OSGi Service Platform, Compliance Tests Manual Release 4, Version 1.0

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Trademarks

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1 Introduction

This document describes the OSGi Reference Implementations (RIs) and Compliance Tests (aka. TCK) for Release 4. The purpose of this document is to be used by companies that want to test the compliance of their implementations of OSGi Release 4 specifications.

2 Test Setup

All tests have been written to execute inside the OSGi test harness. It is therefore necessary to setup an environment with both a *target* framework on the device under test as well as a *director* framework from which the test execution is controlled.

2.1 The Execution Environment

The director framework must run on a device that supports at least J2SE 1.4. The target framework can run on the OSGi minimum execution environment but some test cases will require the foundation execution environment.

2.2 Installing the Test Harness

The Test Harness is stored in the `osgi.mobile.tck.zip` file. This file should be unzipped in an empty directory (called the base directory and denoted with "."). The zip file contains the following files:

Table 1-1 Contents of the osgi.mobile.tck.zip

about.html	Describes license notices
director	Directory containing the harness
build.xml	An ant script that runs the director framework with the test scripts
osgi.properties	Contains the combined properties for the director framework
doc	Documentation and coverage XML files
tck-manual.pdf	This manual
LICENSE	License information, please read before usage
org.osgi.impl.framework.eclipse.jar	The OSGi framework reference implementation used to run the director.
osgi.director.jar	The test harness, a.k.a. the Director
osgi.jar	Jar containing all OSGi specification interfaces for use by the director framework.
osgi.min.jar	Minimum set of service implementations used to run the director

Table 1-1 Contents of the osgi.mobile.tck.zip

osgi.target.jar	Part of test harness that runs on device under test in the target framework
target	Directory containing files used by the target framework. This directory should be copied to the device under test and modified as appropriate to adapt it to the implementation under test.
build.xml	Example ant script that can run the tests on the target. The example is written for the OSGi RI. The RI is available in a seperate zip file and is licensed separately. This ant script has the same targets as the ant script in the `director` directory.
keystore	Contains a test certificate for signed bundles. Used in a number of test cases. The certificate alias used is `test` and the password is `testtest`.
osgi.properties	Properties for the target framework
policy	Security policy file for the target framework

2.3 Core Tests

The Core Test are included with the Mobile Tests:

Table 1-2 Contents of the Core Test

osgi.core.jar	Jar containing the core specification APIs
osgi.core.tests.jar	All tests for the core specification. This JAR will automatically install all contained tests. Is intended to run on the director framework. This file can be installed on the director GUI with the management console.
osgi.core.impls.jar	Reference Implementation. Intended to be used to verify that the setup is correct.
director	
core.script	Script file used by the test harness to run the core tests
doc	
osgi.core.html	Coverage report for the core tests.

The Core RI requires the properties defined in table Table 1-3 on page 2.

Table 1-3 Core RI Properties

`scr.bundle.name`	Bundle symbolic name of the bundle implementing declarative services
`eclipse.ee.install.verify`	Verifies the execution environment. Must be `true` for the tests to succeed.
`osgi.support.signature.verify`	Verifies bundle signatures, must be `true` for the tests to succeed
`osgi.framework.keystore`	URL to the keystore used by the Framework

The ant target to run the Core Tests in the director and target directories is:

```
run-core
```

2.4 Mobile Tests

The Mobile Tests include the remainder of the tests not covered by the Core Tests:

Table 1-4 Contents of the Mobile Tests

osgi.mobile.jar	Jar containing the core specification APIs
osgi.mobile.tests.jar	All tests for the mobile specification. This JAR will automatically install all contained tests. Is intended to run on the director framework. This file can be installed on the director GUI with the management console.
osgi.mobile.impls.jar	Reference Implementation. Intended to be used to verify that the setup is correct.
director	
mobile.script	Script file used by the test harness to run the mobile tests
doc	
osgi.mobile.html	Coverage report for the mobile tests
delivered	A directory with files that are required by the deployment tests. This directory *must* be available on the device under test. Its location is set by the `org.osgi.impl.service.deploymentadmin.deliverearea` property in the osgi.properties file in the target directory.

