Windup User Guide

Introduction

This guide is for engineers, consultants, and others who plan to use Windup to migrate Java applications or other components.

What is Windup?

Overview

Windup is an extensible and customizable rule-based tool that helps simplify migration of Java applications.

Running from a Forge environment, Windup examines application artifacts, including project source directories and applications archives, then produces an HTML report highlighting areas that need changes. Windup can be used to migrate Java applications from previous versions of *Red Hat JBoss Enterprise Application Platform* or from other containers, such as *Oracle WebLogic Server* or *IBM® WebSphere® Application Server*.

How Does Windup Simplify Migration?

Windup looks for common resources and highlights technologies and known “trouble spots” when migrating applications. The goal is to provide a high level view into the technologies used by the application and provide a detailed report organizations can use to estimate, document, and migrate enterprise applications to Java EE and JBoss EAP.

Features of Windup

Shared Data Model

Windup creates a shared data model graph that provides the following benefits.

- It enables complex rule interaction, allowing rules to pass findings to other rules.
- It enables 3rd-party plug-ins to interact with other plug-ins, rules and reports.
- The findings in data graph model can be searched and queried during rule execution and used for reporting purposes.

Extensibility

Windup can be extended by developers, users, and 3rd-party software.

- It provides a plug-in API to inject other applications into Windup.
- It enables 3rd-parties to create simple POJO plug-ins that can interact with the data graph.
- Means we don't have to invent everything. Users with domain knowledge can implement their own rules.

Better Rules

Windup provides more powerful and complex rules.

- XML-based rules are simple to write and and easy to implement.
- Java-based rule add-ons are based on OCPsoft Rewrite and provide greater flexibility and power creating when rules.
- Rules can now be nested to handle more complex situations. This means you can nest simple statements rather than use complex XPATH or REGEX expressions. *Rules can be linked using and/or statements

Work Estimation

Estimates for the *level of effort* are based on the skills required and the classification of migration work needed. *Level of effort* is represented as *story points* in the Windup reports.

Better Reporting

Windup reports are now targeted for specific audiences.

- Project Management - Reports detail the type of work and estimation of effort to complete the tasks.
- Developers: Reports provide hints and suggested code changes by class or file.

About Windup Rules

Windup is a rule-based migration tool that analyzes the APIs, technologies, and architectures used by the applications you plan to migrate. In fact, the Windup tool executes its own core set of rules through all phases of the migration process. It uses rules to extract files from archives, decompile files, scan and classify file types, analyze XML and other file content, analyze the application code, and build the reports.

Windup builds a data model based on the rule execution results and stores component data and relationships in a graph database, which can then be queried and updated as needed by the migration rules and for reporting purposes.

Windup rules use the following familiar rule pattern:

```
when(condition)
    perform(action)
otherwise(action)
```

Windup provides comprehensive set of standard migration rules out-of-the-box. Because applications may contain custom libraries or components, Windup allows you to write your own rules to identify use of components or software that may not be covered by the existing ruleset. If you plan to write your own custom rules, see the Windup Rules Development Guide for detailed instructions.

System Requirements

Software

- Java Platform, JRE version 7+
- Windup is tested on Linux, Mac OS X, and Windows. Other Operating Systems

with Java 7+ support should work equally well.

Hardware

The following memory and disk space requirements are the minimum needed to run Windup. If your application is very large or you need to evaluate multiple applications, you may want to increase these values to improve performance. For tips on how to optimize performance, see Optimize Windup Performance.

- A minimum of 4 GB RAM. For better performance, a 4-core processor with 8 GB RAM is recommended. This allows 3 - 4 GB RAM for use by the JVM.
- A minimum of 4 GB of free disk space. A fast disk, especially a Solid State Drive (SSD), will improve performance.

About the WINDUP_HOME Variable

This documentation uses the **WINDUP_HOME** *replaceable* value to denote the path to the Windup distribution. When you encounter this value in the documentation, be sure to replace it with the actual path to your Windup installation.

- If you download and install the latest distribution of Windup from the JBoss Nexus repository, WINDUP_HOME refers to the windup-distribution-2.4.0-Final folder extracted from the downloaded ZIP file.
- If you build Windup from GitHub source, WINDUP_HOME refers to the windup-distribution-2.4.0-Final folder extracted from the windup-distribution/target/windup-distribution-2.4.0-Final.zip file.

Get Started

Install Windup

1. Download the latest Windup ZIP distribution.
2. Extract the ZIP file in to a directory of your choice.

Execute Windup

Overview

These instructions use the replaceable variable `WINDUP_HOME` to refer to the fully qualified path to your Windup installation. For more information, see About the WINDUP_HOME Variable.

Run Windup

1. Open a terminal and navigate to the WINDUP_HOME directory.
2. Run Windup against the application using the appropriate command.

   See Windup Command Line Arguments below for a detailed description of the available command line arguments.

   - The basic command to run Windup uses the following syntax.

     ```
     For Linux:     $ bin/windup --input INPUT_ARCHIVE_OR_FOLDER --output OUTPUT_REPOR
     For Windows:   > bin\windup.bat --input INPUT_ARCHIVE_OR_FOLDER --output OUTPUT_R
     ```

   - To evaluate an application archive, use the following syntax:

     ```
     bin/windup --input INPUT_ARCHIVE_OR_FOLDER --output OUTPUT_REPORT_DIRECTORY --sou
     ```

   - To run Windup against application source code, add the `--sourceMode` argument:

     ```
     bin/windup  --sourceMode --input INPUT_ARCHIVE_OR_FOLDER --output OUTPUT_REPORT_D
     ```

   - To override the default *Fernflower* decompiler, pass the `-Dwindup.decompiler` argument on the command line. For example, to use the *Procyon* compiler, use the following syntax:

     ```
     bin/windup -Dwindup.decompiler=procyon --input INPUT_ARCHIVE_OR_FOLDER --output O
     ```

   See Windup Command Examples below for concrete examples of commands that use source code directories and archives located in the Windup GitHub repository.

3. You should see the following result upon completion of the command:

```
**SUCCESS*** Windup report created: PATH_TO_REPORTS/index.html
             Access it at this URL: file:///home/username/PATH_TO_REPORTS/index.htm
```

WARNING

Depending on the size of the application and the hardware Windup is running on, this command can take a very long time. For tips on how to improve performance, see Optimize Windup Performance.

4. Open the `OUTPUT_REPORT_DIRECTORY/index.html` file in a browser to access the report. The following subdirectories in the `OUTPUT_REPORT_DIRECTORY` contain the supporting information for the report:

```
OUTPUT_REPORT_DIRECTORY/
├── archives/
├── graph/
├── reports/
├── stats/
├── index.html
├── OPTIONAL_EXPORTED_CSV_FILE.csv
```

5. For details on how to evaluate the report data, seeReview the Report.

Windup Help

To see the complete list of available arguments for the `windup` command, open a terminal, navigate to the WINDUP_HOME directory, and execute the following command:

```
bin/windup --help
```

Windup Command Line Arguments

The following is a detailed description of the available Windup command line arguments.

--input INPUT_ARCHIVE_OR_FOLDER

This is the fully qualified path of the application archive or folder you plan to migrate. This argument is required.

--output OUTPUT_REPORT_DIRECTORY (optional)

This is the fully qualified path to the folder that will contain the the report information produced by Windup.

- If omitted, the report will be generated in a **INPUT_ARCHIVE_OR_FOLDER.report** folder.
- If the output directory exists, you will be prompted with the following (with a default of N).

```
Overwrite all contents of "/home/username/OUTPUT_REPORT_DIRECTORY" (anything
already in the directory will be deleted)? [y,N]
```

However, if you specify the `--overwrite` argument, Windup will proceed to delete and recreate the folder.

