt-rollout
        Description: Performs full WLS ZDT rollout.
      Patch Plan Name: wls-push-image
        Description: Performs only image push portion of WLS ZDT rollout.
```

After identifying whether the patch is a ZDT patch (see Identifying a Zero Downtime Patch), consider the following information when choosing a plan:

- If a patch is not a ZDT patch, you should use the **parallel** patch plan to apply the patch, as shown in Applying a non-ZDT Patch on Multiple Hosts Using the Apply Command.

- If a patch is a ZDT patch, there are two available plans, `rolling` and `wls-zdt-rollout`.

  - Use the **rolling** option if the patch is a `FMW_ROLLING_ORACLE_HOME` patch. This option uses a pure OPatchAuto approach, where OPatchAuto is used to perform all patching operations. This is the recommended method for Fusion Middleware.

    With this approach, you can perform both image based and non-image based patching. You can also use this approach to perform what is known as configuration patching (or patching operations performed on a domain). However, this method has no session management features, such as migrating a session to another server when a server is shutdown.

    For information on how to apply a ZDT patch with the `rolling` plan, see Applying a ZDT Patch on Multiple Hosts Using the Apply Command.

  - Use the **wls-zdt-rollout** option if the patch is a `FMW_ROLLING_SESSION` patch. You also use OPatchAuto for this option, but certain lifecycle operations are delegated to WebLogic Server components, such as WLST or the WebLogic Server Administration Console. This is recommended for WebLogic Server only.

    This approach only supports image based patching and doesn't support configuration patching. But, it does provide support for migrating a session when an instance is shutdown.

    This document does not cover the steps to apply a ZDT patch using this option. See Introduction to Zero Downtime Patching in *Oracle Fusion Middleware Administering Zero Downtime Patching Workflows* to learn more about this option.

2.2 Preparing to Use OPatchAuto

To ensure successful patching, there are several prerequisites you should complete to prepare your environment for running OPatchAuto, such as obtaining the latest version of OPatch, obtaining required patches from My Oracle Support, and backing up the environment.

For more information on preparing your environment, see the following topics:

Locating and Obtaining the Latest Version of OPatch and OPatchAuto
> Before you run OPatchAuto, find the OPatchAuto utility in the Oracle home and verify that you have the latest version. If you have the latest version of OPatchAuto, you have the latest version of OPatch.

Obtaining Patches Required For Your Installation
> You can search for and download the latest patches for your installation from My Oracle Support.

Directory Variables Used in the Examples
> The examples in this guide show sample commands for running OPatchAuto. These example commands use variables to reference key directories.

Creating a Topology File for Patching Multiple Hosts
> To apply a patch on multiple hosts, you must create a topology file that defines the elements of your topology. To do this, you'll need to open FMW (Fusion Middleware) Composer, which is located in `ORACLE_HOME`/oracle_common/bin, and then add and define each element of the topology one-by-one.

Creating a Wallet
> To successfully run OPatchAuto, you must provide a wallet on the command line that contains the necessary password credentials, such as the SSH credentials for each host.

Configuring Node Manager to Support Start and Stop Operations
> To ensure that OPatchAuto can properly stop and start your system during patching, you must configure the Node Manager(s) to support the start and stop operations.

Remote Host Patching on Windows
> For patching on Windows machines, ensure that Cygwin SSH server is installed and set up. OPatchAuto doesn't support other SSH servers at this time.

Backup and Recovery Considerations for Patching
> It is highly recommended that you back up the Oracle home before any patch operation. You can back up the Oracle home using your preferred method.

2.2.1 Locating and Obtaining the Latest Version of OPatch and OPatchAuto

Before you run OPatchAuto, find the OPatchAuto utility in the Oracle home and verify that you have the latest version. If you have the latest version of OPatchAuto, you have the latest version of OPatch.

For more information, see the following topics:

Locating and Running OPatchAuto in the Oracle Fusion Middleware Oracle Home
    You can find and run the OPatchAuto utility in the *ORACLE_HOME*/`OPatch` directory after you install any Oracle Fusion Middleware product.

Identifying the Version of OPatchAuto Included with Oracle Fusion Middleware 12c
    Oracle Fusion Middleware 12*c* (12.2.1.2) includes OPatchAuto version 13.9.1.0.0. Use the `opatchauto version` command to verify that you have this version.

2.2.1.1 Locating and Running OPatchAuto in the Oracle Fusion Middleware Oracle Home

You can find and run the OPatchAuto utility in the *ORACLE_HOME*/`OPatch` directory after you install any Oracle Fusion Middleware product.

To run OPatchAuto, simply run the `opatchauto` command in this directory.

For example, to view the list of commands available for OPatchAuto on a Unix system, enter the following:

```
./opatchauto -help
```

2.2.1.2 Identifying the Version of OPatchAuto Included with Oracle Fusion Middleware 12c

Oracle Fusion Middleware 12*c* (12.2.1.2) includes OPatchAuto version 13.9.1.0.0. Use the `opatchauto version` command to verify that you have this version.

In general, there is a version of OPatch and OPatchAuto available for each version of the Oracle Universal Installer software.

To identify the version of OPatchAuto:

1. Change directory to the following directory:

   ```
   cd ORACLE_HOME/OPatch/
   ```

2. Run the following command:

   ```
   ./opatchauto version
   ```

   For example:

   ```
   ./opatchauto version
   Oracle OPatchAuto Version 13.9.1.0.0
   Copyright (c) 2016, Oracle Corporation.  All rights reserved.