There are a number of properties that must be set for the Mobile RI . These properties are actually set in the target osgi.properties files and will likely not be used by the implementation being tested. These properties are not part of the OSGi specification and may change in future versions.

Table 1-5 Mobile RI Properties

`org.osgi.vendor.application`	The Implementation package for the org.osgi.service.application specification
`org.osgi.vendor.application.ApplicationDescriptor`	The implementation class for the Application Descriptor
`org.osgi.vendor.application.ApplicationHandle`	The implementation class for the Application Handle
osgi.dev	Used by the framework reference implementation
`org.osgi.vendor.deploymentadmin`	Implementation package for the org.osgi.service.deploymentadmin specification.
`org.osgi.vendor.mobile.UserPromptCondition`	Implementation class for the UserPromptCondition
`org.osgi.impl.service.deploymentadmin.deliveredarea`	Points to the delivered directory from the zip file. It contains deployment packages necessary for the deployment admin test.

Table 1-5 Mobile RI Properties

`org.osgi.impl.service.deploymentadmin.userprompt`	`true` means the implementation of the `UserPromptCondition` must do a real user prompt, otherwise it is assumed to run in a regression test and should not consult the user.
`org.osgi.impl.service.deploymentadmin.keystore.file`	Place where the keystore is located
`org.osgi.impl.service.dmt.DigestDelegate`	Class that implements the Digest Delegate

The ant target to run the Mobile Tests in the director and target directories is:

```
run-mobile
```

2.5 Running the Tests against the RI

The RI must is licensed separately from the TCK. However, this description can help to setup a specific framework for running the TCK.

The following directions assume that you have "`java`" and "`ant`" in your `PATH` variable. That is, when you type "java", it will execute the java VM. The example is tested against Java 1.4 and Java 1.5 and ant 1.6.

There are two directories necessary for running the tests. The first directory is the target directory which contains an ant script that runs the *target*; the target is the device under test. The other directory is the director directory that has an ant script to run the test in the director. The ant scripts must be started in different process or devices. The `osgi.properties` assume they run on the same machine but this can be modified. The target should be started before the director.

In the director directory, please modify the appropriate properties for your environment in the `osgi.properties` file.

The following targets are supported in the director and target build:

- *run-core* – Core Framework and Framework services
- *run-cmpn* — Compendium services
- *run-mobile* – Mobile services

Additionally, you can run the following target in the director directory:

- *director* – Run the GUI

The script can fail if the appropriate tests are not installed.

The director script generates a file called "run-xxxx.xml" in the director directory. This is a report of the run. It is also possible to generate an html file, but the XML should be readable in most browsers because it contains an XSL style sheet header.

2.6 Sample Run

Most of the details are abstracted in the ant files. In principle a framework must be started in the target directory as well as the director directory. Both directories support the run-xxxx target.

First the target framework must be started. Start a shell (both a windows shell or a Linux/Unix shell should work) and cd to the ./target directory. Run ant run-core in this directory.

```
$ cd ./target
$ ant run-core
Buildfile: build.xml
run-core:
-run:
     [echo] Testing file:../osgi.core.impls.jar
     [java] Bundle id is 9435
     [java] Bundle id is 9436
     [java] Bundle id is 9437
     [java] No files specified  in Group-Load manifest tag:
```

The default target is to only run the core RI. The last line of the output contains a warning that can be ignored. The target will run until it is quit (possibly by the director) or when no activity has taken place for a certain time. This time-out prevents target frameworks from running forever and polluting the system.

Now a director framework must be started. Start a new shell and cd to the ./director directory. Also run ant run-core.

```
$ cd ../director/
$ ant run-core
Buildfile: build.xml

director:
 [java] Bundle id is 2215
 [java] Bundle id is 2216
 [java] Bundle id is 2217
 [java] osgi> Discovery starts.
```

It is possible that there is a warning

```
 [java] DatagramSockeet for target discovery already
        in use (2001)
```

This warning can be ignored, it means that there is another director running (e.g. the OSGi Test plugin for Eclipse). The default configuration of the properties always assumes the localhost as where the target is running. You can change this property, see *Director Properties* on page 10.