> **WARNING** Be careful not to specify a report output directory that contains important information!

--sourceMode (optional)

If specified, indicates the application to be evaluated contains source files rather than compiled binaries.

--source SOURCE_1 SOURCE_2 (optional)

A space delimited list of one or more source technologies, servers, platforms, or frameworks to migrate from.

> **TIP** For the list of the available `--source` servers or frameworks, use the `--listSourceTechnologies` argument on the `windup` command line as in the following example.
>
> ```
> bin/windup --listSourceTechnologies
> ```

--target TARGET_1 TARGET_2 (optional)

A space delimited list of one or more target technologies, servers, platforms, or

frameworks to migrate to. If you do not specify this option, you are prompted to select a target. The default target technology is `eap`.

TIP

For the list of the available `--target` servers or frameworks, use the `--listTargetTechnologies` argument on the `windup` command line as in the following example.

```
bin/windup --listTargetTechnologies
```

--packages PACKAGE_1 PACKAGE_2 PACKAGE_N (optional)

A space delimited list of the packages to be evaluated by Windup.

- In most cases, you are interested only in evaluating custom application class packages and not standard Java EE or 3rd party packages. For example, if the *MyCustomApp* application uses the package `com.mycustomapp`, you provide that package using the `--packages` argument on the command line.
- It is not necessary to provide the standard Java EE packages, like `java.util` or `javax.ejb`.
- While you can provide package names for standard Java EE 3rd party software like `org.apache`, it is usually best not to include them as they should not impact the migration effort.

WARNING

If you omit the `--packages` argument, every package in the application is scanned, which can impact performance. It is best to provide this argument with one or more packages.

--overwrite (optional)

Specify this argument only if you are certain you want to force Windup to delete the existing **OUTPUT_REPORT_DIRECTORY** folder. If you do not specify this argument and the `--output` folder exists, you are prompted to choose whether to overwrite the contents.

--includeTags TAG_1 TAG_2 (optional)

Limit processing to rules that contain the specified tags. If this option is not specified, all tags are processed. Multiple tags are delimited by spaces.

> TIP
>
> For the list of the available tags, use the `--listTags` argument on the `windup` command line as in the following example.
>
> ```
> bin/windup --listTag
> ```

--excludeTags TAG_1 TAG_2 (optional)

Do not process rules that contain the specified tags. If this option is not specified, all tags are processed.

--userRulesDirectory CUSTOM_RULES_DIRECTORY (optional)

By default, Windup looks for rules in the `${user.home}/.windup/rules/` directory. This option allows you to provide the fully qualified path to a user directory containing additional custom XML rules that should be loaded and executed by Windup. The XML ruleset files must use one of the following extensions: `*.windup.groovy` or `*.windup.xml`.

--userIgnorePath CUSTOM_IGNORE_DIRECTORY (optional)

Windup looks for file names matching the pattern `*windup-ignore.txt` to identify files that should be ignored. By default, it looks for these files in the `~/.windup/ignore/` and `WINDUP_HOME/ignore/` directories, but this option allows you to create files with this pattern name in a different directory.

--exportCSV (optional)

Export the report data to a CSV formatted file on your local file system. Windup creates the file in the folder specified by the `--output` argument. The CSV file can be imported into your favorite spreadsheet program for data manipulation and analysis. For details, see Export the Report for Use by Spreadsheet Programs

--additionalClassPath JAR_OR_DIRECTORY_1 JAR_OR_DIRECTORY_2 (optional)

Use this option to add additional JAR files or directories to the classpath. For example:

```
--additionalClassPath MyClasses.jar com/mycompany/
```

--excludePackages PACKAGE_1 PACKAGE_2 PACKAGE_N (optional)

This is a space-delimited list of the packages to be excluded by Windup.

--offline (optional)

If specified, do all processing offline and do not fetch information from the internet.

--updateRulesets (optional)

Update the core rulesets distributed with Windup. It first checks for the existence of newer release, and if found, replaces the current rulesets directory with the new one.

TIP

To update the rulesets without analyzing an application, pass only this argument on the `windup` command line as in the following example.

```
bin/windup --updateRulesets
```

--batchMode (optional)

Specifies that Windup should be run in a non-interactive mode without prompting for confirmation. This mode takes the default values for any parameters not passed in via the command line.

Windup Command Examples

The following examples report against applications located in the Windup source test-files directory.

Source Code Example

The following command runs against the seam-booking-5.2 application source code. It evaluates all `org.jboss.seam` packages and creates a folder named 'seam-booking-report' in the `/home/username/windup-reports/` directory to contain the

reporting output.

```
bin/windup --sourceMode --input /home/username/windup-source/test-files/seam-booking-
5.2/ --output /home/username/windup-reports/seam-booking-report --target eap --
packages org.jboss.seam
```

Archive Example

The following command runs against the jee-example-app-1.0.0.ear EAR archive. It evaluates all `com.acme` and `org.apache` packages and creates a folder named 'jee-example-app-1.0.0.ear-report' in the `/home/username/windup-reports/` directory to contain the reporting output.

```
bin/windup  --input /home/username/windup-source/test-files/jee-example-app-
1.0.0.ear/ --output /home/username/windup-reports/jee-example-app-1.0.0.ear-report --
target eap --packages com.acme org.apache
```

Windup Quickstart Examples

For more concrete examples, see the Windup quickstarts located on GitHub here: https://github.com/windup/windup-quickstarts. If you prefer, you can download the latest release ZIP or TAR distribution of the quickstarts.

The quickstarts provide examples of Java-based and XML-based rules you can run and test using Windup. The README instructions provide a step-by-step guide to run the quickstart example. You can also look through the code examples and use them as a starting point for creating your own rules.

Review the Report

About the Report

When you execute Windup, the report is generated in the `OUTPUT_REPORT_DIRECTORY` you specify for the `--output` argument in the command line. This output directory contains the following files and subdirectories:

```
OUTPUT_REPORT_DIRECTORY/
├── index.html          (landing page for the report)
├── EXPORT_FILE.csv     (optional export of data in CSV format)
├── archives/           (archives extracted from the application, for information only)
├── graph/              (binary graph database files generated during the run, for info
├── reports/            (generated HTML reports)
├── stats/              (performance statistics)
```