   1. OPatchAuto version 13.9.1.0.0
   ```

If you have the latest version of OPatchAuto, you have the latest version of OPatch. If you don't have the latest version, OPatch can be downloaded using patch 6880880. You should always use the latest download designated for your installation. For Oracle Fusion Middleware 12*c* (12.2.1.2), select **OUI NextGen 13.9.1** for the version and platform, and then click **Download** to download OUI NextGen OPatch 13.9.1.

2.2.2 Obtaining Patches Required For Your Installation

You can search for and download the latest patches for your installation from My Oracle Support.

You can check for the latest patches available for your Oracle Fusion Middleware product or component by registering and logging in to My Oracle Support at:

http://support.oracle.com

After you log in to My Oracle Support, click the **Patches & Updates** tab, which provides various tools that allow you to quickly locate the patches most important to your Oracle software installation.

> **Note:**
>
> It is important that you review the README file that is included with each patch. The README file includes important information about the requirements and procedures for applying the patch.

2.2.3 Directory Variables Used in the Examples

The examples in this guide show sample commands for running OPatchAuto. These example commands use variables to reference key directories.

The following directory variables are used in this guide:

- *ORACLE_HOME*, which is used to reference the location of the Oracle home directory.

- *PATCH_HOME*, which is used to reference the location of the patch directory that contains the patches to be applied to the Oracle home.

- *DOMAIN_HOME*, which is used to reference the location of the domain home directory.

2.2.4 Creating a Topology File for Patching Multiple Hosts

To apply a patch on multiple hosts, you must create a topology file that defines the elements of your topology. To do this, you'll need to open FMW (Fusion Middleware) Composer, which is located in *ORACLE_HOME*/oracle_common/bin, and then add and define each element of the topology one-by-one.

After you create your topology in Composer, you can save it to a XML or JSON file, which you can then provide to OPatchAuto to apply the patch.

To familiarize yourself with the Composer user interface, see An Example of Creating A Topology File Using FMW Composer. You should review this example to understand the basic steps for creating a topology file.

2.2.5 Creating a Wallet

To successfully run OPatchAuto, you must provide a wallet on the command line that contains the necessary password credentials, such as the SSH credentials for each host.

To create a wallet, you can use one of the following tools:

Creating a Wallet Using the patchingWallet Tool

You can use the `patchingWallet.sh` tool in the *ORACLE_HOME*/ `OPatch/auto/core/bin` directory to create a wallet file.

Creating a Wallet Using FMW Composer

If you are patching a multi-host topology, you could also use FMW Composer in *ORACLE_HOME*/ `oracle_common/bin` to create a wallet when you create the topology file.

2.2.5.1 Creating a Wallet Using the patchingWallet Tool

You can use the `patchingWallet.sh` tool in the *ORACLE_HOME*/OPatch/auto/ `core/bin` directory to create a wallet file.

When you create a wallet:

- SSH credentials should be defined for each host using the format "*user*:*hostname*:ssh"

- WebLogic administrator credentials should be defined using the format "*adminuser*:*adminhost*:wls". The `wls` credential is required if you are using the `wls-zdt-rollout` option to apply a zero downtime (ZDT) patch.

For multi-host patching, you will need to create a topology file using FMW Composer. This requires the following additional credentials:

- Node Manager credentials should be defined using the format "*adminuser*:*domain_name*/NM"

- Domain administrator credentials should be defined using the format "*adminuser*:*domain_name*/ADMIN"

Note that *domain_name*/NM and *domain_name*/ADMIN are the default wallet aliases used by FMW Composer for the Node Manager and Administration Server, respectively. You can use different values. But, when you create a topology file using Composer, you need to make sure the credential values specified in the **Credential** fields in Composer match the aliases in the wallet.

The following shows an example of how to create a wallet and add the credentials to the wallet:

```
./patchingWallet.sh -walletDir wallet_location –create "user:adminhost:ssh"
"user:host1:ssh" "user:host2:ssh"
"adminuser:domain_name/ADMIN"  "adminuser:domain_name/NM"
```

For example:

```
./patchingWallet.sh -walletDir /tmp/samplewallet –create "oracle:adminhost:ssh"
"oracle:host1:ssh"
"oracle:host2:ssh" "weblogic:zdtDomain/ADMIN" "weblogic:zdtDomain/NM"
```

The tool will prompt you to enter and confirm the password for each credential:

```
Enter Password for oracle:adminhost:ssh:
Confirm Password for oracle:adminhost:ssh:
Enter Password for oracle:host1:ssh:
Confirm Password for oracle:host1:ssh:
Enter Password for oracle:host2:ssh:
Confirm Password for oracle:host2:ssh:
Enter Password for weblogic:zdtDomain/ADMIN:
Confirm Password for weblogic:zdtDomain/ADMIN:
```

```
Enter Password for weblogic:zdtDomain/NM:
Confirm Password for weblogic:zdtDomain/NM:
```

2.2.5.2 Creating a Wallet Using FMW Composer

If you are patching a multi-host topology, you could also use FMW Composer in *ORACLE_HOME*/oracle_common/bin to create a wallet when you create the topology file.

This tool provides a graphical user interface to assign or edit an existing wallet or create one from scratch. Assigning or Creating a Wallet File provides an example of how to assign or create a wallet for a topology.

2.2.6 Configuring Node Manager to Support Start and Stop Operations

To ensure that OPatchAuto can properly stop and start your system during patching, you must configure the Node Manager(s) to support the start and stop operations.

To do this, set the `QuitEnabled` and `CrashRecoveryEnabled` properties in the `nodemanager.properties` file as follows:

```
QuitEnabled=true
CrashRecoveryEnabled=false
```

Note that the default value for `CrashRecoveryEnabled` is `false`.

By default, this file is created in the Node Manager home directory, where the Node Manager home is typically *DOMAIN_HOME*/nodemanager.

Note:

For Zero Downtime (ZDT) patching:

- `QuitEnabled=true` is only required if you are using the `rolling` plan to apply a ZDT patch. This is not required if you are using the `wls-zdt-rollout` plan, which is described in Introduction to Zero Downtime Patching in *Oracle Fusion Middleware Administering Zero Downtime Patching Workflows*.

- If you are using the `wls-zdt-rollout` plan, then you should set `CrashRecoveryEnabled` to `true`.

After updating these properties, restart the Node Manager(s).

For more information about the `nodemanager.properties` file, see Reviewing nodemanager.properties in *Oracle Fusion Middleware Administering Node Manager for Oracle WebLogic Server*.

2.2.7 Remote Host Patching on Windows

For patching on Windows machines, ensure that Cygwin SSH server is installed and set up. OPatchAuto doesn't support other SSH servers at this time.

For more information, see Remote Host Execution Using SSH in the *Oracle OPatch User's Guide for Windows and UNIX*.

2.2.8 Backup and Recovery Considerations for Patching

It is highly recommended that you back up the Oracle home before any patch operation. You can back up the Oracle home using your preferred method.

You can use any method such as `zip`, `cp -r`, `tar`, and `cpio` to compress the Oracle home.

If the Oracle home doesn't appear when you execute the `opatch lsinventory -detail` command, the Oracle home might be missing from the Central Inventory, or the Central Inventory itself could be missing or corrupted.

If the Oracle home is listed when you execute the `opatch lsinventory -detail` command, but the products and components within the Oracle home are not listed, the inventory within the Oracle home (local inventory) might be missing or corrupted.

If the local inventory is corrupted or lost for some reason, you must restore the entire Oracle home if it was backed up. If a backup doesn't exist, you may have to reinstall the software.

2.3 Using OPatchAuto to Patch Oracle Fusion Middleware

You can use OPatchAuto to automate the necessary steps for applying or rolling back a patch on a single host or multi-host environment.

The following topics describe how to use OPatchAuto to patch Oracle Fusion Middleware.

Summary of the Steps For Using OPatchAuto in a Fusion Middleware Environment
> Applying a patch with OPatchAuto involves a series of steps that must be performed to ensure successful patching.

Applying a Patch on a Single Host Using OPatchAuto
> After you obtain the patches required for your installation, use the `opatchauto apply —analyze` command to verify prerequisites, and then use `opatchauto apply` to apply a patch on a single host. If needed, you can use `opatchauto rollback` to roll back a patch.

Applying a Patch on Multiple Hosts Using OPatchAuto
> After you obtain the necessary patches, use the `opatchauto apply —analyze` command to verify prerequisites, and then use `opatchauto apply` to apply a patch on multiple hosts. If needed, you can use `opatchauto rollback` to roll back a patch.

Troubleshooting a Patch by Viewing the OPatchAuto Log File
> To understand how a patch is applied and to troubleshoot any problems with the application of a patch, you should review the log file for the OPatchAuto session.

Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home
> To verify what patches have been applied to an Oracle home, or to find out additional information about the Oracle home, use the `opatch lsinventory` command.

Using the listDomainPatchInventory.sh Command to Verify the Patches Applied to a Domain

To verify what patches have been applied to a domain, use the `listDomainPatchInventory.sh` command. Use this command with the OPatch `lsinventory` command to verify that the patch has been applied successfully.

Verifying Your Installation After Applying a Patch

After you apply one or more patches successfully, use the WebLogic Administration Console, Fusion Middleware Control, and your organization's application testing to verify that your system is currently running successfully.

2.3.1 Summary of the Steps For Using OPatchAuto in a Fusion Middleware Environment

Applying a patch with OPatchAuto involves a series of steps that must be performed to ensure successful patching.

The following table summarizes the typical steps required to patch your existing Fusion Middleware environment using OPatchAuto.

Table 2-1   Using OPatchAuto with Oracle Fusion Middleware

Task	Description	Documentation
Acquire patches required for your installation	Log in, search for, and download the patches required for your specific installation. You don't need to worry about whether OPatchAuto supports a particular patch type. If OPatchAuto doesn't support a particular patch type, you will be notified when you run the tool.	Obtaining Patches Required For Your Installation
Review the README.txt file for the patch.	Each patch archive includes a README file that contains important information and instructions that must be followed prior to applying your patch. It is important to review the README file because it provides any unique steps or other information specific to the patch.	The README.txt file that is packaged within the patch archive
For a multi-host environment, identify whether the patch is a Zero Downtime (ZDT) patch.	Determine the patch uptime option in `patchdeploy.xml` to identify whether the patch is a ZDT patch, and as a result, identify the patch plan to use to apply the patch.	Identifying a Zero Downtime Patch About the Available Patch Plans
For a multi-host environment, define your topology (configuration) using FMW Composer.	To apply a patch on multiple hosts, you must create a topology file, which can be a XML or JSON file and should be created using FMW Composer. This file contains information about your configuration. The topology file provides a way for OPatchAuto to obtain information from your environment so it can automate the application of the patch.	An Example of Creating A Topology File Using FMW Composer

Table 2-1   (Cont.) Using OPatchAuto with Oracle Fusion Middleware

Task	Description	Documentation
Check for patch prerequisites.	The OPatchAuto `apply -analyze` command will identify that the prerequisites for the patch have been met.	If you are patching a single host environment, see Verifying the Prerequisites for Applying a Patch on a Single Host. If you are patching a multi-host environment, see Verifying the Prerequisites for Applying a Patch on Multiple Hosts.
Apply the patch.	After you determine the Oracle home to which you need to apply the patch, and you have read the README file, then you should apply the patch with the `opatchauto apply` command.	If you are patching a single-host environment, see Applying a Patch on a Single Host Using the Apply Command. If you are patching a multi-host environment, see one of the following, depending on whether the patch is suitable for ZDT patching: • Applying a non-ZDT Patch on Multiple Hosts Using the Apply Command • Applying a ZDT Patch on Multiple Hosts Using the Apply Command
Verify the patch was applied to the Oracle home successfully.	The OPatch `lsinventory` command will show what patches have been applied to the Oracle home. The `listDomainPatchInventory.sh` command will show the patches applied to the domain. Use these commands together to verify the application of the patch.	Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home Using the listDomainPatchInventory.sh Command to Verify the Patches Applied to a Domain
Verify that your software runs properly after you apply the patch.	After the patching is complete and your servers are restarted, you should check your product software to verify that the issue has been resolved.	Verifying Your Installation After Applying a Patch
Troubleshoot the application of a patch.	If there are problems applying a patch, your first troubleshooting task is to review the log file for the OPatchAuto session.	Troubleshooting a Patch by Viewing the OPatchAuto Log File
Roll back the application of a patch.	If for some reason the result is not satisfactory, you can use the `opatchauto rollback` command to remove the patch from the Oracle home. If additional assistance is required, go to My Oracle Support (formerly Oracle Meta*Link*).	For a single host environment, see Rolling Back a Patch You Have Applied on a Single Host. For a multi-host environment, see Rolling Back a Patch You Have Applied on Multiple Hosts.

2.3.2 Applying a Patch on a Single Host Using OPatchAuto

After you obtain the patches required for your installation, use the `opatchauto apply —analyze` command to verify prerequisites, and then use `opatchauto apply` to apply a patch on a single host. If needed, you can use `opatchauto rollback` to roll back a patch.

Patching a single host environment with OPatchAuto involves the following tasks:

Verifying the Prerequisites for Applying a Patch on a Single Host

> To verify that a patch can be applied on a single host, use the `–analyze` argument to the OPatchAuto `apply` command. For single host patching, you must also provide the domain location using the `–instance` argument.

Applying a Patch on a Single Host Using the Apply Command

> To apply a patch on a single host, use the `opatchauto apply` command. This is the same command as `opatchauto apply –analyze`, except you remove the `–analyze` argument when you are ready to apply the patch.

Rolling Back a Patch You Have Applied on a Single Host

> If you apply a patch and the results are not satisfactory, use the `opatchauto rollback` command to roll back the application of the patch. This is the same command as `opatchauto rollback –analyze`, except you remove the `-analyze` argument when you are ready to roll back the patch.

2.3.2.1 Verifying the Prerequisites for Applying a Patch on a Single Host

To verify that a patch can be applied on a single host, use the `–analyze` argument to the OPatchAuto `apply` command. For single host patching, you must also provide the domain location using the `–instance` argument.

The following command shows how to verify the prerequisites for applying a patch on a single host:

```
opatchauto apply PATCH_HOME -analyze -instance DOMAIN_HOME -wallet wallet_location -
walletPassword password_ifneeded
-wls-admin-host weblogic_adminserver_host:port
```

For example:

```
opatchauto apply /home/oracle/patches/15941858 –analyze -instance /home/oracle/
config/domains/exampledomain -wallet /tmp/samplewallet
-wls-admin-host examplehost.exampledomain.com:7001
```

If you want to apply multiple patches in one session, use the `–phBaseDir` option.

This command analyzes and displays the actions that will be taken by the patch, but does not actually apply the patch. As a result, it allows you to verify that the prerequisites for the patch have been met.

If any prerequisite checks fail, refer to the output and log file to fix the issues before continuing. For example, a common failure is the detection of patch conflicts. If any patch conflicts occur, follow the instructions in the log file for how to obtain a merge patch from Oracle Support.

2.3.2.2 Applying a Patch on a Single Host Using the Apply Command

To apply a patch on a single host, use the `opatchauto apply` command. This is the same command as `opatchauto apply –analyze`, except you remove the `–analyze` argument when you are ready to apply the patch.

The following example shows how to use the `opatchauto apply` command to apply a patch to an Oracle Fusion Middleware environment on a single host.

This example assumes that:

- The patch you have downloaded has been saved to a directory that is named for the patch number in My Oracle Support. In this case, the patch number is 15941858.

- The user runs the OPatchAuto command from the *ORACLE_HOME*/OPatch directory and includes the location of the patch (PATCH_HOME) as an argument to the command.

Note:

When you run the opatchauto apply command, make a note of the session id (for example, EKZR) in the command output. This will simplify the rollback process if you decide to roll back the patch later.

```
opatchauto apply PATCH_HOME -instance DOMAIN_HOME -wallet wallet_location -
walletPassword password_ifneeded -wls-admin-host weblogic_adminserver_host:port
```

For example:

```
opatchauto apply /home/oracle/patches/15941858 -instance /home/oracle/config/domains/
exampledomain -wallet /tmp/samplewallet
-walletPassword password -wls-admin-host examplehost.exampledomain.com:7001
```

2.3.2.3 Rolling Back a Patch You Have Applied on a Single Host

If you apply a patch and the results are not satisfactory, use the opatchauto rollback command to roll back the application of the patch. This is the same command as opatchauto rollback –analyze, except you remove the -analyze argument when you are ready to roll back the patch.

The following example shows how to use the opatchauto rollback command to roll back a patch that was applied to an Oracle Fusion Middleware environment on a single host.

To do a roll back, you follow the same process for when you applied the patch. That is, you first do a test run of the opatchauto rollback command:

Note:

You can simplify the command if you provide the session id (for example, EKZR) that was used to apply the patch. Then, OPatchAuto can derive all the necessary command line parameters.

```
opatchauto rollback –session session_id -analyze –wallet wallet_location -
walletPassword password_ifneeded -wls-admin-host weblogic_adminserver_host:port
```

For example:

```
opatchauto rollback –session EKZR -analyze –wallet /tmp/samplewallet -walletPassword
password -wls-admin-host examplehost.exampledomain.com:7001
```

When the test run successfully passes, perform the actual roll back of the patch:

```
opatchauto rollback –session session_id –wallet wallet_location -walletPassword
password_ifneeded -wls-admin-host weblogic_adminserver_host:port
```

For example:

```
opatchauto rollback –session EKZR –wallet /tmp/samplewallet -walletPassword password
-wls-admin-host examplehost.exampledomain.com:7001
```

Alternatively, you can roll back the patch by pointing OPatchAuto to a copy of the unzipped patch as follows:

```
opatchauto rollback unzipped_patch_location -instance DOMAIN_HOME –wallet
wallet_location -walletPassword password_ifneeded
-wls-admin-host weblogic_adminserver_host:port
```

2.3.3 Applying a Patch on Multiple Hosts Using OPatchAuto

After you obtain the necessary patches, use the `opatchauto apply —analyze` command to verify prerequisites, and then use `opatchauto apply` to apply a patch on multiple hosts. If needed, you can use `opatchauto rollback` to roll back a patch.

> **Note:**
>
> Before applying a patch on multiple hosts, ensure that you have created a topology file using FMW Composer. You must supply this file, which can be either a XML or JSON file, on the command line using the `-topology` option when you run OPatchAuto. OPatchAuto uses this file to obtain information about the environment that you want to patch. For an example on how to create a topology file, see An Example of Creating A Topology File Using FMW Composer.

Patching a multi-host environment with OPatchAuto involves the following tasks:

Verifying the Prerequisites for Applying a Patch on Multiple Hosts
> To ensure successful patching, use the `opatchauto apply —analyze` command to check for any prerequisites before applying a patch.

Applying a non-ZDT Patch on Multiple Hosts Using the Apply Command
> To apply a non-ZDT patch, use the `opatchauto apply` command with the `parallel` patch plan. This is the same command as `opatchauto apply -analyze`, except you remove the `-analyze` argument when you are ready to apply the patch.

Applying a ZDT Patch on Multiple Hosts Using the Apply Command
> To apply a Zero Downtime (ZDT) patch, use the `opatchauto apply` command with the `rolling` patch plan. This is the same command as `opatchauto apply -analyze`, except you remove the `-analyze` argument when you are ready to apply the patch.

Rolling Back a Patch You Have Applied on Multiple Hosts
> If you apply a patch and the results are not satisfactory, use the `opatchauto rollback` command to roll back the application of a patch. This is the same command as `opatchauto rollback –analyze`, except you remove the `-analyze` argument when you are ready to roll back the patch.

2.3.3.1 Verifying the Prerequisites for Applying a Patch on Multiple Hosts

To ensure successful patching, use the `opatchauto apply —analyze` command to check for any prerequisites before applying a patch.

To verify that a patch can be applied to a specific Oracle home (ORACLE_HOME) and domain location (DOMAIN_HOME) on multiple hosts, use the —analyze argument to the OPatchAuto apply command.

```
opatchauto apply PATCH_HOME -analyze -plan patch_plan -topology
path_to_topology_file -wallet wallet_location -walletPassword password_ifneeded
```

For example:

```
opatchauto apply /home/oracle/patches/15941858 -analyze -plan rolling -topology /
home/oracle/topologies/topology-1.0.xml -wallet /tmp/samplewallet -walletPassword
password
```

If you want to apply multiple patches in one session, use the —phBaseDir option.

Note that rolling is the default patch plan if no plan is specified on the command line. For information on identifying the available plans, see About the Available Patch Plans.

This command displays the actions that will be taken by the patch, but does not actually apply the patch. As a result, it allows you to verify that the prerequisites for the patch have been met.

If any prerequisite checks fail, refer to the command output and log file to fix any issues before continuing. For example, a common failure is the detection of patch conflicts. If any patch conflicts occur, follow the instructions in the log file for how to obtain a merge patch from Oracle Support.

2.3.3.2 Applying a non-ZDT Patch on Multiple Hosts Using the Apply Command

To apply a non-ZDT patch, use the opatchauto apply command with the parallel patch plan. This is the same command as opatchauto apply -analyze, except you remove the -analyze argument when you are ready to apply the patch.

The following example shows how to use the opatchauto apply command to apply a non-ZDT patch to an Oracle Fusion Middleware environment on multiple hosts.

This example assumes that:

- The patch you have downloaded has been saved to a directory that is named for the patch number in My Oracle Support. In this case, the patch number is 15941858.

- The user runs the OPatchAuto command from the ORACLE_HOME/OPatch directory and includes the location of the patch (PATCH_HOME) as an argument to the command.

> **Note:**
>
> When you run the opatchauto apply command, make a note of the session id (for example, EKZR) in the command output. This will simplify the rollback process if you decide to roll back the patch later.

```
opatchauto apply PATCH_HOME -plan parallel -topology path_to_topology_file -wallet
wallet_location -walletPassword password_ifneeded
```

For example:

```
opatchauto apply /home/oracle/patches/15941858 -plan parallel -topology /home/oracle/
topologies/topology-1.0.xml -wallet /tmp/samplewallet -walletPassword password
```

2.3.3.3 Applying a ZDT Patch on Multiple Hosts Using the Apply Command

To apply a Zero Downtime (ZDT) patch, use the `opatchauto apply` command with the `rolling` patch plan. This is the same command as `opatchauto apply -analyze`, except you remove the `-analyze` argument when you are ready to apply the patch.

The following example shows how to use the `opatchauto apply` command to apply a ZDT patch to an Oracle Fusion Middleware environment on multiple hosts.

This example assumes that:

- The patch you have downloaded has been saved to a directory that is named for the patch number in My Oracle Support. In this case, the patch number is 15941858.

- The user runs the OPatchAuto command from the *ORACLE_HOME*/OPatch directory and includes the location of the patch (PATCH_HOME) as an argument to the command.

Note:

- When you run the `opatchauto apply` command, make a note of the session id (for example, EKZR) in the command output. This will simplify the rollback process if you decide to roll back the patch later.

- `rolling` is the default patch plan if no plan is specified on the command line.

```
opatchauto apply PATCH_HOME -plan rolling -topology path_to_topology_file -wallet
wallet_location -walletPassword password_ifneeded
```

For example:

```
opatchauto apply /home/oracle/patches/15941858 -plan rolling -topology /home/oracle/
topologies/topology-1.0.xml -wallet /tmp/samplewallet -walletPassword password
```

2.3.3.4 Rolling Back a Patch You Have Applied on Multiple Hosts

If you apply a patch and the results are not satisfactory, use the `opatchauto rollback` command to roll back the application of a patch. This is the same command as `opatchauto rollback -analyze`, except you remove the `-analyze` argument when you are ready to roll back the patch.

The following example shows how to use the `opatchauto rollback` command to roll back a patch that was applied to an Oracle Fusion Middleware environment on multiple hosts.

To do a roll back, you follow the same process for when you applied the patch. That is, you first do a test run of the `opatchauto rollback` command:

> **Note:**
>
> You can simplify the command if you provide the session id (for example, EKZR) that was used to apply the patch. Then, OPatchAuto can derive all the necessary command line parameters.