The build file will run a test script in the directory. There are separate scripts for each set of tests. The scripts normally delay for a number of seconds to finish installation and then sequence the test cases. For the target, the output looks like:

```
[java] Target: Accepting connection from /127.0.0.1
[java] Target: Installing test.framework.classloading_TBC
[java] Log: [begin=testAllServiceListener001]
[java] Log: #Checking if an event is delivered for a bundle
       which imports a assignable service interface
[java] Log: #Checking if an event is delivered for a bundle
       which imports a non-assignable service interface
[java] Log: [end=testAllServiceListener001]
```

```
...
[java] Log: [end=testBundleContextGetAllServiceReferences001]
```

The output of the Director shell looks like:

```
[java] Listening on port 2201 ...
[java] ----------------------------------------------
[java] test.framework.classloading
[java] ----------------------------------------------
[java] test.framework.classpath
[java] ----------------------------------------------
[java] test.framework.div
[java] ----------------------------------------------
[java] test.framework.dynpkgimport
[java] ----------------------------------------------
[java] test.framework.filter
```

When the Director is finished, you can find a run-xxxx.xml file in the director directory. This file can be viewed in a modern browser. It is formatted with XSL; it gets its style sheet from http://bundles.osgi.org.

3 Adapting To Your Implementation

The normal way to run the compliance tests is to create a setup that is similar to the RI. This means your implementation of the Framework must be started running the `osgi.target.jar` file. This will automaticaly allow the director to control it. This implementation is carefully written to rely on as little Java and OSGi as possible.

The Director harness has many options that can be found in its manual to adapt to your environment. See *Director Properties* on page 10 for more information.

3.1 Certificate Handling

One point that must be taken care of is certificate handling. The RI and Tests uses a Java keystore that is included in the target directory. However, certificate handling is not standardized in OSGi and framework vendors must therefore add the "test" certificate to their own certificate repository for these tests to pass.

Usually it will take a number of rounds before the tests runs correctly on your implementation. Running all the tests for each correction can be cumbersome. The Director is therefore quite easy to use in GUI mode. Running `ant director` script in the director directory will start it in GUI mode without any test cases. The manage button allows you to install a single test case and run it individually. See *Test Harness* on page 7 for more information how the Director can be used to debug.

4 Test Harness

The Director is a test harness for OSGi test cases. It runs on an OSGi Framework and controls a target implementation framework via a network connection. The Director can be used interactively in GUI mode or via a script for automated testing. The tool has a number of options that can be set using system properties.

The output of a test run is colleced in an XML file. The XML file can be mailed, posted, as XML or HTML, or stored in a standard place.

The complete test harness is packed together with the compliance tests zip file.

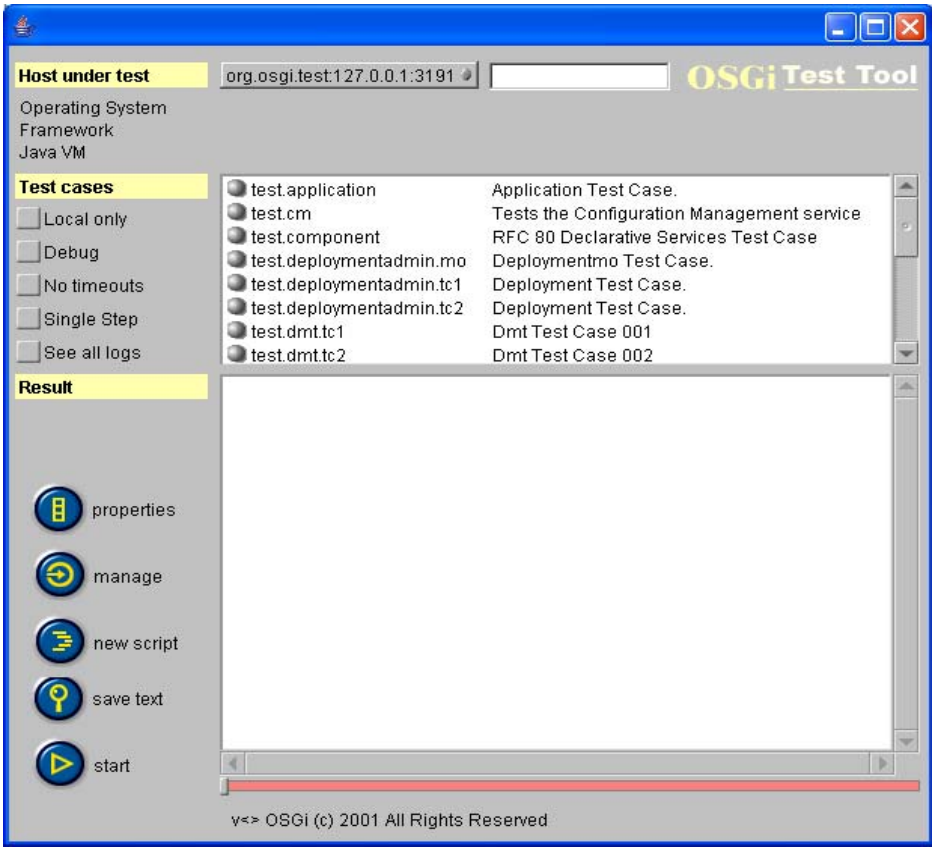
The target is a minimal bundle that announces itself on the local network so that a Director can find it. The Director can then interactively run test cases on the target.

4.1 The Director GUI

The GUI allows the interactive manipulation and execution of tests. The GUI is written using Netscape IFC. This is a different UI than Windows or Swing but should be quite straightforward to use for most computer users. The UI is shown in Figure 1-1.

The following sections explain how the GUI can be used.

Figure 1-1 OSGi Director GUI



1.1.1 Selecting a target

Goto the menu on the top of the page. The menu shows all the active targets that are available on your network. Select the one needed. The UI will remember your choice, even when targets go away or come.

Sometimes a network contains multiple targets and you are only interested in the local target (i.e. a target running on your own computer). In that case, there is a checkbox "local only" that will help. It will remove all targets that come from other computers than your own computer.

1.1.2 Selecting a "challenged" target

Some OSGi environments are not capable of broadcasting the announcement messages or they are on another network where broadcasts messages are not forwarded. There are multiple solutions to this problem.

- First, on the top right site there is a text field. Typing the name of the host (or IP number) and hitting enter/return will create a target to that host.
- The other solution is to set the broadcast address of the target to a single address of your host computer. This is done by setting the system

property: `org.osgi.test.broadcast` to the destination system (or network) in the target properties.

1.1.3 Selecting test cases

Select the testcases you want to execute. No selected testcases is the same as selecting all. Multiple testcases can be selected with selecting the first and then keep the mouse pressed and dragging it to include more. Unfortunately, the standard select + shift/control does not work.

1.1.4 Starting a test run

A test run is started with pressing the start key. The key will become red to indicate a run is in progress. The UI, however, remains active and responds to other button clicks. You can still scroll through the testcases and messages. Pressing the same button again (now called *stop*) will attempt to stop the run. This can cause many exceptions on the target because it requires the cooperation of the test case itself. It does therefore not always respond immediately but will finally timeout.

1.1.5 Setting the Test Properties

The UI allows the selection of a properties file that is downloaded to the target. The "properties" button opens a file chooser that selects the appropriate properties file. This function will only set the system property `org.osgi.test.properties.file` to the file path. For each test run, this will cause the Director to download the given properties file to the target.

1.1.6 Debugging a test run

There are two support options for debugging a test case. First option is to select the debug checkbox; this will log more information. The second option is to select the single step checkbox. Every time the test case sends log information, the start/stop button will change and the progress halts. This allows you to inspect the target framework and look at the bundles state. Time outs might step in if the session takes too long. In that case, use the disable timeouts checkbox option.

1.1.7 How to see the log

All information that is logged from the target is compared to a reference log. Due to the size of the information it is not useful to see it when everything is passing. However, during debugging it is useful to see this information. First, it is always displayed on the console of the target framework. Second, checking the ' 'See all logs' checkbox will show the result in the message window.

1.1.8 Progress

Some test cases can take a lot of time to execute. Well written test cases should indicate progress by sending the percentage of work done. The UI will show the progress but also a '.' for each received log entry.

1.1.9 Managing the director framework

The Director framework can be managed when the *Manage* button is pressed. A small window opens that shows the state of all bundles in the director framework. There are buttons to start/stop/update/uninstall and install bundles. The manage window can sometimes be very useful. For example, it allows one to install test case bundles.

The text line at the bottom of the window is a filter of the bundle symbolic name. Only bundles whose names start with the given prefix are visible. This prefix is default test. for test cases, however, this can potentially hide newly installed bundles when the bundle name does not start with test. Just remove the prefix and press Enter and all bundles will be visible.

1.1.10 Running a script

A script can be selected from the UI with the *Script* button. You are then asked to open a file. A reference to this file is placed in the Framework's registry as if it was a normal testcase. This allows scripts to be executed as normal testcases. Scripts cannot be removed.

1.1.11 Saving the messages content

The message window can be saved with the 'save text' button, or it can be copied to the clipboard. Copying is achieved by selecting the text in the message window and typing ^C (Control key + C key at the same time).

1.1.12 Seeing the test result

After a test run, the message window and the status line will show where the results can be found. The easiest way to direct your browser is to copy the URL (^C) and paste it in the appropriate place of your favorite browser.

1.2 Director Properties

The Director is normally configured with a number of System properties. These are explained in the following table:

Table 1-6 Director Properties

Property	Default	Description
org.osgi.test.batch.target	localhost:3191	This the host and port of the target that is used for running a script.
org.osgi.test.batch.script		A URL (mandatory, no filename alone) of a script. The script should contain an XML script.

Table 1-6 Director Properties

org.osgi.test.batch.out	<date & time >.xml	A URL or a file name (if the name does not have ':' between the 3 and 10th character it is assumed to be a file name) of a script. The URL is used in the output mode. There exist many URLs that work that way: mailto:cpeg@mail.osgi.org?subject=Test+Result Will send a mail, on some systems this requires the Java mail.host System property to be set! ftp://cpeg:password@membercvs.osgi.org/testresult.xml Will only work on systems that implement output on the FTP stream handler. http://membercvs.osgi.org/servlet/testresult.xml - Will do a POST on the given server result.xml - Assume normal file name result.html - URLs or filenames ending in HTML are stored as HTML and not the default XML
org.osgi.test.batch.ui	script ? false : true	Defines if there is a UI. If the property is set to 'false', the UI is not started. The default tries to be intelligent. If a script is run, there will be no UI. Without a script there is a UI. The UI follows the script run if it is open and can be used for debugging.
org.osgi.test.batch.quittarget	false	This property defines if the target should be exited at the end of the script test run.
org.osgi.test.compliance.applicant		This property can identify the applicant for the compliance program.
org.osgi.test.compliance.program		Specifies the compliance program this test run was done for.
org.osgi.test.compliance.campaign		The campaign id for the compliance program.
org.osgi.test.properties.file		The value of this property is used a file name of a properties file. If this property is set and the given file exists, it is loaded into a Properties object and send to the target. The target will use these properties to override and augment the target's system properties.

1.2.1 Target Properties

The following properties are for the target framework.