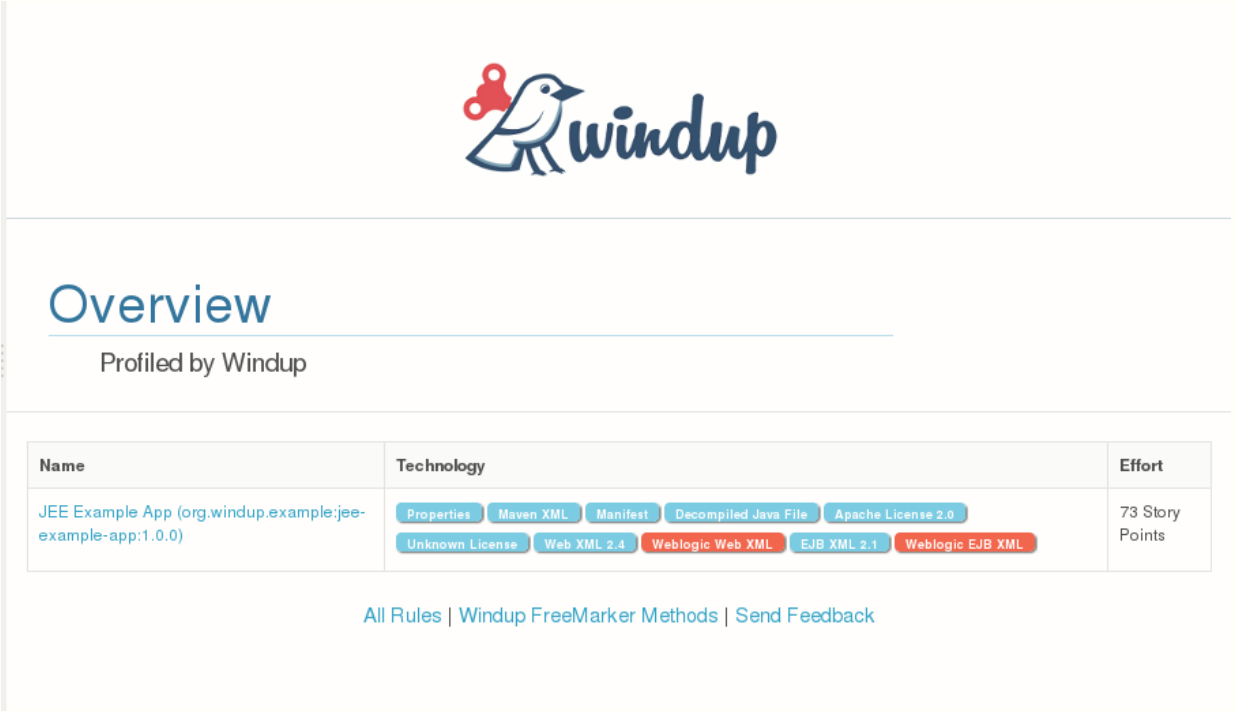
The report examples shown are a result of analyzing `com.acme` and `org.apache` packages in the [test-files/jee-example-app-1.0.0.ear] application, which is located in the Windup core source repository. The report was generated using the using the following command.

```
WINDUP_HOME/bin/windup --input /home/username/windup-source/test-files/jee-example-app-
```

Access the Reports

Use your favorite browser to open the `index.html` file located in the output report directory. You should see something like the following:

Windup Report: Index Page



This page lists the application that was processed along with the technologies that were encountered. It also provides links to the following additional reports.

Report	How to Access the Report
Application Report	Click on the link under the `Name` column to view this report.
Rule Provider Executions Report	Click on the `All Rules` link at the bottom of the index page.
Windup Freemarker Functions and Directives Report	Click on the `Windup FreeMarker Methods` link at the bottom of the index page.
Send Feedback Form	Click on the `Send Feedback` link at the bottom of the index page to open a form that allows you to provide feedback to the Windup team. .

Application Report

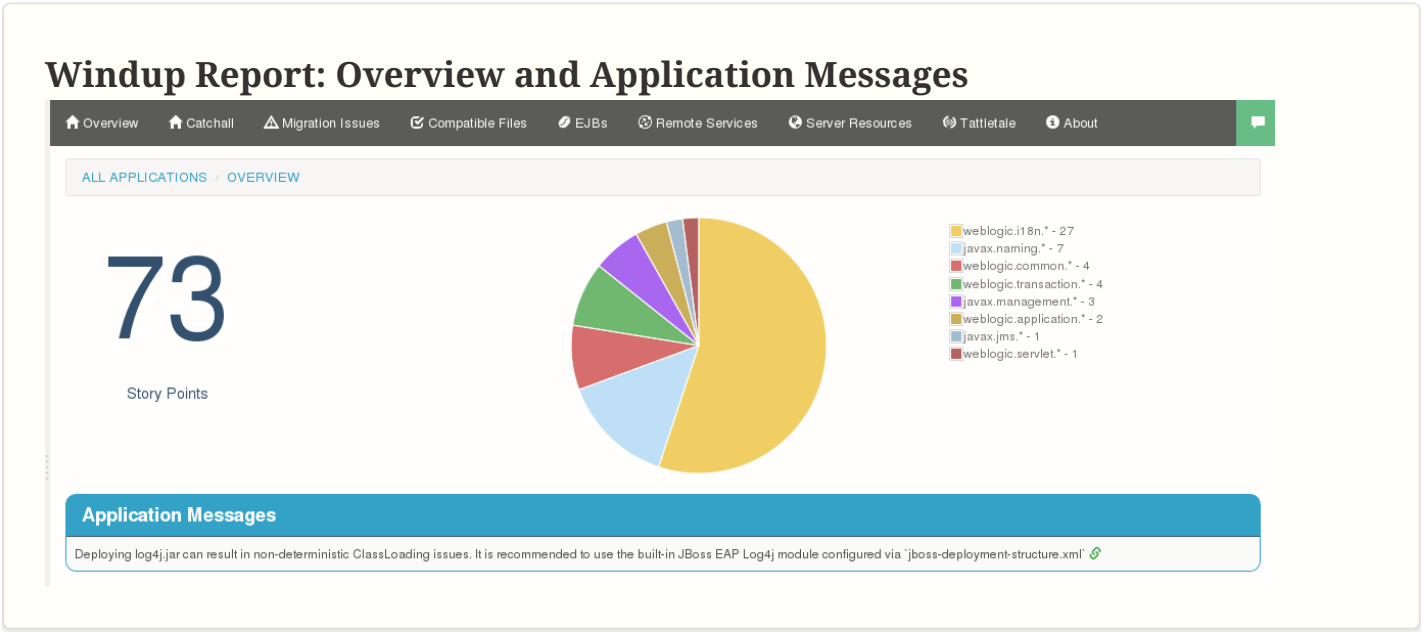
Overview and Application Messages

The first section of the application report page summarizes the entire application migration effort by technology type both graphically and in list format. This is followed by the `Application Messages` section, which contains useful information about general migration requirements for the application, such as the need to replace deprecated libraries or the need to resolve potential class loading issues.

In the following example, the "JEE Example App" is assigned 73 story points related to 10 different technologies. It also displays one application message "Deploying log4j.jar can result in non-deterministic ClassLoading issues. It is recommended to use the built-in JBoss EAP Log4j module configured via `jboss-deployment-structure.xml`" with a link to the rule that triggered it.

NOTE

The estimated Story Points change as new rules are added to Windup. The values here may not match what you see when you test this application.



Archive Analysis Sections

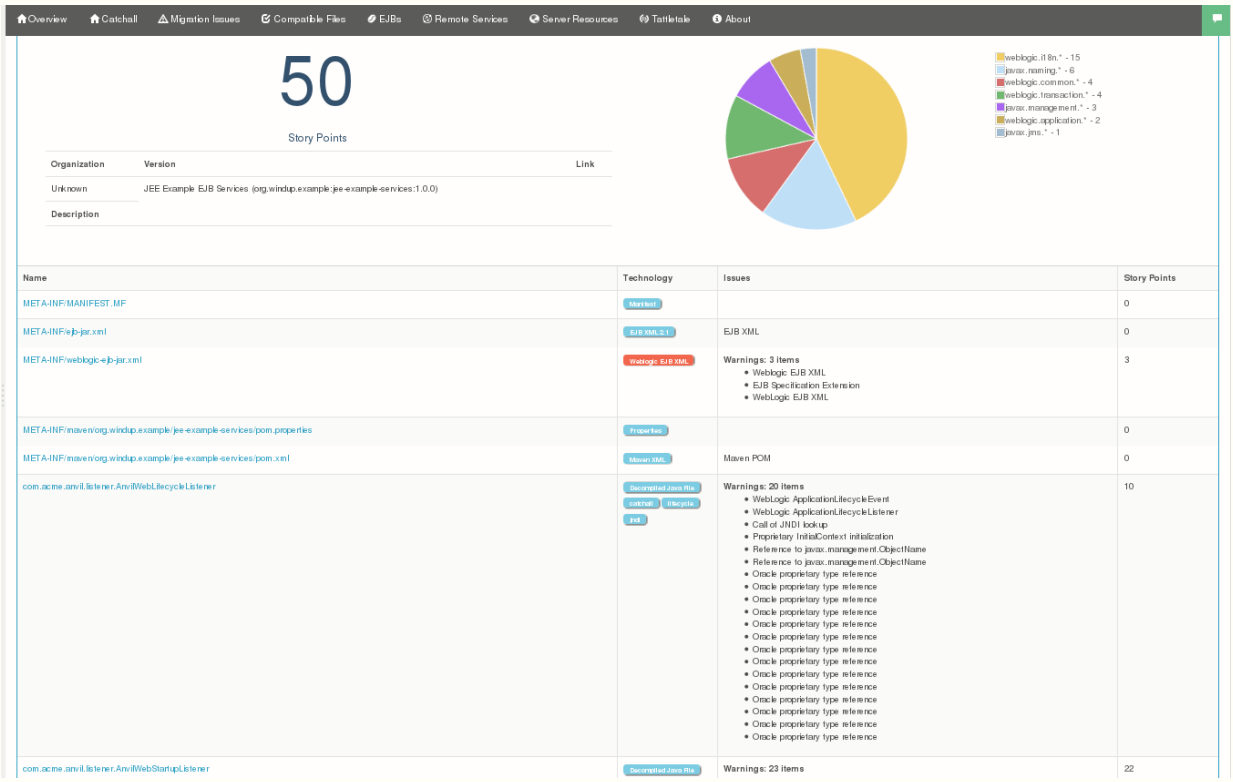
Depending on whether you run Windup against source or compiled code, the report next provides details by file, or by file within each archive. Each archive summary begins with a total of the story points assigned to its migration, followed by a table detailing the changes required for each file in the archive. The report contains the following columns.

Column Name	Description
Name	The name of the file being analyzed.
Technology	The type of file being analyzed, for example: Java Source, Decompiled Java File, Manifest, Properties, EJB XML, Spring XML, Web XML, Hibernate Cfg, Hibernate Mapping
Issues	Warnings about areas of code that need review or changes.
Estimated Story Points	Level of effort required to migrate the file. *Story Points* are covered in more detail in the Windup Rules Development Guide.

The following is an example of the archive analysis summary section of a Windup Report. The following is an the analysis of the `WINDUP_SOURCE/test-files/jee-`

`example-app-1.0.0.ear/jee-example-services.jar`.

Windup Report: Archive Detail



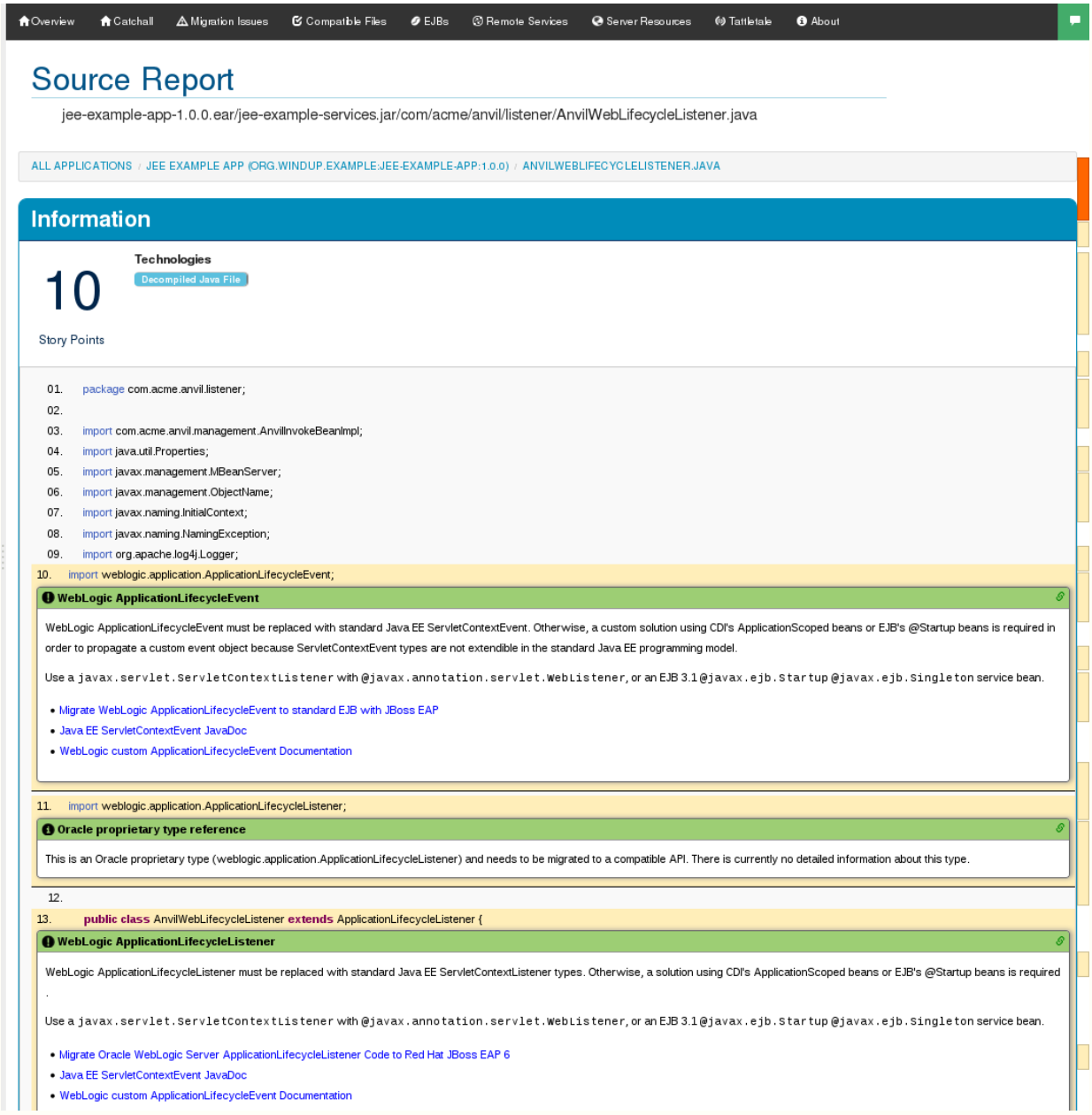
File Analysis Pages

The analysis of the `jee-example-services.jar` lists the files in the JAR and the warnings and story points assigned to each one. Notice the `com.acme.anvil.listener.AnvilWebLifecycleListener` file, at the time of this test, has 20 warnings and is assigned 10 story points. Click on the file to see the detail.

- The **Information** section provides a summary of the story points and notes that the file was decompiled by Windup.
- This is followed by the file source code listing. Warnings appear in the file at the point where migration is required.

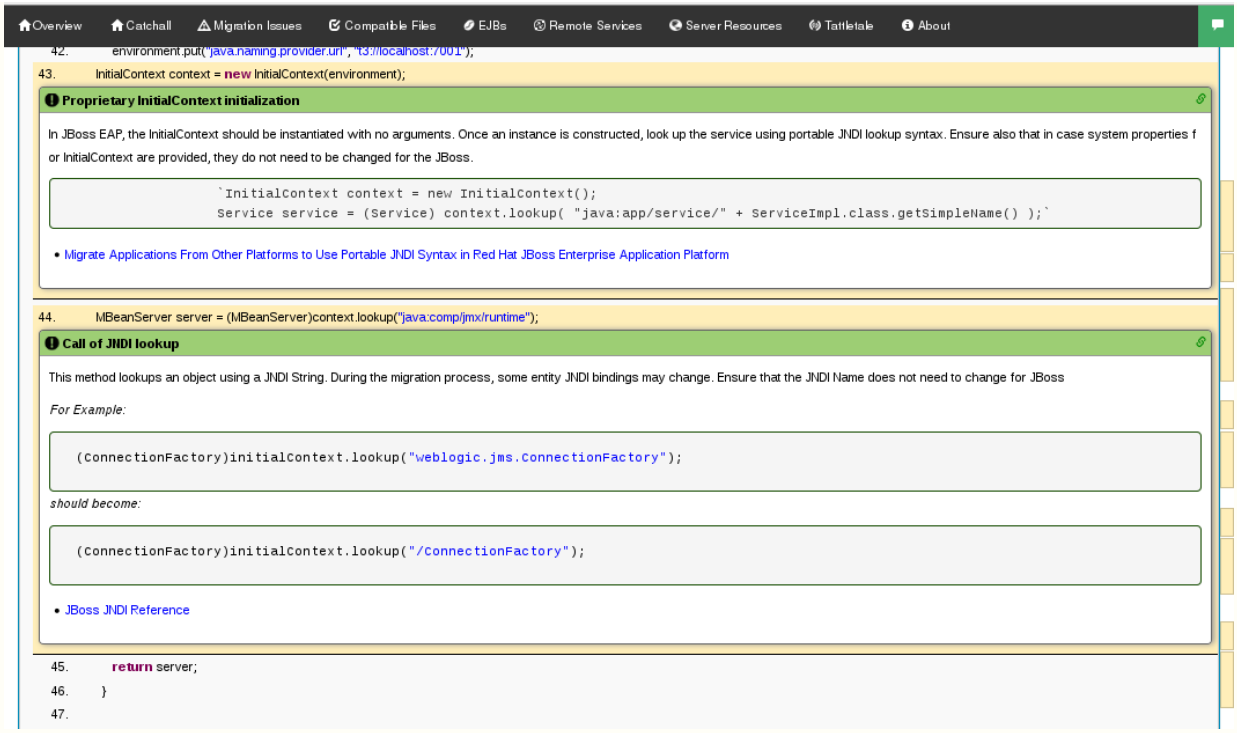
In this example, warnings appear at various import statements, declarations, and method calls. Each warning describes the issue and the action that should be taken.

Windup Report: Source Report - Part 1



Later in the source code, warnings appear for the creation of the InitialContext and for JNDI lookup names.

Windup Report: Source Report - Part 2

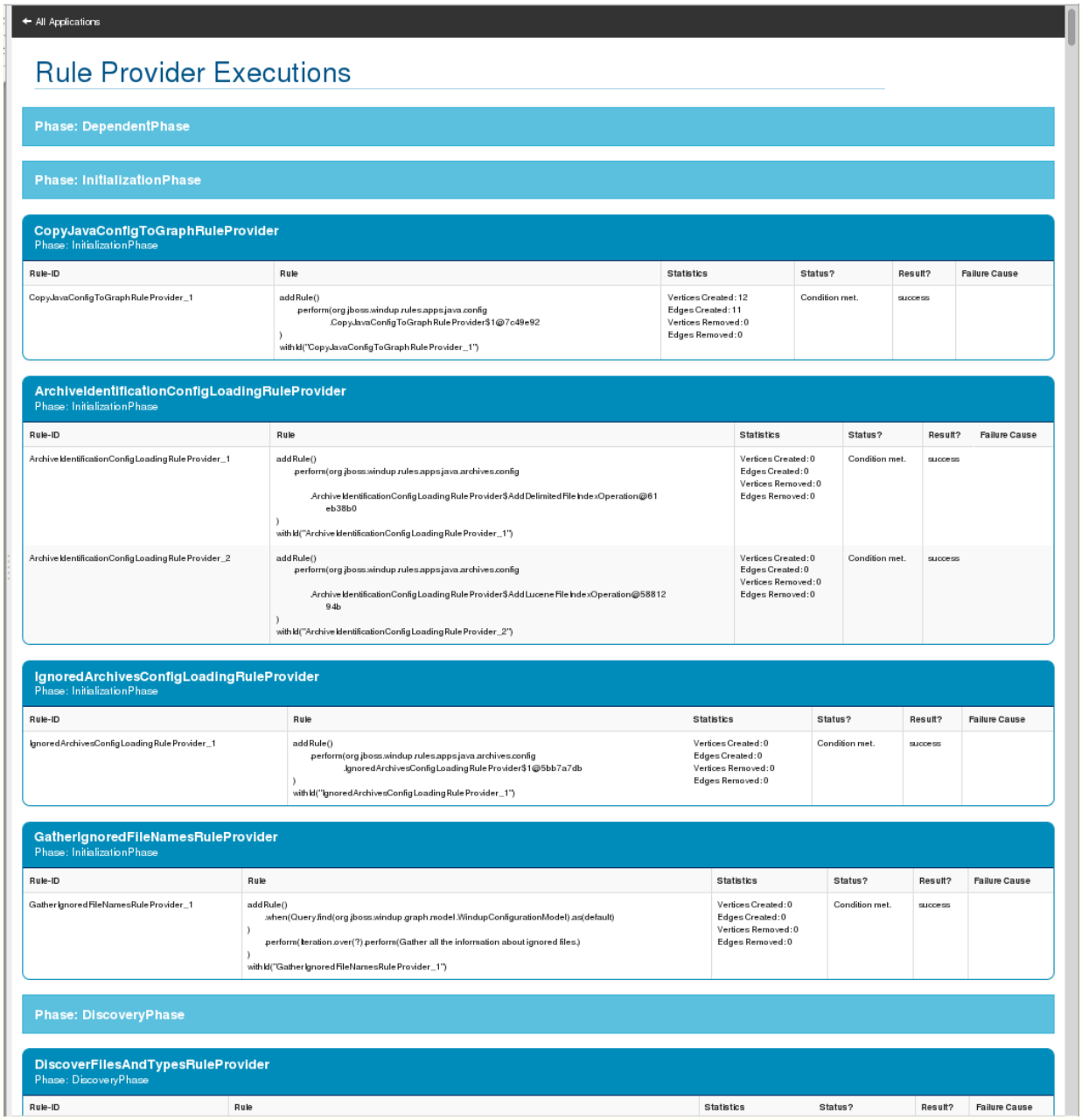


Rule Provider Execution Report

As stated above,access this report by clicking on the `All Rules` link at the bottom of the index page. This report provides the list of rule providers that executed when running the Windup migration command against the application. The report contains the following columns.