```
opatchauto rollback -session session_id -analyze -walletPassword password_ifneeded
```

For example:

```
opatchauto rollback -session EKZR -analyze -walletPassword password
```

When the test run successfully passes, perform the actual roll back of the patch:

```
opatchauto rollback -session session_id -walletPassword password_ifneeded
```

For example:

```
opatchauto rollback -session EKZR -walletPassword password
```

Alternatively, you can roll back the patch by pointing OPatchAuto to a copy of the unzipped patch as follows:

```
opatchauto rollback unzipped_patch_location -topology path_to_topology_file -wallet
wallet_location -walletPassword password_ifneeded
```

Or, you can specify the patch id using the -id option without specifying the location of the patch directory, as shown in the following example:

```
opatchauto rollback -id 12345 -wallet /tmp/samplewallet -topology /home/oracle/
topologies/topology-1.0.json
```

2.3.4 Troubleshooting a Patch by Viewing the OPatchAuto Log File

To understand how a patch is applied and to troubleshoot any problems with the application of a patch, you should review the log file for the OPatchAuto session.

The log file location is usually saved to the following directory or a subdirectory within this location:

```
ORACLE_HOME/cfgtoollogs/opatchauto/
```

The file name for each log file identifies the date and time it was executed. For example:

```
opatchauto2015-09-28_11-47-13AM.log
```

You can also locate the log file by viewing the output of the opatchauto command. The log file name and location is included in the output of the command. For example:

```
Session log file is /home/Oracle/products/fmw12c/cfgtoollogs/opatchauto/
opatchauto2015-09-28_11-47-13AM.log
```

2.3.5 Using the OPatch lsinventory Command to Verify the Patches Applied to an Oracle Home

To verify what patches have been applied to an Oracle home, or to find out additional information about the Oracle home, use the opatch lsinventory command.

The following example shows sample output of the `lsinventory` command, which indicates that a specific interim patch has been applied.

Example 2-1   Running the opatch lsinventory Command to Obtain the Oracle Home Information

```
> opatch lsinventory
Oracle Interim Patch Installer version 13.9.1.0.0
Copyright (c) 2016, Oracle Corporation.  All rights reserved.

Oracle Home       : /opt/Oracle/products/fmw12c
Central Inventory : /opt/Oracle/oraInventory
   from           : /var/opt/Oracle/oraInst.loc
OPatch version    : 13.9.1.0.0
OUI version       : 13.9.1.0.0
Log file location : /opt/Oracle/products/fmw12c/cfgtoollogs/opatch/
opatch2013-06-10_12-32-37PM_1.log

OPatch detects the Middleware Home as "/opt/Oracle/products/fmw12c"

Lsinventory Output file location :
/opt/Oracle/products/fmw12c/cfgtoollogs/opatch/lsinv/
lsinventory2013-06-10_12-32-37PM.txt


--------------------------------------------------------------------------------
Local Machine Information::
Hostname:
ARU platform id: 226
ARU platform description:: Linux x86-64

Interim patches (1) :

Patch  15941858     : applied on Mon Jun 10 12:39:07 PDT 2013
Unique Patch ID:  150220
Patch description:  "TEST PATCH FOR WLS 12.2.1.2.0 - JAVA CLASSES PATCH"
   Created on 17 May 2013, 11:54:20 hrs PST8PDT
   Bugs fixed:
     783169, 15941850


--------------------------------------------------------------------------------

OPatch succeeded.
```

2.3.6 Using the listDomainPatchInventory.sh Command to Verify the Patches Applied to a Domain

To verify what patches have been applied to a domain, use the `listDomainPatchInventory.sh` command. Use this command with the OPatch `lsinventory` command to verify that the patch has been applied successfully.

For example:

```
cd ORACLE_HOME/OPatch/bin
./listDomainPatchInventory.sh DOMAIN_HOME
```

This command indicates that a specific interim patch has been applied.

You should see the same list of patches in both the domain inventory and in the inventory for each Oracle home. If not, re-apply the patch. When you re-apply the

patch, only the missing steps will be executed. The tasks that have already been performed will be skipped.

2.3.7 Verifying Your Installation After Applying a Patch

After you apply one or more patches successfully, use the WebLogic Administration Console, Fusion Middleware Control, and your organization's application testing to verify that your system is currently running successfully.

To verify your installations in an Oracle Fusion Middleware 12*c* environment:

1. Ensure that all the servers in all the domains associated with the Oracle home you just patched are up and running.

   > **Note:**
   >
   > If the servers were up and running before patching, it is not necessary to manually restart the servers. OPatchAuto restarts the servers for you once patching is complete.

2. Open the WebLogic Server Administration Console for each domain to verify the Administration Server and to view the status of the components in the domain.

   - Also, in any Oracle Fusion Middleware domain (where the Oracle Fusion Middleware Infrastructure is installed), open the Oracle Enterprise Manager Fusion Middleware Control console to view the status of the components in the domain.

   From either console, you can verify that the servers and applications are up and running correctly. For more information, see the following topics in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*:

   - Starting and Stopping Oracle Fusion Middleware

   - Overview of Oracle Fusion Middleware Administration Tools

   If the software does not work as expected, follow the rollback instructions to roll back the application of the patch.

2.4 An Example of Creating A Topology File Using FMW Composer

For multi-host patching, a prerequisite is to define the elements of your topology in a topology file. You'll need to use FMW Composer to create this file and provide information about your environment to OPatchAuto. This allows OPatchAuto to automatically perform the patching steps without manual intervention.

This guide uses an example to show you the typical steps to create a topology file for a multi-host topology. Specifically, this example provides step-by-step instructions to create a topology file for the sample topology shown in the following diagram. This topology represents a standard WebLogic Server domain that contains an Administration Server and a cluster containing two Managed Servers.

WebLogic Domain
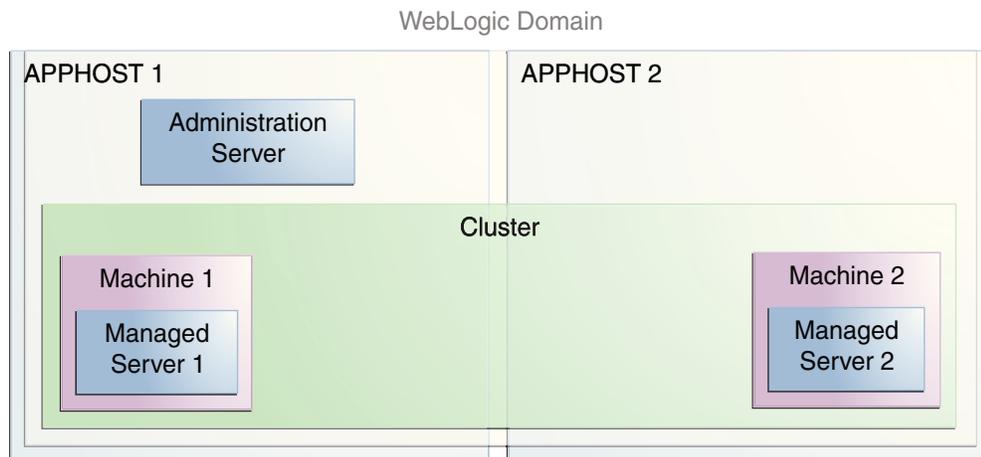
The following steps show how to create a topology file for this example topology:

Starting FMW Composer

Start FMW Composer from the *ORACLE_HOME*/`oracle_common/bin` directory.

Creating a New Topology File

After you start FMW Composer, open a new topology file. This is where you will add and define each element of your topology one-by-one.

Assigning or Creating a Wallet File

Use the FMW Composer Settings page to assign and edit an existing wallet file or create a new one for your topology.

Adding the Hosts

Next, add the hosts to the topology and then define the host information in the host panel on the right side of the screen.

Adding the Oracle Home

After you add the hosts, add the Oracle home to the hosts and provide information about the Oracle home on the right side of the screen.

Adding the Domain

> Add the domain to the topology and provide information about the domain, such as the directory path of the domain home, the Administration Server credentials, and the Administration Server URL.

Adding the Administration Server

> After adding the domain element to the topology, specify information about the domain's Administration Server.

Adding the Cluster

> Add the cluster to the domain and specify information about the cluster where the Managed Servers are running.

Adding the Managed Servers

> Next, add the Managed Servers to the cluster in the domain.

Adding the Node Managers

> Finally, if you have Node Managers being used in the environment, each Node Manager has to be defined in the topology file.

Saving the Topology File

> After defining the elements of your topology, select **File** and then **Save** to save the topology to a topology file, which can be a XML or JSON file.

2.4.1 Starting FMW Composer

Start FMW Composer from the *ORACLE_HOME*/`oracle_common/bin` directory.

1. Set the JAVA_HOME environment variable to the path of a certified JDK.

   For example:

   ```
   export JAVA_HOME=/home/Oracle/products/jdk1.8.0_101
   ```

2. Change directory to the *ORACLE_HOME*/`oracle_common/bin` directory and start FMW Composer (`fmw-composer.sh`).

   ```
   cd ORACLE_HOME/oracle_common/bin
   ./fmw-composer.sh
   ```

2.4.2 Creating a New Topology File

After you start FMW Composer, open a new topology file. This is where you will add and define each element of your topology one-by-one.

1. Select **File**, **New**, and then **Topology** to open a new, blank topology file.

2. Click anywhere inside the Model tab to display the **Topology Properties** panel on the right side of the screen.

3. In the **ID** field, enter a name for the topology file. For example, `sample-topology`.

4. In the **Version** field, enter `1.0` (default value).

   This property allows you to create different versions of a topology and distinguish them from one another.

5. Select **File** and then **Save As...** to save the file as either a XML or JSON file.

   The file should be saved to a directory named `topologies`.

The file name is automatically generated using the *id-version*.xml or *id-version*.json format. For example, sample-topology-1.0.xml.

2.4.3 Assigning or Creating a Wallet File

Use the FMW Composer Settings page to assign and edit an existing wallet file or create a new one for your topology.

1. From the **File** menu, select **Settings...** to open the Composer Settings page.

2. On the Settings page, click **change** next to **Wallet**.

3. In the **Change wallet** dialog box, select one of the following options:

   • Select **Select an existing wallet** to assign an existing wallet to the topology.

   • Select **Create a new wallet** to create a wallet that does not require a password.

   • Select **Create a new encrypted wallet** to create a password-protected wallet.

   An additional dialog box appears that prompts you to identify the wallet location.

4. Provide the wallet location and click **Open**.

5. If the wallet requires a password, you will be prompted to enter a password for the wallet.

6. After you create or identify a wallet, click **edit** to add the required credentials to the wallet.

   The wallet must contain the following credentials:

   • SSH credentials should be defined for each host using the alias format *hostname*:ssh

   • Administration Server credentials should be defined using the alias format *domain_name*/ADMIN

   • Node Manager credentials should be defined using the alias format *domain_name*/NM

7. After the wallet is created and contains the required credentials, click **OK** to dismiss the Settings page.

2.4.4 Adding the Hosts

Next, add the hosts to the topology and then define the host information in the host panel on the right side of the screen.

1. Inside the left pane of the Model tab, right-click and select **Add New Host**.

   A new host element (**host1**) appears on the left side of the screen.

2. Select the host element, and then specify the following information in the fields on the right side of the screen.

Field	Description
ID	A unique name for the host. Keep the default value, host1.
Address	Enter the primary IP address for the host.
Credential	The credentials (username and password) from the wallet file that will be used to connect to the host.
	Click **select** to select the credential for the host from the wallet file. When you click **select**, a dialog box will appear with a list of credentials to choose from only if you have provided the path to a wallet on the Composer Settings page (located in the File menu).