Table 1-7 Target Properties

org.osgi.test.target.port	3191	This property is intended for the target framework. Normally, the target framework listens at 3191 and this property can change that. The target informs the director of this port through a broadcast message so no property is necessary for the director.
org.osgi.test.broadcast	255.255.255.255	The target uses this property to broadcast the announcement package. The default works fine and works for most systems. It should be used when the broadcast should be limited to one network, or it is limited to a single host. For a host the actual IP can be used, for a network, network broadcast address should be used which is for example 172.16.255.255. On some systems the broadcast address is 0.0.0.0, in that case this property can also be used.
org.osgi.test.seewait	false	Testing is not easy and writing test cases is harder. This property sets a simple animation when the target is waiting for input, indicating that it is ready to listen to the director. There are two animations: • |/-\ for normal operation • ?!?! when there is an exception (usually security) during the sending of the announcement.
org.osgi.test.testcase.timeout	60000	Timeout used for communication between director and target for testcase communication when the testcase is based on the classes in org.osgi.test.cases.util
org.osgi.test.testcase.watchdog	10	If this property is set, the target will exit after 30s * this value seconds. Deault, after 5 minutes the watchdog will exit. This is intended to be used when the test is run in a batch file every couple of hours and there are test cases that make the target hang.

1.3 The Script language

The director implements a simple script language for controlling the test cases. A script can look like the following example:

```
<script name="compliance" version="1.0">
   <delay duration="10" type="sec"/>
   <istart>
      <url>http://membercvs.osgi.org/project/sp-r3/bundles/
org.osgi.test.cases.useradmin.tc1</url>
```

```
      <url>http://membercvs.osgi.org/project/sp-r3/bundles/
org.osgi.test.cases.useradmin.tc2</url>
      <url>http://membercvs.osgi.org/project/sp-r3/bundles/
org.osgi.test.cases.useradmin.tc3</url>
   </istart>
   <testcase>useradmin.tc2</testcase>
   <waitfor max="10000"
      count="1" poll="500">
   (&(objectclass=org.osgi.test.TestCase)
      (name=permissions.tc))</waitfor>
   <updateFramework/>
   <reboot status="0"/>
</script>
```

In detail:

Construct	Attributes	Description
<script>		This is the outer marker of the script.
	name	Identifying name of the script
<waitfor>		Wait for a number of services to appear in the service registry for a maximum time. The value of the tag is a filter expression for the Framework.
	max='10000'	Maximum time to wait in ms
	count='1'	Number of services that should come out of getServiceReferences with the associated filter.
	poll='500'	Number of ms between checks of the registry.
<delay>		Wait for a number of seconds.
	duration='10'	Time to wait, unit depends on type.
	type='sec'	Unit, can be week, hour, day, minute, sec, ms
<istart>		Install and start a bundle from a url.
<url>		URL for a bundle to be started.
<testcase>		Run a testcase. The body of the tag is trimmed of spaces and looked up in the registry. If such a test case exists, it is executed in a new session.
<properties>	location	Set the `org.osgi.test.properties.file` System property so that the properties file is downloaded for every test case and its content is merged with the Target's system properties.
<updateFramework>		This function will update the framework on the target. It will call Bundle.update() on the bundle with ID=0. This will of course terminate the session, but if a delay is inserted, the next line of the script could run on the same target after it is restarted.

<reboot>		This function will exit the framework on the target. It will call Bundle.stop() on the bundle with ID=0. This will of course terminate the session. However, if the target framework is restarted with a script that starts it again, a small delay can be used to continue the test run. Note that the exit status can be used by the script on the target machine to stop the framework or restart.
	status='0'	Set the exit status of the target framework.

1.4 The Command Line

The director supports the CommandProvider interface. It will register a CommandProvider with the Framework when it starts. The `org.osgi.tools.console.jar` bundle can be run on the director Framework at the same time. This console will listen on port 2201 (or a next port if it is busy) for a telnet session. The director adds the following commands to the console:

Table 1-8

Command	Options	Description
startrun		Starts a test run. This command must precede any testcase or exec commands.
	-host localhost	Defines the host where the target runs
	-port 3191	The port where the target runs.
	-forever	Will not time out on messages.
	-debugging	Generate extra debugging information
exec	<script name>	Execute a script. This can only be done after a startrun is given.
exec	<script name>	Execute a script. This can only be done after a startrun is given.
	-output <file name>	Places the output in a file.
testcase	<testcase name>	This will lookup the test case with the given name and executes it in a new session.
stoprun		Stop the current run and return the name of the result file. This is an XML file stored in the history directory of the bundle. It can also be found on the web on http://host:port/test/director

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