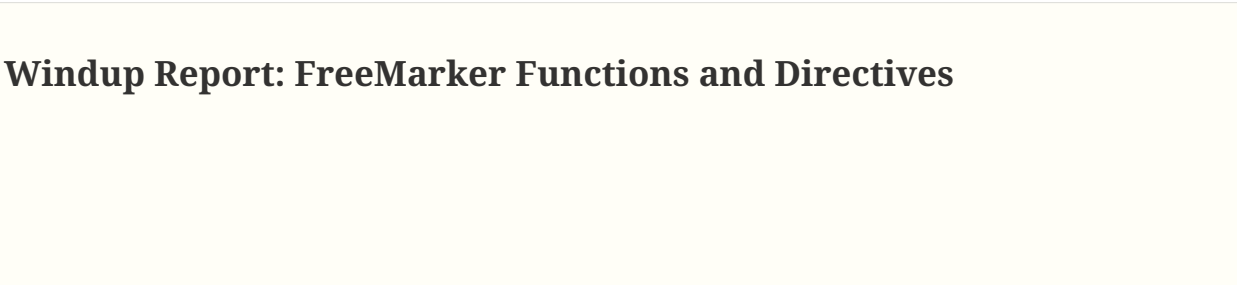
Column Name	Description
Rule-ID	The Rule ID
Rule	The Java code for the rule
Statistics	Statistics behind the graph
Status?	Whether the rule executed or not
Result?	Whether the execution was successful or not
Failure Cause	The reason for an execution failure

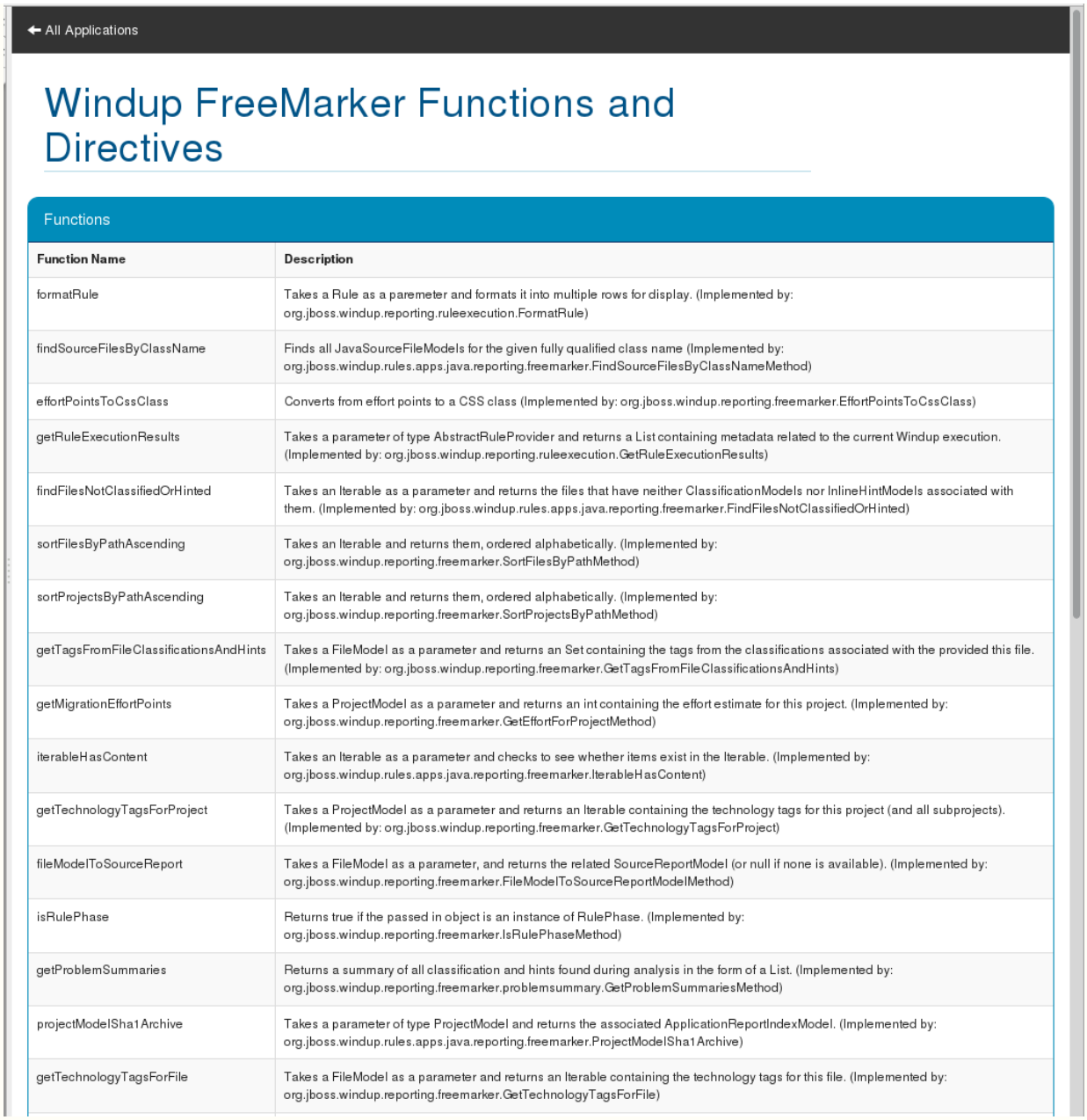
Windup Report: Rule Provider Report



Windup FreeMarker Functions and Directives Report

Access this report by clicking on the `Windup FreeMarker Methods` link on the initial index page. This report lists all the registered functions and directives that were used to build the report. It is useful if you plan to build your own custom report or for debugging purposes.



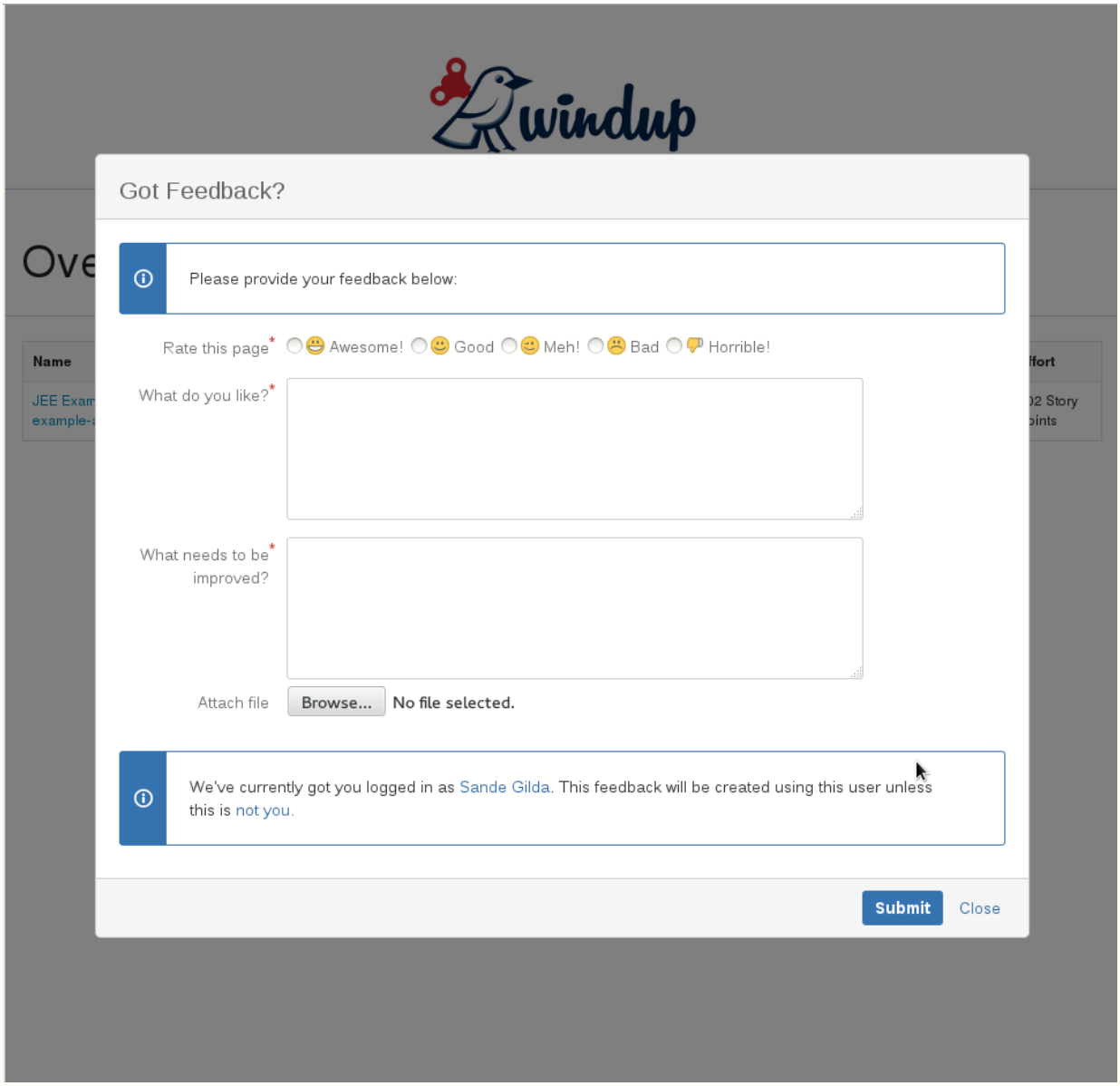


Function Name	Description
formatRule	Takes a Rule as a paremeter and formats it into multiple rows for display. (Implemented by: org.jboss.windup.reporting.ruleexecution.FormatRule)
findSourceFilesByClassName	Finds all JavaSourceFileModels for the given fully qualified class name (Implemented by: org.jboss.windup.rules.apps.java.reporting.freemarker.FindSourceFilesByClassNameMethod)
effortPointsToCssClass	Converts from effort points to a CSS class (Implemented by: org.jboss.windup.reporting.freemarker.EffortPointsToCssClass)
getRuleExecutionResults	Takes a parameter of type AbstractRuleProvider and returns a List containing metadata related to the current Windup execution. (Implemented by: org.jboss.windup.reporting.ruleexecution.GetRuleExecutionResults)
findFilesNotClassifiedOrHinted	Takes an Iterable as a parameter and returns the files that have neither ClassificationModels nor InlineHintModels associated with them. (Implemented by: org.jboss.windup.rules.apps.java.reporting.freemarker.FindFilesNotClassifiedOrHinted)
sortFilesByPathAscending	Takes an Iterable and returns them, ordered alphabetically. (Implemented by: org.jboss.windup.reporting.freemarker.SortFilesByPathMethod)
sortProjectsByPathAscending	Takes an Iterable and returns them, ordered alphabetically. (Implemented by: org.jboss.windup.reporting.freemarker.SortProjectsByPathMethod)
getTagsFromFileClassificationsAndHints	Takes a FileModel as a parameter and returns an Set containing the tags from the classifications associated with the provided this file. (Implemented by: org.jboss.windup.reporting.freemarker.GetTagsFromFileClassificationsAndHints)
getMigrationEffortPoints	Takes a ProjectModel as a parameter and returns an int containing the effort estimate for this project. (Implemented by: org.jboss.windup.reporting.freemarker.GetEffortForProjectMethod)
iterableHasContent	Takes an Iterable as a parameter and checks to see whether items exist in the Iterable. (Implemented by: org.jboss.windup.rules.apps.java.reporting.freemarker.IterableHasContent)
getTechnologyTagsForProject	Takes a ProjectModel as a parameter and returns an Iterable containing the technology tags for this project (and all subprojects). (Implemented by: org.jboss.windup.reporting.freemarker.GetTechnologyTagsForProject)
fileModelToSourceReport	Takes a FileModel as a parameter, and returns the related SourceReportModel (or null if none is available). (Implemented by: org.jboss.windup.reporting.freemarker.FileModelToSourceReportModelMethod)
isRulePhase	Returns true if the passed in object is an instance of RulePhase. (Implemented by: org.jboss.windup.reporting.freemarker.IsRulePhaseMethod)
getProblemSummaries	Returns a summary of all classification and hints found during analysis in the form of a List. (Implemented by: org.jboss.windup.reporting.freemarker.problemsummary.GetProblemSummariesMethod)
projectModelSha1Archive	Takes a parameter of type ProjectModel and returns the associated ApplicationReportIndexModel. (Implemented by: org.jboss.windup.rules.apps.java.reporting.freemarker.ProjectModelSha1Archive)
getTechnologyTagsForFile	Takes a FileModel as a parameter and returns an Iterable containing the technology tags for this file. (Implemented by: org.jboss.windup.reporting.freemarker.GetTechnologyTagsForFile)

Send Feedback Form

Access the feedback form by clicking on the `Send Feedback` link on the initial index page. The form allows you to rate the product, talk about what you like and what needs to be improved. You can also attach a file.

Send Feedback Form



Export the Report for Use by Spreadsheet Programs

Windup provides the ability to export the report data, including the **Classifications** and **Hints**, to a flat file on your local file system. The export function currently supports the CSV file format, which presents the report data as fields delimited by a comma (,) separator.

Windup follows the Common Format and MIME Type for Comma-Separated Values (CSV) Files standard for escaping special characters contained within each field in the file. The exported file has the following characteristics.

1. The file is named with the `.csv' file extension.
2. The first row is a header listing the names of the fields.

```
"Rule Id","Problem type","Title","Description","Links","Application","File Name","Fi
```

3. Each field is enclosed in double quotes (").

```
"FindUnboundJavaReferencesRuleProvider","hint","Unresolved Class Binding","","","JEE
```

4. Any double quote (") appearing within a field is preceded with another double quote.

```
"MyWindupRule","hint",""Replace the ""foo"" class","Replace the ""foo"" class instar
```

The CSV formatted file can be imported and manipulated by spreadsheet software such as Microsoft Excel and OpenOffice or LibreOffice Calc. Spreadsheet software provide the ability to sort, analyze, evaluate, and manage the result data from a Windup report.

Enable the Export Functionality

To enable export of the report into CSV file, run Windup with `--exportCSV` argument. The CSV file will be created in the directory specified by the `--output` argument.

Import the CSV File into a Spreadsheet

1. Start the spreadsheet software (LibreOffice Calc, OpenOffice Calc, Microsoft Excel, etc.).
2. Choose `File` -→ `Open'.
3. Navigate to the CSV exported file and select it.
4. The data is now ready to analyze in the spreadsheet software.

For more information or to resolve any issues, check the help for your spreadsheet software.

Overview of the CSV data structure

The CSV formatted output file contains the following data fields:

Rule Id

The ID of the rule that generated the given item.

Problem type

"Hint" or "Classification"

Title

The title of the *Classification* or *Hint*. This field summarizes the issue for the given item.

Description

The detailed description of the issue for the given item.

Links

URLs that provide additional information about the issue. A link consists of two attributes: the link and a description of the link.

Application

The name of the application for which this item was generated.

File Name

The name of the file for the given item.

File Path

The file path of the file for the given item.

Line

The line number of the file for the given item.

Story points

The number of story points, which represent the level of effort, assigned to the given item.

Additional Resources

Review the Windup Quickstarts

The Windup quickstarts provide working examples of how to create custom Java-based rule add-ons and XML rules. You can use them as a starting point for creating your own custom rules.

You can download a ZIP file of the latest released version of the quickstarts. Or, if you prefer to play around with the source code, you can fork and clone the windup-quickstarts project repository.

Download the Latest Quickstart ZIP

To download the latest quickstart ZIP file, browse to: https://github.com/windup/windup-quickstarts/releases

Click on the most recent release to download the ZIP to your local file system.

Fork and Clone the Quickstart GitHub Project

If you don't have the GitHub client (`git`), download it from: http://git-scm.com/

1. Click the `Fork` link on the Windup quickstart GitHub page to create the project in your own Git. The forked GitHub repository URL created by the fork should look like this: https://github.com/YOUR_USER_NAME/windup-quickstarts.git
2. Clone your Windup quickstart repository to your local file system:

```
git clone https://github.com/YOUR_USER_NAME/windup-quickstarts.git
```

3. This creates and populates a `windup-quickstarts` directory on your local file system. Navigate to the newly created directory, for example

```
cd windup-quickstarts/
```

4. If you want to be able to retrieve the lates code updates, add the remote `upstream` repository so you can fetch any changes to the original forked repository.

```
git remote add upstream https://github.com/windup/windup-quickstarts.git
```

5. To get the latest files from the `upstream` repository.

```
git reset --hard upstream/master
```

Get Involved

How can you help?

To help us make Windup cover most application constructs and server configurations, including yours, you can help with any of the following items. Many require only a few minutes of your time!

- Send an email to windup-users@lists.jboss.org and let us know what should Windup migration rules cover.
- Provide example applications to test migration rules.
- Identify application components and problem areas that may be difficult to migrate.
  - Write a short description of these problem migration areas.
  - Write a brief overview describing how to solve the problem migration areas.
- Try Windup on your application. Be sure to report any issues you encounter.
- You can contribute to the Windup rules repository.
  - Write a Windup rule to identify or automate a migration process.
  - Create a test for the new rule.
  - Details are provided in the Windup Rules Development Guide.
- You can also contribute to the project source code.
  - Create a core rule.
  - Improve Windup performance or efficiency.
  - See the Windup Core Development Guide for information about how to configure your environment and set up the project.

Any level of involvement is greatly appreciated!

Important Links

- Windup wiki: https://github.com/windup/windup/wiki
- Windup forums: https://community.jboss.org/en/windup
- Windup JIRA issue trackers
  - Core Windup: https://issues.jboss.org/browse/WINDUP
  - Windup Rules: https://issues.jboss.org/browse/WINDUPRULE
- Windup users mailing List: windup-users@lists.jboss.org
- Windup on Twitter: @JBossWindup
- Windup IRC channel: Server FreeNode (`irc.freenode.net`), channel `#windup`.

Known Windup Issues

Windup known issues are tracked here: Open Windup issues

Report Issues with Windup

Windup uses JIRA as its issue tracking system. If you encounter an issue executing Windup, please file a JIRA Issue.

Create a JIRA Account

If you do not yet have a JIRA account, create one using the following procedure.

1. Open a browser to the following URL: https://issues.jboss.org/secure/Dashboard.jspa
2. Click the *Sign Up* link in the top right side of the page.
3. Enter your email address and click the `Confirm address` button.
4. Follow the instructions sent to your email address.

Create a JIRA Issue

1. Open a browser to the following URL: https://issues.jboss.org/secure/CreateIssue!default.jspa.
   - If you have not yet logged in, click the *Log In* link at the top right side of the page.

- Enter your credentials and click the `LOGIN` button.
- You are then redirected back to the **Create Issue** page.

2. Choose the following options and click the `Next` button.
   - **Project**

     For core Windup issues, choose *Windup: (WINDUP)*.

     For issues with Windup rules, choose: *Windup rules (WINDUPRULES)*.
   - **Issue Type**: *Bug*
3. On the next screen complete the following fields:
   - **Summary**: Enter a brief description of the problem or issue.
   - **Environment**: Provide the details of your operating system, version of Java, and any other pertinent information.
   - **Description**: Provide a detailed description of the issue. Be sure to include logs and exceptions traces.
4. Click the `Create` button to create the JIRA issue.
5. If the application or archive causing the issue does not contain sensitive information and you are comfortable sharing it with the Windup development team, attach it to the issue by choosing `More → Attach Files`. You are provided with an option to restrict visibility to JBoss employees.

Appendix

Glossary of Terms Used in Windup

Rules Terms

Rule

A piece of code that performs a single unit of work during the migration process. The following is an example of am XML-based rule that finds and reports on instances of `weblogic-ejb-jar` XML files and provides a link to a article on the Red Hat Customer Portal that describes how to migrate the file.

```
<rule id="weblogic-xml-descriptor-04000">
    <when>
        <xmlfile matches="/weblogic-ejb-jar" />
    </when>
    <perform>
        <classification title="WebLogic EJB XML" severity="mandatory" effort="3">
            <link href="https://access.redhat.com/articles/1326823" title="Map weblog
            <tag>ejb</tag>
        </classification>
    </perform>
</rule>
```

RuleProvider

An implementation of OCPSoft ConfigurationProvider class specifically for Windup. It provides Rule instances and the relevant RuleProviderMetadata for those Java-based and XML-based Rule instances.

Ruleset

A ruleset is a group of one or more RuleProviders that targets a specific area of migration, for example, `Spring → Java EE 6` or `WebLogic → JBoss EAP`. A ruleset is packaged as a JAR and contains additional information needed for the migration, such as operations, conditions, report templates, static files, metadata, and relationships to other rulesets. The following Windup projects are rulesets.

- rules-java-ee
- rules-xml

Rules Metadata

Information about whether a particular ruleset applies to a given situation. The metadata can include the source and target platform and frameworks.

Rules Pipeline

A collection of rules that feed information into the knowledge graph.

Reporting Terms

Level of effort

The effort required to complete the migration task.*Level of effort* is represented as

story points in the Windup reports.

Story Point

A term commonly used in Scrum Agile software development methodology to estimate the *level of effort* needed to implement a feature or change. It does not necessarily translate to man-hours, but the value should be consistent across tasks. Story points are covered in more detail in the Windup Rules Development Guide.

Optimize Windup Performance

Overview

Windup performance depends on a number of factors, including hardware configuration, the number and types of files in the application, the size and number of applications to be evaluated, and whether the application contains source or compiled code. For example, a file that is larger than 10 MB may need a lot of time to process.

In general, Windup spends about 40% of the time decompiling classes, 40% of the time executing rules, and the remainder of the time processing other tasks and generating reports. This section describes what you can do to improve the performance of Windup.

Tips to Optimize Performance

Application and Command Line Suggestions

Try these suggestions first before upgrading hardware.

- If possible, execute Windup against the source code instead of the archives. This eliminates the need to decompile additional JARs and archives.
- Specify the `--target` platform on the on the `WINDUP_HOME/bin/windup` command line to limit the execution of rules to only those that apply to this target platform.
- Be sure to specify a comma-delimited list of the packages to be evaluated by Windup using the `--packages` argument on the `WINDUP_HOME/bin/windup`command line. If you omit this argument, Windup

will decompile everything, which has a big impact on performance.

- Specify the `--excludePackages` and `--excludeTags` where possible to exclude them from processing.
- Add additional proprietary packages that should not be processed to the `ignore/proprietary.package-ignore.txt` file in the Windup distribution directory. Windup can still find the references to the packages in the application source code, but avoids the need to decompile and analyze the proprietary classes.
- If you have access to a server that has better resources than your laptop or desktop machine, you may want to consider running Windup on that server.

Hardware Upgrade Suggestions

If the steps above do not improve performance, you may need to upgrade your hardware.

- If you have access to a server that has better resources than your laptop/desktop, than you may want to consider running Windup on that server.
- Very large applications that require decompilation have large memory requirements. 8 GB RAM is recommended. This allows 3 - 4 GB RAM for use by the JVM.
- An upgrade from a single or dual-core to a 4-core CPU processor provides better performance.
- Disk space and fragmentation can impact performance. A fast disk, especially a Solid State Drive (SSD), with greater than 4 GB of defragmented disk space should improve performance.