	• If the credential already exists in the wallet, select the appropriate credential from the list and click **OK**
	• If the credential does not exist in the wallet, click **New** to add the host credential to the wallet.

3. Repeat this process to add and define a second host (**host2**).

2.4.5 Adding the Oracle Home

After you add the hosts, add the Oracle home to the hosts and provide information about the Oracle home on the right side of the screen.

1. Right-click the **Host: host1** element and select **Assign New Oracle Home to Host 'host1'**.

An Oracle home element (**home1**) appears inside **host1**.

2. Select the **Oracle home: home1** element, and then specify the following information about the Oracle home in the fields on the right side of the screen.

Field	Description
ID	A unique name for the Oracle home. Keep the default value, home1.
Type	Select **shared** to indicate that the Oracle home is on shared storage. If your Oracle home is on local storage, select **local**.
	If there are copies of the Oracle home on multiple hosts, each Oracle home should be defined individually, and the **Type** attribute should be **local** for each one. Use **shared** if the Oracle home is on shared disk that is mounted on more than one host.
Path	Enter the full path to the Oracle home that is being patched.

3. Right-click the **Host: host2** element and select **Assign Existing Oracle Homes to Host 'host2'** to add **home1** to **Host: host2**.

2.4.6 Adding the Domain

Add the domain to the topology and provide information about the domain, such as the directory path of the domain home, the Administration Server credentials, and the Administration Server URL.

1. Inside **Host: host1**, right-click the **Oracle home: home1** element and select **Add New Domain To Host 'host1' (home1)**.

A domain element (**domain1**) appears inside the **Host: host1** element.

2. Select the **Domain: domain1** element, and then specify the following information about the domain in the fields on the right side of the screen.

Field	Description
ID	A unique name for the domain. Keep the default value, domain1.
Name	Enter the name of the domain. This should match the name provided during domain configuration.
Type	Select **shared** to indicate that the domain is on shared storage. If your domain is on local storage, select **local**.
Path	Enter the full path to the Domain home.
Admin Credential	The administrative credentials from the wallet file that will be used to connect to the domain's Administration Server. Click **select** to select the credential for the Administration Server from the wallet file. When you click **select**, a dialog box will appear with a list of credentials to choose from only if you have provided the path to a wallet on the Composer Settings page (located in the File menu). • If the credential already exists in the wallet, select the appropriate credential from the list and click **OK**. • If the credential does not exist in the wallet, click **New** to add the Administration Server credential to the wallet.
Admin Server Url	Enter the URL that is used to connect to the WebLogic Administration Server. For example, `http://adminserver_host:adminserver_port`.

3. Inside **Host: host2**, right-click the **Oracle home: home1** element and select **Assign Existing Domains to Host 'host2' (home1)** to add the domain (**domain1**) to **host2**.

2.4.7 Adding the Administration Server

After adding the domain element to the topology, specify information about the domain's Administration Server.

1. Inside **Host: host1**, right-click the **Domain: domain1** element and select **Add New Server for Domain 'domain1' to Host 'host1' (home1)** to add a server (**server1**) to **host1**.

   A new server (**server1**) appears inside the domain on **host1**.

2. Select the **Server: server1** element, and then specify the following information about the Administration Server in the fields on the right side of the screen.

Field	Description
ID	A unique name for the server in the domain. Keep the default value, server1.
Is Admin Server	Select the **Is Admin Server** check box to identify this server as the Administration Server.

Field	Description
Name	Enter a name for the Administration Server. For example, `AdminServer`.
Listen Address	Enter the listen address of the Administration Server.
Listen Port	Enter the listen port of the Administration Server. For example, 7001.

2.4.8 Adding the Cluster

Add the cluster to the domain and specify information about the cluster where the Managed Servers are running.

1. Inside **Host: host1**, right-click the **Domain: domain1** element and select **Add New Cluster to Domain 'domain1'** to add a cluster to the domain.

   A new cluster (**cluster1**) appears in the domain.

2. Select the **Cluster: cluster1** element, and then specify the following information about the cluster in the fields on the right side of the screen.

Field	Description
ID	A unique name for the cluster in the domain. Keep the default value, cluster1.
Name	Enter the name of the cluster.

2.4.9 Adding the Managed Servers

Next, add the Managed Servers to the cluster in the domain.

1. Inside **Host: host1**, right-click the **Cluster: cluster1** element and select **Add New Server to Cluster 'cluster1'** to add a new server (**server2**) to the cluster on **host1**.

   A new server (**server2**) appears in the cluster on **host1**.

2. Select the **Server: server2** element, and then specify the following information about the Managed Server in the fields on the right side of the screen.

Field	Description
ID	A unique name for the server in this domain. Keep the default value, server2.
Name	Enter a name for the Managed Server. For example, `managed_server_1`.
Listen Address	Enter the listen address of the Managed Server.
Listen Port	Enter the listen port of the Managed Server.

3. Repeat this process to add a second Managed Server, **server3**, to the cluster on **host2**.

2.4.10 Adding the Node Managers

Finally, if you have Node Managers being used in the environment, each Node Manager has to be defined in the topology file.

1. Inside **Host: host1**, right-click the **Domain: domain1** element and select **Assign New Node Manager to Domain 'domain1'**.

   A Node Manager (**nm1**) appears in the domain on **host1**.

2. Select the **Node Manager: nm1** element, and then specify the following information about the Node Manager in the fields on the right side of the screen.

Field	Description
ID	A unique name for the Node Manager. Keep the default value, nm1.
Name	Enter the name of the Node Manager. This should match the name provided during domain configuration.
Credential	The credentials from the wallet file that will be used to connect to the Node Manager. Click **select** to select the credential for the Node Manager from the wallet file. When you click **select**, a dialog box will appear with a list of credentials to choose from only if you have provided the path to a wallet on the Composer Settings page (located in the File menu). • If the credential already exists in the wallet, select the appropriate credential from the list and click **OK**. • If the credential does not exist in the wallet, click **New** to add the credential to the wallet.
NmAddress	Under **Tuning Parameter Settings**, click ➕ to add a value for the Node Manager listen address parameter (**NmAddress**). When you click this icon, a dialog box appears. For **Name**, select **NmAddress** from the drop-down menu, and then enter the Node Manager listen address in the **Value** field.
NmPort	Under **Tuning Parameter Settings**, click ➕ to add a value for the Node Manager listen port parameter (**NmPort**). When you click this icon, a dialog box appears. For **Name**, select **NmPort** from the drop-down menu, and then enter the Node Manager listen port in the **Value** field (for example, 5556).

3. Repeat this process to add a Node Manager, **nm2**, to **host2**.

2.4.11 Saving the Topology File

After defining the elements of your topology, select **File** and then **Save** to save the topology to a topology file, which can be a XML or JSON file.

The following image shows what the example topology looks like in Composer when it's finished: