Beware: Testing RCP Applications in Tycho can cause Serious Harm to your Brain

- Dependencies
- Debugging
- Surefire
- JUnit
- OSGi
- Mac OS X
- Update Site
- Tycho
- p2

Bortion Data
Beware: Testing RCP Applications in Tycho can cause Serious Harm to your Brain

For our Business Integration product - AGETOR -, we have built an IDE based on Eclipse. Until recently this product has been build using PDE Build and simple JUnit testing.

As we anticipate a lot of new features in this IDE over the next year, we have refactored the compete code base and moved from PDE Build to Tycho. And with that we also need to move our various tests to Tycho.

Where the move from PDE Build to Tycho wasn't too difficult (once you have studied the various examples on the web and the Tycho sessions from the previous EclipseCons), moving the tests was an entirely different story!

In the "old" days, to test an RCP application, you traditionally "just" added a number of JUnit related plug-ins and fragments and ran all your tests in the same basic environment as the original application. Not so when you use Tycho as the build system. Here each test usually is run in a much smaller environment that just includes the plug-in or bundle to test and not everything else. As we found out, this can give you some unexpected problems when you want to test OSGi services, extension points, update sites and other "things" that are not based on pure OSGi dependencies.

In this session, I will show some of the problems we ran into and illustrate how we solved the problems. As it turns out, you can actually test a lot more when using Tycho than when using PDE Build, but it does take some getting used to..
Why Tycho/Surefire for Tests? Less is More...

Only the needed environment is present

- Based on OSGi dependencies

Each Maven module is basically a separate testbed

More can be tested with Tycho than with the usual PDE/JUnit approach

- Update sites
- Different configurations of extensions and services
- Mocked OSGi services and APIs
- Specific Environment for Specific Failures
Some Sources for Harm to Your Brain...

UI or not

System Software Dependencies
- Mac OS X
- 32 versus 64 bit
- Java

Dependencies outside OSGi
- Declarative Services
- Extension Registry
- Update Sites

Specifying Dependencies

OSGi Boot Loader Arguments

When Tests Fail Inconsistently
UI Testing or not...

Simple on the surface:

➢ If you test UI stuff just add "<useUIHarness>true</useUIHarness>" to the test configuration

➢ But the test sequence also gets much slower

```xml
<project>
  <packaging>eclipse-test-plugin</packaging>

  <parent>
    <groupId>com.agetor.v5</groupId>
    <artifactId>com.agetor.wb.parent</artifactId>
    <version>1-SNAPSHOT</version>
    <relativePath>../com.agetor.wb.parent</relativePath>
  </parent>

  <build>
    <plugins>
      <plugin>
        <groupId>org.eclipse.tycho</groupId>
        <artifactId>tycho-surefire-plugin</artifactId>
        <version>${tycho.version}</version>
        <configuration>
          <useUIHarness>true</useUIHarness>
        </configuration>
      </plugin>
    </plugins>
  </build>

</project>
```
UI Testing or not...

But it quickly gets more complicated:

- If any part of the bundles under test - directly or indirectly - depends on `IWorkbench`, then it is a UI test

Typical Problems

- **Most services** - e.g. the `ICommandService`, `IHandlerService`
- Help System
- Expressions
- Resources in your bundle
System Software Dependencies

In theory Maven and Tycho should factor out all the architectural dependencies, but that is not always the case.

- Mac OS X
- 32 versus 64 bit
- Memory and options
Additional “Hidden” Dependencies

Tycho detects OSGi/Java based dependencies

Optional Dependencies?

RAP versus RCP?

Declarative Services

Extension Registry

Update Sites

JSR 223

Buddy Class Loading

Manifest-Version: 1.0
Bundle-ManifestVersion: 2
Bundle-Name: AGETOR 5 Workbench: Base Model
Bundle-SymbolicName: com.agetor.wb.model;singleton:=true
Bundle-Version: 1.1.0.qualifier
Bundle-ClassPath: .
Bundle-Vendor: Bording Data A/S
Bundle-Localization: plugin
Export-Package: ...
Require-Bundle: org.eclipse.core.runtime,
                 org.eclipse.emf.ecore;visibility:=reexport,
                 org.eclipse.xtext.xbase.lib;visibility:=reexport,
                 com.rcpcompany.uibindings.moao;bundle-version="[1.2.0,2.0.0)",
                 org.eclipse.equinox.ds;bundle-version="[1.4.0,2.0.0)"
Import-Package: com.agetor.wb.ui.preferences;version="1.0.0",
                 com.rcpcompany.uibindings.model.utils,
                 com.rcpcompany.utils.logging;version="[1.5.0,2.0.0)",
                 org.eclipse.emf.ecore.xmi.impl,
                 org.eclipse.jdt.annotation,
                 org.eclipse.jface.preference,
                 org.eclipse.jface.util,
                 org.eclipse.ui.preferences,
                 org.osgi.service.component.annotations
Service-Component: OSGI-INF/com.agetor.wb.model.GlobalSettings.xml,
                 OSGI-INF/com.agetor.wb.model.internal.SettingsService.xml
Bundle-ActivationPolicy: lazy
Bundle-RequiredExecutionEnvironment: JavaSE-1.6
Declarative Services

OSGi Declarative services does not play well with Tychos dependency resolution!

Services not discovered at all???

- Add “org.eclipse.equinox.ds” to Require-Bundle for all providers and users of declarative services
- Have you remembered to set “Bundle-ActivationPolicy: lazy” in MANIFEST.MF? (also known as “Activate this plug-in when one of its classes is loaded”)

Still not working?!?!

- Re-run the tests with the Eclipse flags “-Dequinox.ds.print=true -Dequinox.ds.debug=true” and be prepared for a lot of output
Declarative Services

Mock services not loaded
- Use `service.ranking=10`

It works in the IDE, but not in Tycho
- Remember to add `OSGI-INF/` in `build.properties`

```xml
<component name="com.agetor.server.mail.mock.internal.MockMailFactory">
   <property value="10" name="service.ranking" />
   <service>
      <provide interface="com.agetor.server.mail.IMailFactory"/>
   </service>
   ...
</component>
```

```properties
source.. = src/
output.. = target/classes/
bin.includes = META-INF/,
               .,
               OSGI-INF/
javacDefaultEncoding.. = UTF-8
```
Specifying Dependencies to Surefire

Dependencies can be specified in three different places

- At the POM level
- At the plugin level
- At the configuration level
Specifying Dependencies to Surefire

```xml
<project>
  <packaging>eclipse-test-plugin</packaging>

  <parent>
    <groupId>com.agetor.v5</groupId>
    <artifactId>com.agetor.wb.parent</artifactId>
    <version>1-SNAPSHOT</version>
    <relativePath>../com.agetor.wb.parent</relativePath>
  </parent>

  <dependencies>
    <dependency>
      <groupId>com.agetor.v5</groupId>
      <artifactId>com.agetor.server.site</artifactId>
      <version>5.0.1-SNAPSHOT</version>
      <type>eclipse-repository</type>
    </dependency>
  </dependencies>

  <build>
    <plugins>
      <plugin>
        <groupId>org.eclipse.tycho</groupId>
        <artifactId>tycho-surefire-plugin</artifactId>
        <version>${tycho.version}</version>
        <configuration>
          <dependencies>
            ...
          </dependencies>
        </configuration>
      </plugin>
    </plugins>
  </build>

</project>
```
Specifying Dependencies to Surefire

```xml
<project>
   <packaging>eclipse-test-plugin</packaging>

   <parent>
      <groupId>com.agetor.v5</groupId>
      <artifactId>com.agetor.wb.parent</artifactId>
      <version>1-SNAPSHOT</version>
      <relativePath>../com.agetor.wb.parent</relativePath>
   </parent>

   <dependencies>
      ...
   </dependencies>

   <build>
      <plugins>
         <plugin>
            <groupId>org.eclipse.tycho</groupId>
            <artifactId>tycho-surefire-plugin</artifactId>
            <version>${tycho.version}</version>
            <configuration>
               <dependencies>
                  <dependency>
                     <type>eclipse-plugin</type>
                     <artifactId>org.eclipse.equinox.p2.artifact.repository</artifactId>
                     <version>0.0.0</version>
                  </dependency>
                  ...
               </dependencies>
            </configuration>
         </plugin>
      </plugins>
   </build>
</project>
```
Specifying Dependencies to Surefire

```xml
<project>
   <packaging>eclipse-test-plugin</packaging>
   <parent>
      <groupId>com.agetor.v5</groupId>
      <artifactId>com.agetor.wb.parent</artifactId>
      <version>1-SNAPSHOT</version>
      <relativePath>../com.agetor.wb.parent</relativePath>
   </parent>
   <dependencies>
      ...
   </dependencies>
   <build>
      <plugins>
         <plugin>
            <groupId>org.eclipse.tycho</groupId>
            <artifactId>tycho-surefire-plugin</artifactId>
            <version>${tycho.version}</version>
            <dependencies>
               <dependency>
                  <type>eclipse-plugin</type>
                  <artifactId>org.eclipse.equinox.p2.artifact.repository</artifactId>
                  <version>0.0.0</version>
               </dependency>
               ...
            </dependencies>
         </plugin>
      </plugins>
   </build>
</project>
```

Missing `<configuration>`
OSGi Bootloader Arguments

!SESSION 2012-08-24 15:21:43.019

eclipse.buildId=unknown
java.version=1.7.0_05
java.vendor=Oracle Corporation
BootLoader constants: OS=win32, ARCH=x86, WS=win32, NL=en_US
Framework arguments: -application
org.eclipse.tycho.surefire.osgibootloader.uitest -testproperties C:\BuildAgent\work\8810fc500e9bd9f8\com.agetor.wb.support.tests\target\surefire.properties
Command-line arguments: -data C:\BuildAgent\work\8810fc500e9bd9f8\com.agetor.wb.support.tests\target\work\data -dev file: C:/BuildAgent/work/8810fc500e9bd9f8/com.agetor.wb.support.tests/target\dev.properties -application org.eclipse.tycho.surefire.osgibootloader.uitest -testproperties C:\BuildAgent\work\8810fc500e9bd9f8\com.agetor.wb.support.tests\target\surefire.properties

!ENTRY org.eclipse.osgi 2 0 2012-08-24 15:21:47.309
!MESSAGE One or more bundles are not resolved because the following root
constraints are not resolved:
!SUBENTRY 1 org.eclipse.osgi 2 0 2012-08-24 15:21:47.310
!MESSAGE Bundle initial@reference:file:../../../../common-m2-repository/p2/osgi/bundle/org.eclipse.swt.cocoa.macosx.x86_64-3.100.0.v4233d/ org.eclipse.swt.cocoa.macosx.x86_64-3.100.0.v4233d.jar was not resolved.

!ENTRY org.eclipse.osgi 4 0 2012-08-24 15:21:47.983
!MESSAGE Application error
!STACK 1
java.lang.UnsatisfiedLinkError: Cannot load 32-bit SWT libraries on 64-bit JVM
    at org.eclipse.swt.internal.Library.loadLibrary(Library.java:263)
    at org.eclipse.swt.internal.Library.loadLibrary(Library.java:156)
    at org.eclipse.swt.internal.C.<clinit>(C.java:24)
    at org.eclipse.swt.widgets.Display.<clinit>(Display.java:476)
    at org.eclipse.ui.internal.Workbench.createDisplay(Workbench.java:654)

OS=win32, ARCH=x86, WS=win32
org.eclipse.swt.cocoa.macosx.x86_64-3.100.0.v4233d.jar was not resolved

Cannot load 32-bit SWT libraries on 64-bit JVM
When Tests Fail Inconsistently...

Works in Tycho/Surefire or in PDE/JUnit... but not in both...

... so you really, really want to debug the test in Tycho/Surefire...

- use the `debugPort` parameter to `tycho-surefire-plugin`
- use Remote Java Application launch configuration with same port number

```xml
<project>
   <packaging>eclipse-test-plugin</packaging>
   <build>
      <plugins>
         <plugin>
            <groupId>org.eclipse.tycho</groupId>
            <artifactId>tycho-surefire-plugin</artifactId>
            <version>${tycho.version}</version>
            <configuration>
               <debugPort>5005</debugPort>
            </configuration>
         </plugin>
      </plugins>
   </build>
</project>
```
Testing will never be a no-brainer, but it could be easier...
More Information

http://www.eclipse.org/tycho/
➤ The Home of Tycho

http://wiki.eclipse.org/Tycho/FAQ
➤ Tycho FAQ - with many interesting pieces on testing

https://dev.eclipse.org/mailman/listinfo/tycho-user
➤ The Tycho User Mailing List

https://dev.eclipse.org/mailman/listinfo/tycho-dev
➤ The Tycho Developers Mailing List
Questions?

If you want to talk more about Tycho, tests and the various properties of the combination, meet me at our booth near Bürgersaal 1.