11 Developing for OpenClinica

How to contribute and what to work on

Read the overview of how to contribute here.

Basics of the OpenClinica Code

A typical feature might consist of a database change as well as middle-tier and back end integration.

For database changes, OpenClinica uses a 3rd party library called liquibase to upgrade the database & schema from version to version. Liquibase does a good job in maintaining the OpenClinica versions and making sure scripts are run at install/upgrade time. If the code requires a database change, such as adding a table, altering a table etc, it is important to put in liquibase script.

The business layer code implementation is based on a typical UI-Controller-transaction management model. The UI layer is common uses jsps, with JSTL libraries along with javascript and Jquery libraries.

There are 2(3) kinds of controllers used all across the OpenClinica application

1. Base controller is SecureController --> This is used widely all across the application and extends SingleThreadedModel (which is deprecated Java Servlet API 2.4). If you are developing a controller, please avoid extending this. As there is no reason to use SingleThreadedModel in OpenClinica application and this would choke up the system resources when many simultaneous requests are made.
2. Base Controller as CoreSecureController--> In order to avoid the performance issues stated above with SecureController, we removed the SingleThreaded model and came up with this servlet controller for data entry module. This can be used as an alternative.
3. The Spring MVC controller--> this would be the best way available in OpenClinica. The suggested approach to avoid all the problems stated above. You can look at rules framework to see the examples of existing approach.

Similarly on the transaction management side, there are 2 broader approaches:

1. Hibernate-spring transaction model
2. JDBC/PSQL approach

All the legacy code is written in preparedStatements using JDBC. and 90% of the existing classes use this. For example, if you have to deal with any of the objects such as Study or CRF, it would be easier to use the existing beans. However, if you have a new set of tables and have a transaction model attached to it. use the Hibernate/Spring approach. There are already existing implementation for hibernate part of the code,

As you might be aware, we are extensively utilizing javascript libraries for implementing the printable forms module, and this is the preferred paradigm for future development.

Thanks and please do not hesitate to ask questions or seek guidance on the forum.

Setting up Your Development Environment

Clone from GitHub

Clone OpenClinica from https://github.com/OpenClinica/OpenClinica

Developing with the Eclipse IDE

This guide covers the installation and configuration of a development environment using Eclipse, which is the IDE used by the OpenClinica development team. Other IDEs can be used, although their configurations instructions are not covered here.

Prerequisites

Name	Recommended Version	Link
Java Development Kit (JDK)	1.7.x	www.oracle.com
Eclipse	Eclipse IDE for Java EE Developers - Indigo (3.7.1)	www.eclipse.org/downloads
Apache Maven	3.0.x	maven.apache.org/download.html
Apache Tomcat	7.x	tomcat.apache.org/download-60.cgi

Install prerequisites

1. Install the JDK, export the `JAVA_HOME` environment variable to point to the JDK directory;
2. Install Maven, export the `M2_HOME` environment variable to point to the installation directory;
3. Extract the Tomcat installation file.
4. Add the `bin` directories of the JDK and Maven installations to your `PATH` environment variable.

```
# On Windows set JAVA_HOME=<path to the JDK installation>
set M2_HOME=<path to the Maven installation>
set PATH=%JAVA_HOME%bin;%M2_HOME%bin;%PATH%

# On Unix export JAVA_HOME=<path to the JDK installation>
export M2_HOME=<path to the Maven installation>
export PATH=$JAVA_HOME/bin:$M2_HOME/bin:$PATH
```

To check if this configuration is ok, run `mvn -version` in your command prompt.

Build the project

Go to the directory where you checked the code out and run

```
mvn clean install -Dmaven.test.skip=true
```

Configure Eclipse

Extract the contents of the Eclipse installation file, then edit the `eclipse.ini` file. Add the `-vm` option to point to the `javaw` executable in the JDK (not the one in the JRE), and change the minimum and maximum memory settings (respectively `-Xms` and `-Xmx`).

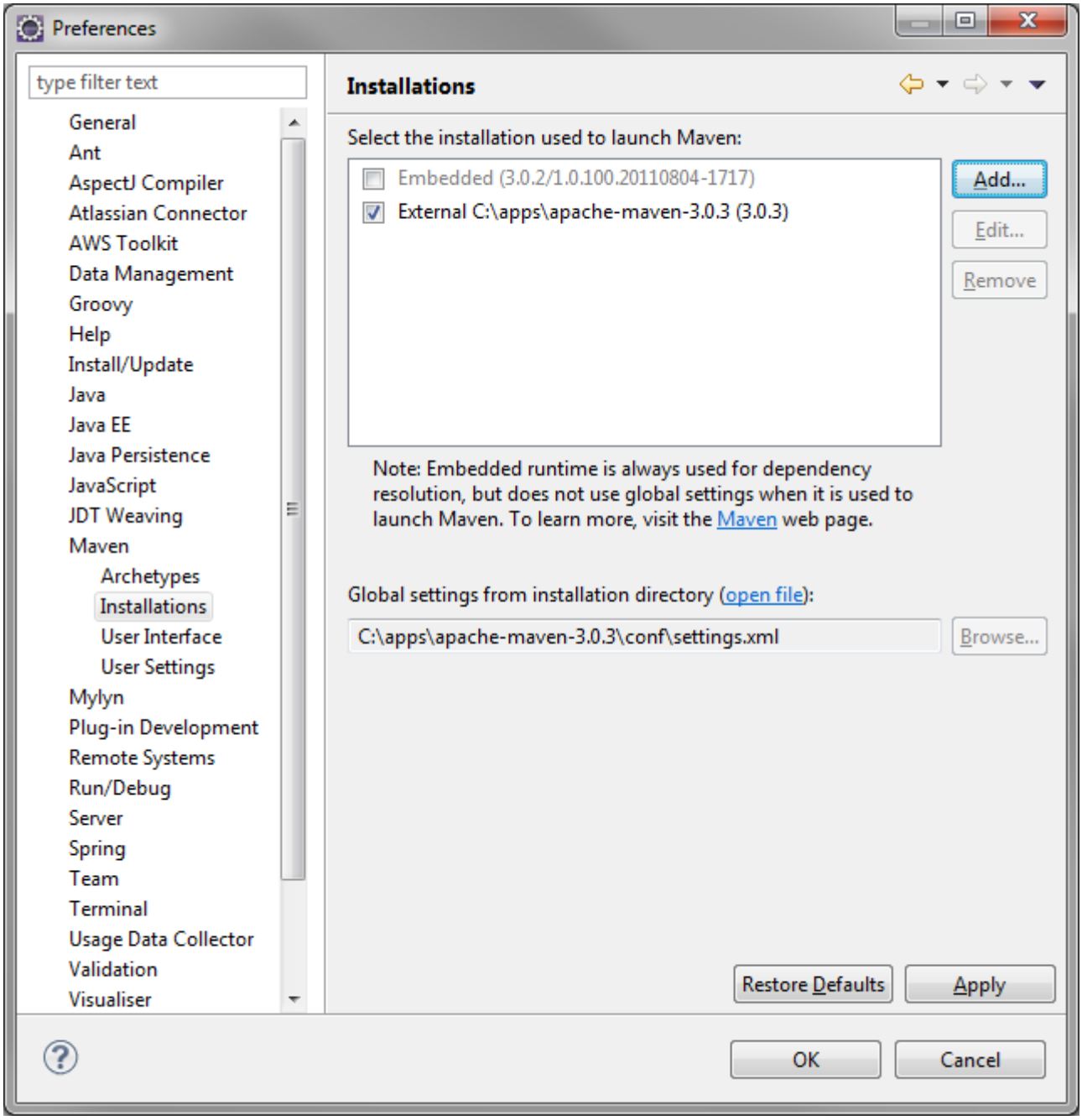
```
[...]
-vm
```

```
<point to $JAVA_HOME/bin/javaw>
-vmargs
-Dosgi.requiredJavaVersion=1.5
-Xms256m
-Xmx1024m
```

Start Eclipse, create a new workspace and go to `Help > "Install New Software..."`. In the field `"Work with"`, enter the plugin installation URL as listed in the table below. After installing each plugin, you will be prompted to restart your Eclipse. Restart it and install the next plugin in the list.

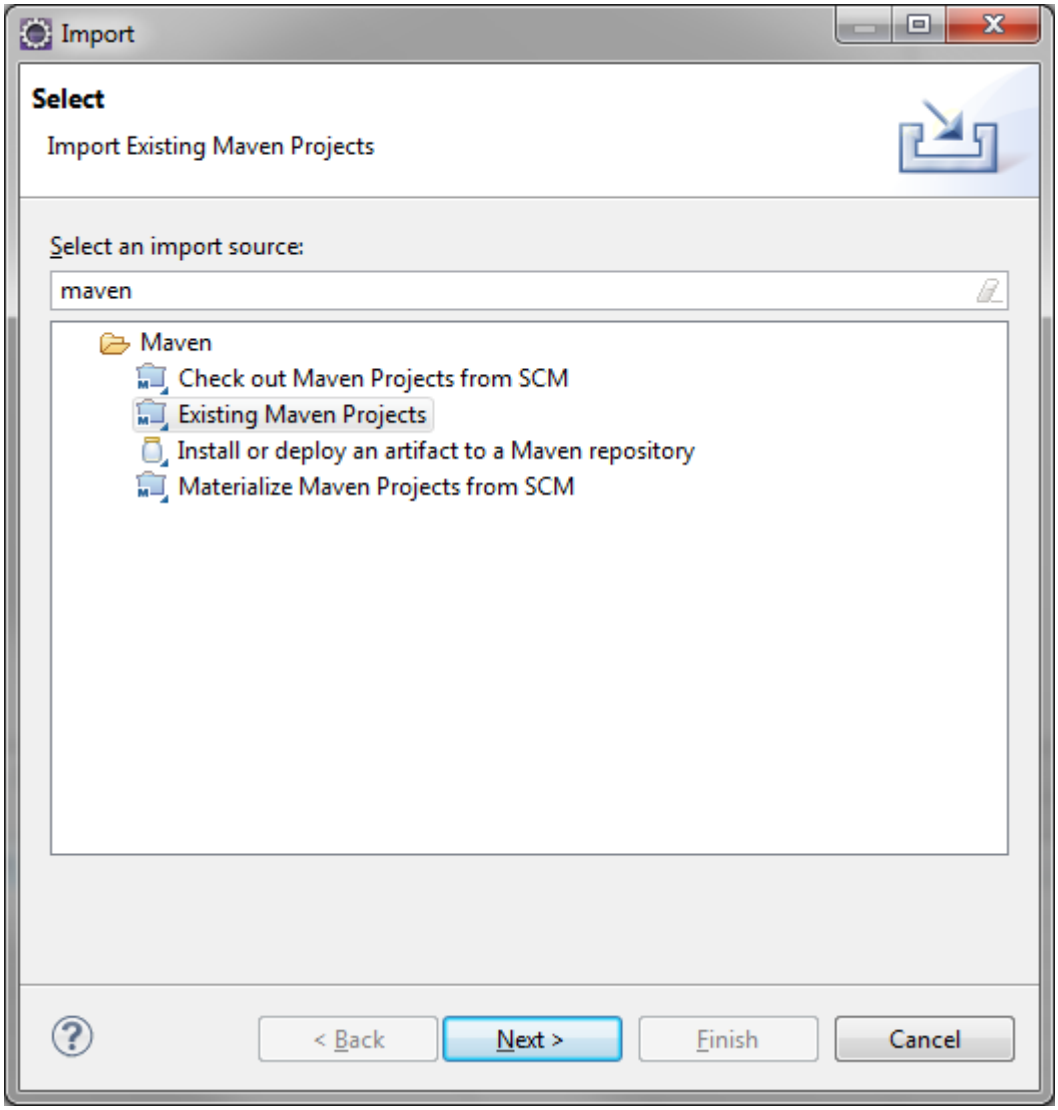
Plugin name	URL
m2eclipse	download.eclipse.org/technology/m2e/releases
MercurialEclipse	cbes.javaforge.com/update
Spring IDE	dist.springsource.com/release/TOOLS/update/e3.7 - Check only Spring IDE Core (required)

After restarting Eclipse, go to `Window > Preferences`. In the left hand side menu, select `Maven > Installations`, and point to your local Maven installation.



Configure the project

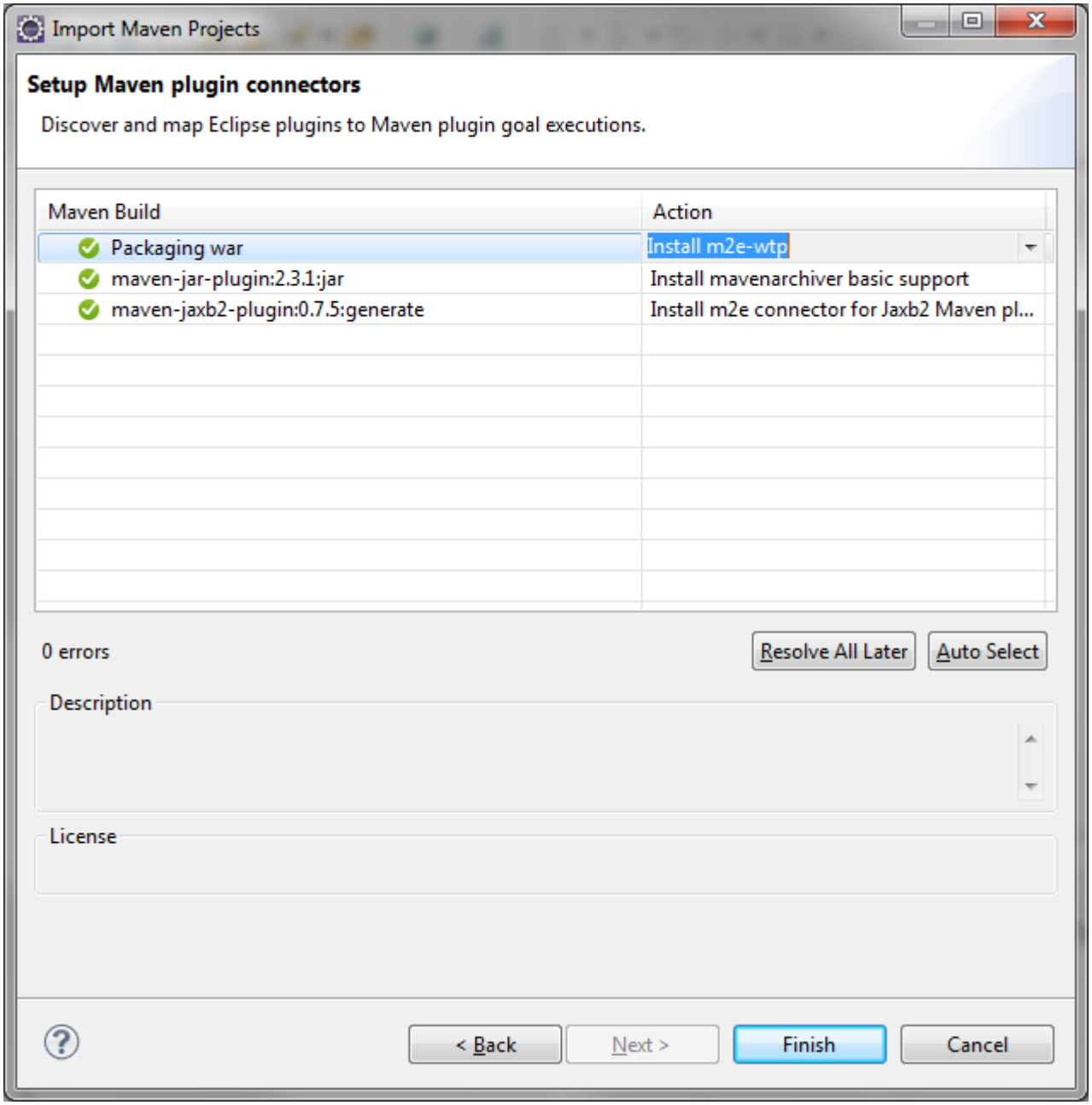
Click File > Import > Existing Maven Projects.



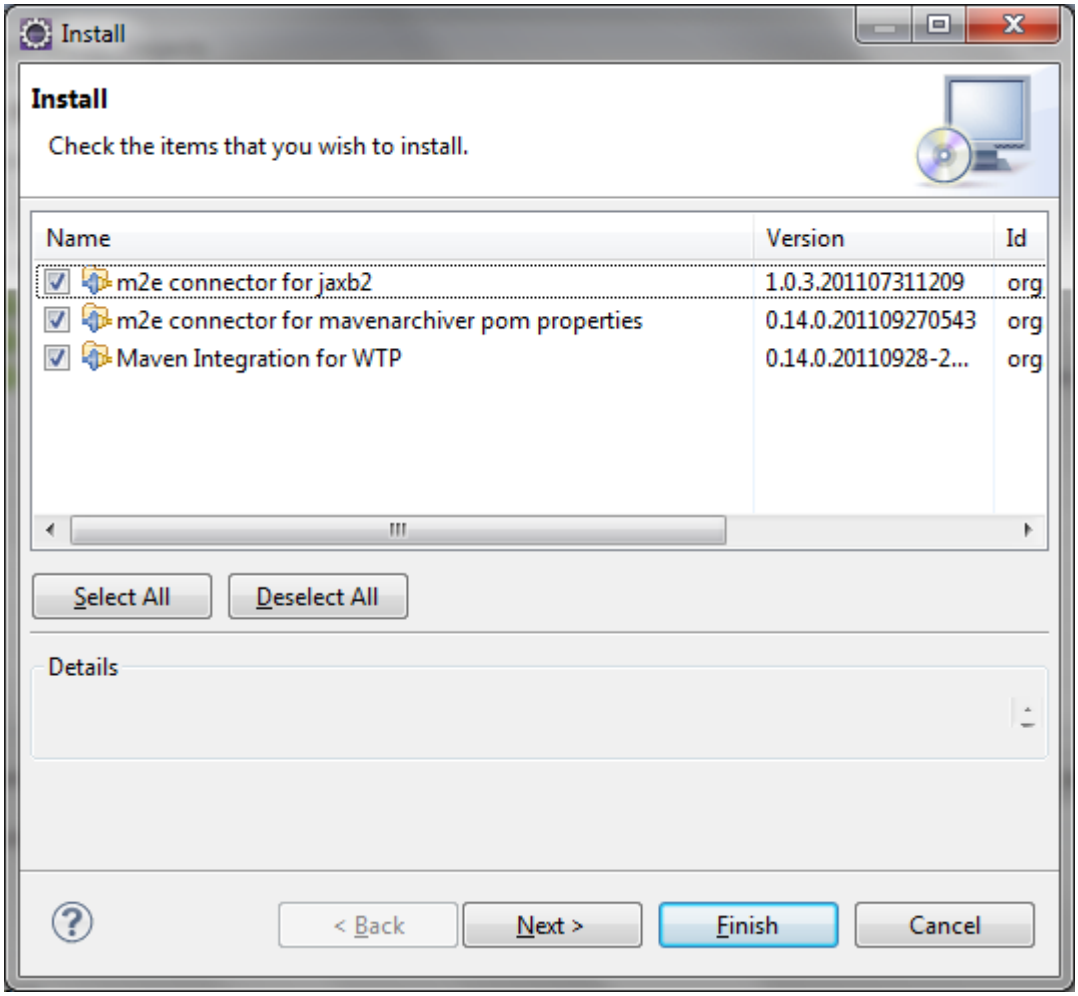
Point to the directory where the code is, mark all the projects, and select the following plugin connections actions:

Maven Build	Action
Packaging war	Install m2e-wtp
maven-jar-plugin:<version>:jar	Install mavenarchiver basic support
maven-jaxb2-plugin:<version>:generate	Install m2e connector for Jaxb2 Maven plugins

Your configuration should look like in the screenshot below.

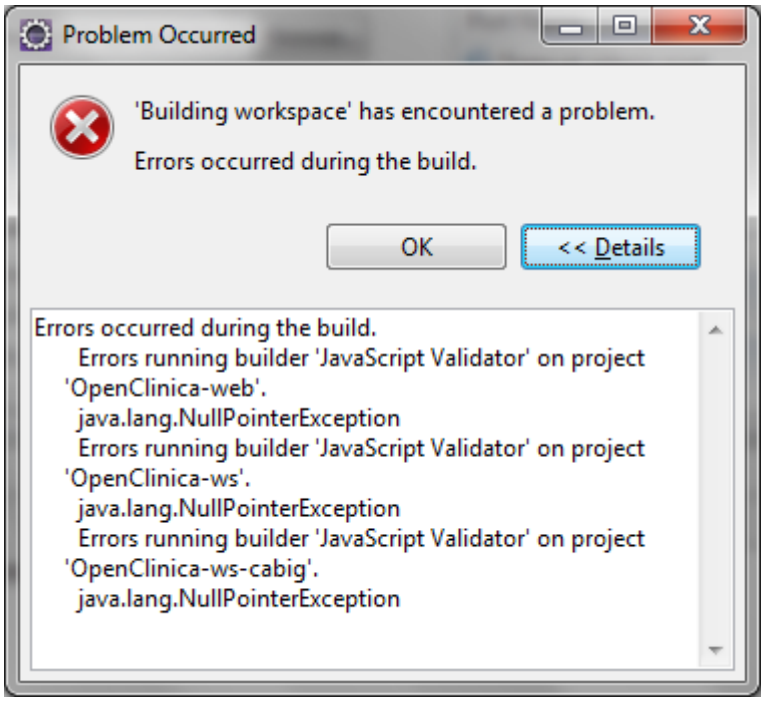


Eclipse will prompt you to download and install the connectors. Click "Next".



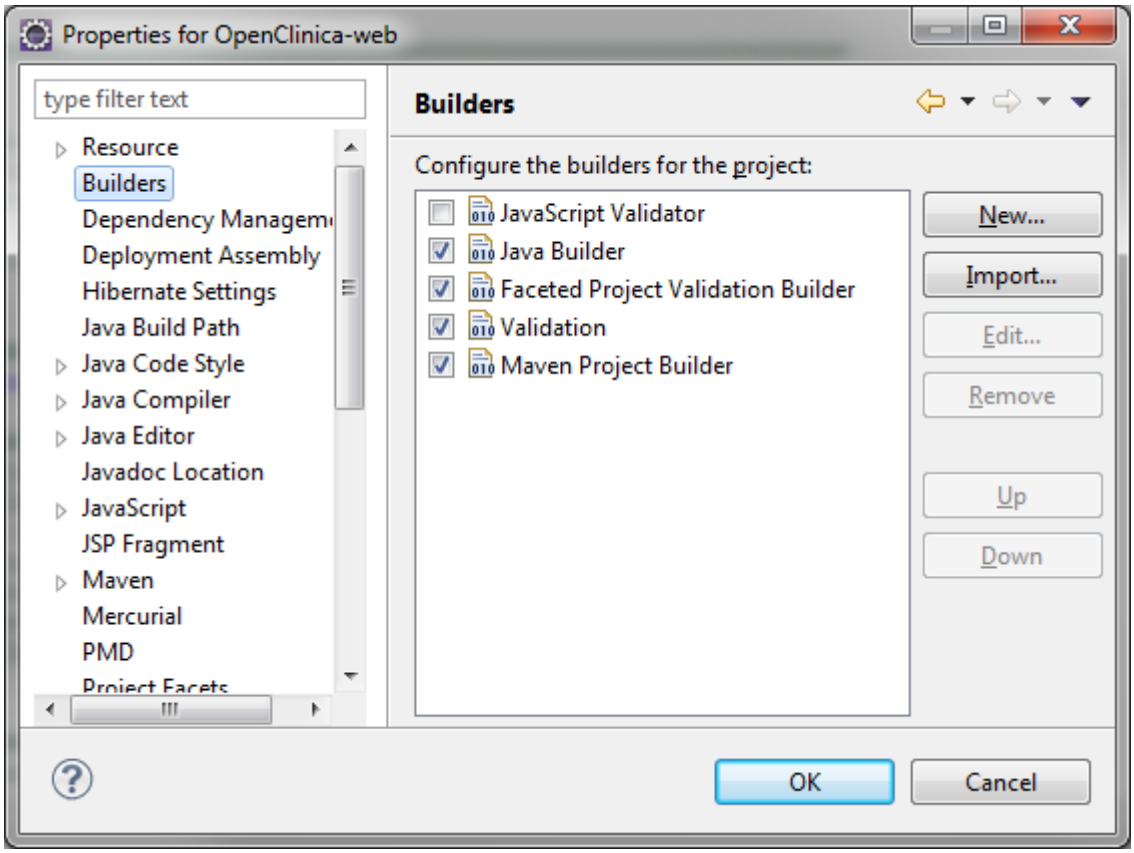
Confirm the installation of the m2e plugins. Restart Eclipse so the changes will take effect. You should then see the OpenClinica projects configured in your IDE.

Eclipse may show a JavaScript related error message when build your project. This is likely a bug on the IDE or its plugins, but has no impact in the environment setup.



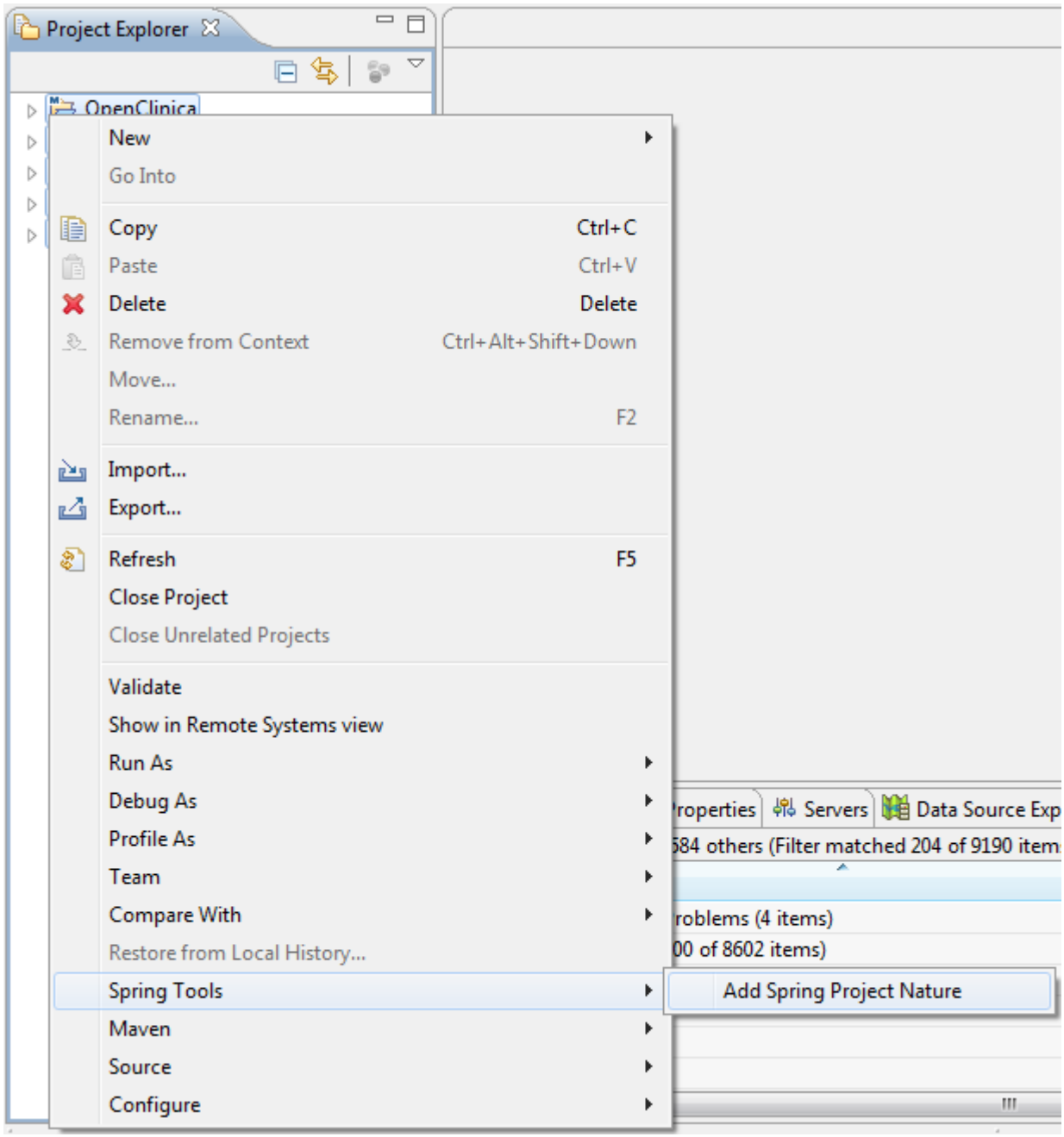
To fix this error message, right-click your OpenClinica-web project and select "Properties". On the

left hand side menu, select "Builders". Disable the JavaScript Validator builder for this project. Repeat the procedure to disable it for the ws and ws-cabig projects.



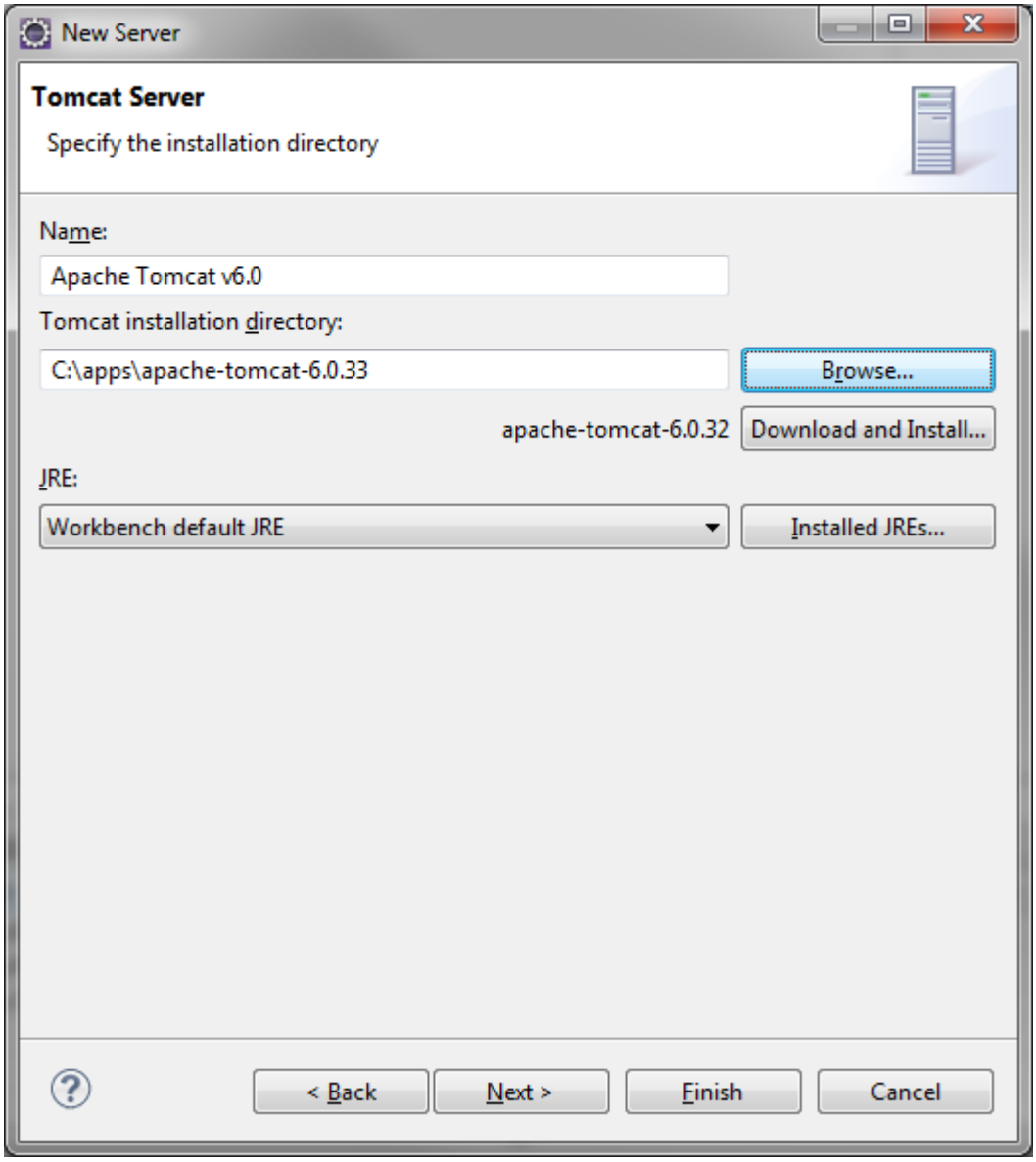
You may see some warnings and errors not related to Java files (e.g., XML validation). To turn those alerts off and to have a faster build, go to "Window" > "Preferences", then under "Validation" check "Suspend all validators".

Enable the Spring plugin by selecting all the projects in the "Project Explorer" view, right click them and select "Spring Tools" > "Add Spring Project Nature".



Create a server

In the "File" menu, select "New", then under "Servers", select "Server". Expand "Apache", click "Tomcat v6.0 Server" and click "Next". Under "Tomcat installation directory", browse to the directory where you extracted Tomcat. Click "Next":

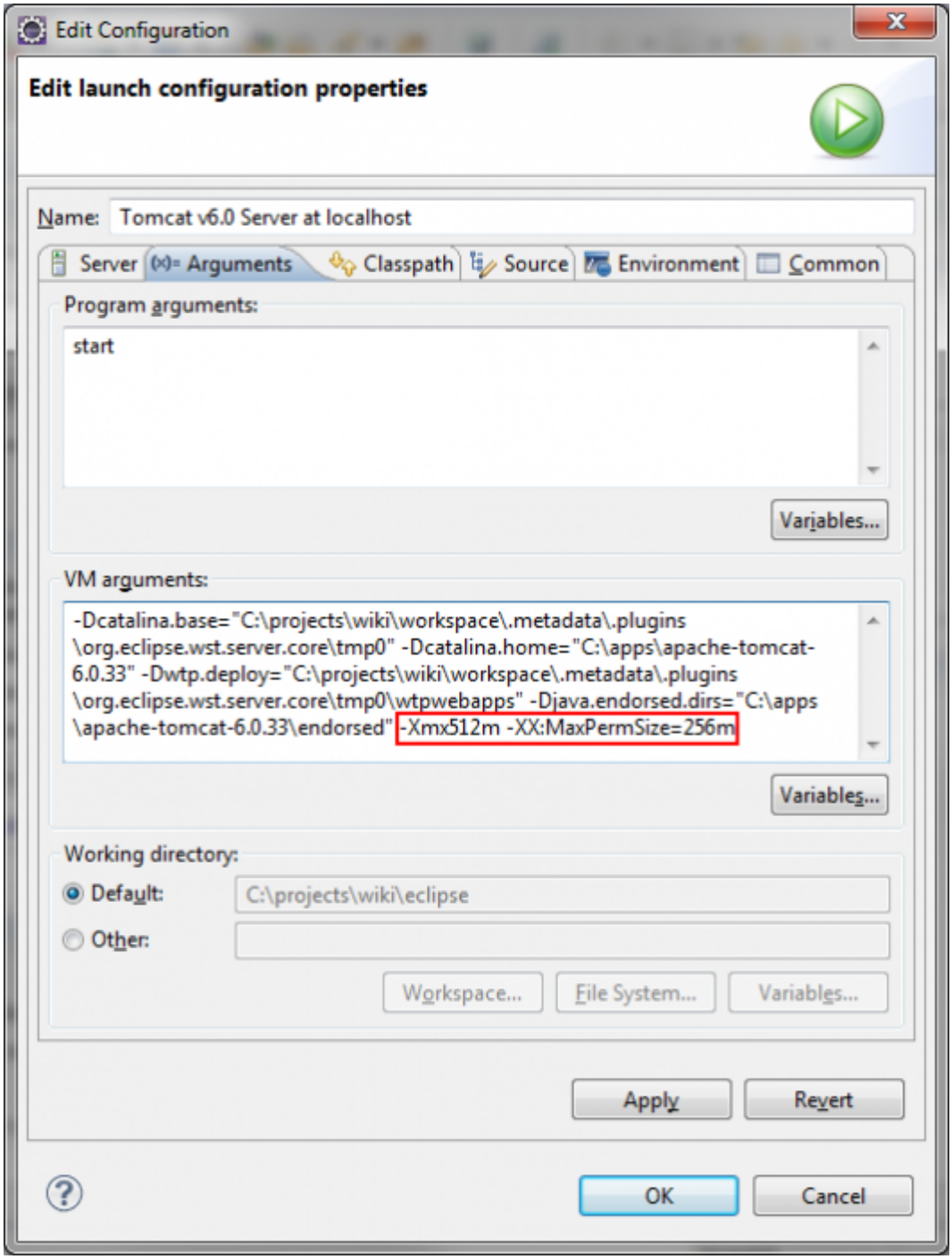


Select in the list on the right hand side the projects you want to deploy in the server, click "Add >", then "Finish".

Configure the server

Double-click the name of your server in the "Servers" view to open the server configuration screen. Under the "General Information" section, click the link "Open Launch Configuration", then click the tab "Arguments". Add the following properties to the field "VM arguments".

```
-Xmx512m -XX:MaxPermSize=256m
```



Under the "Timeouts" section, set both "Start" and "Stop" to 999. Save the changes to the server by clicking "File" > "Save".

Configure JRebel (Optional)

Prerequisites

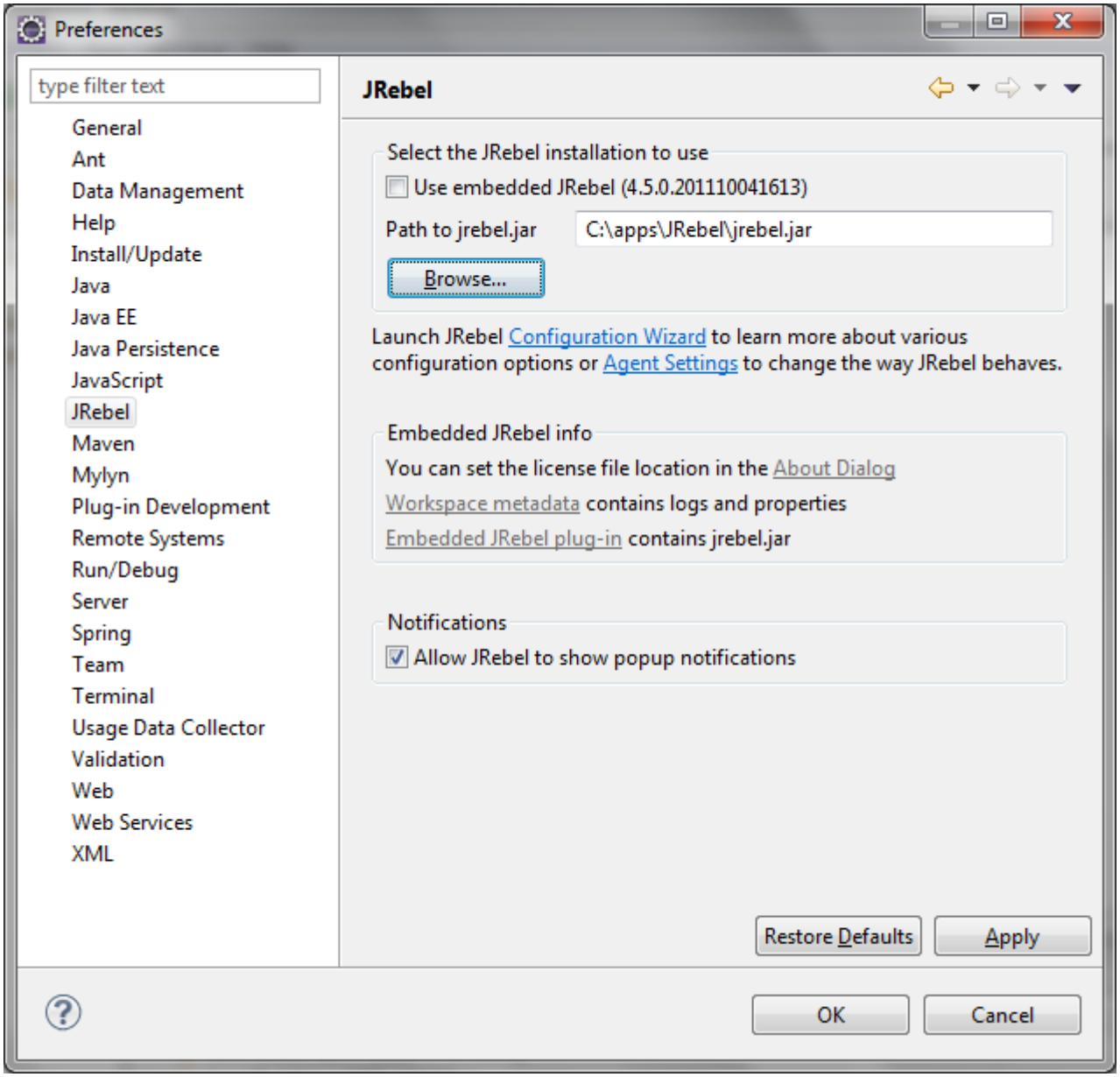
Download the JRebel installer corresponding to your operating system (not the Eclipse plugin, which will be installed in the next step) from http://zeroturnaround.com/jrebel/current/. Copy the license file (.lic) to the same directory where you installed JRebel. This license file must be in the same directory as the jrebel.jar file. JRebel will work in trial mode without the license file.

Configure Eclipse with the JRebel Eclipse plugin.

Download the JRebel Eclipse plugin from http://www.zeroturnaround.com/update-site. Select all the

items under the first group "JRebel".

Restart Eclipse when prompted. The JRebel Configuration Wizard screen should appear after Eclipse starts. Click "Cancel". Go to "Window" > "Preferences", and under "JRebel", uncheck "Use embedded JRebel". Click "Browse" and locate the jrebel.jar file in the JRebels installation directory.



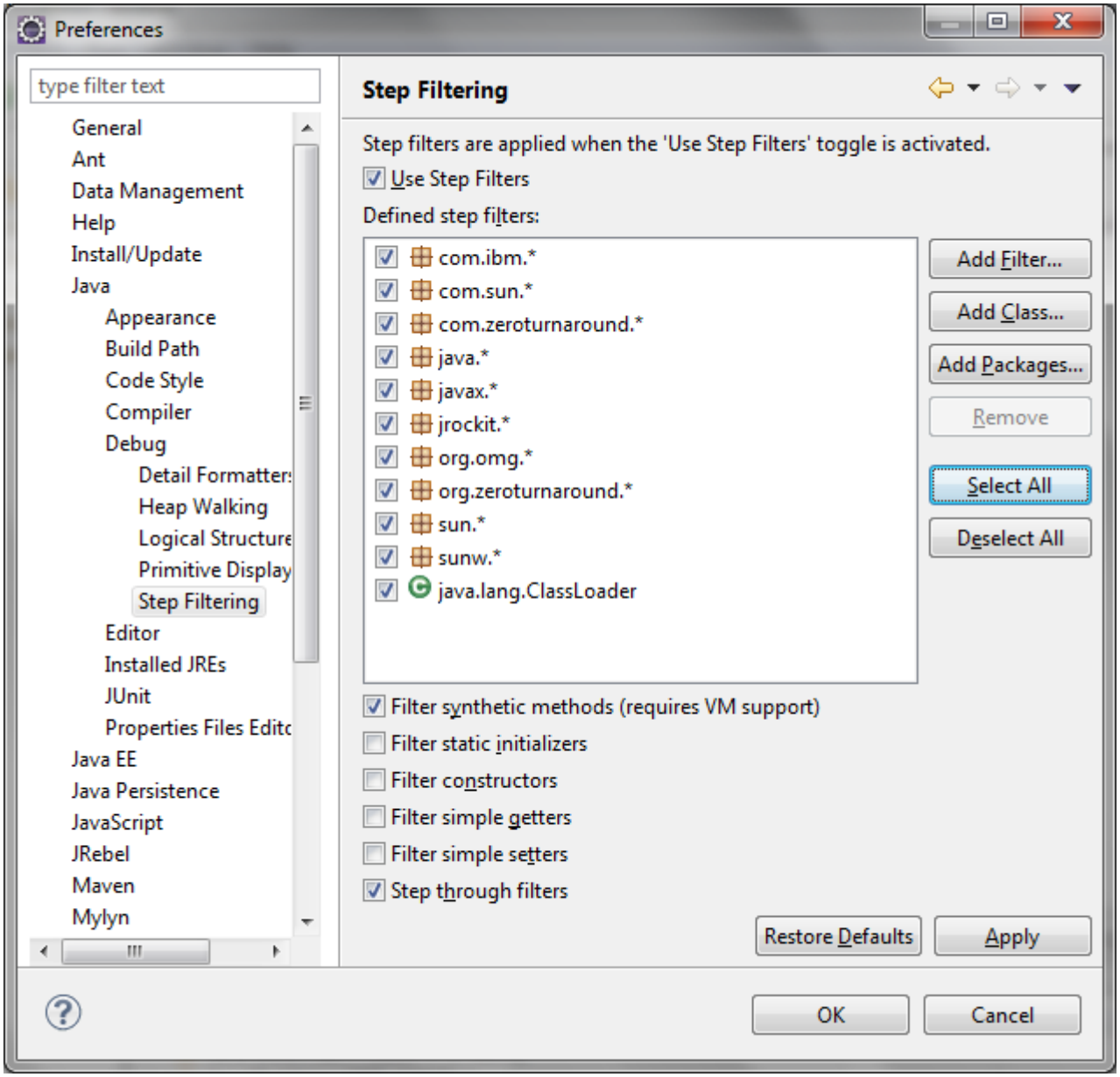
On the left hand side, select "Java" > "Debug" > "Step filtering". Check "Use Step Filters", "Filter synthetic methods" and "Step through filters".

Use the "Add Filter..." button to add the following filters:

```
com.zeroturnaround.*
```

```
org.zeroturnaround.*
```

Click "Select All" to check all filters in the filters list. Your configuration should look like the screenshot below.

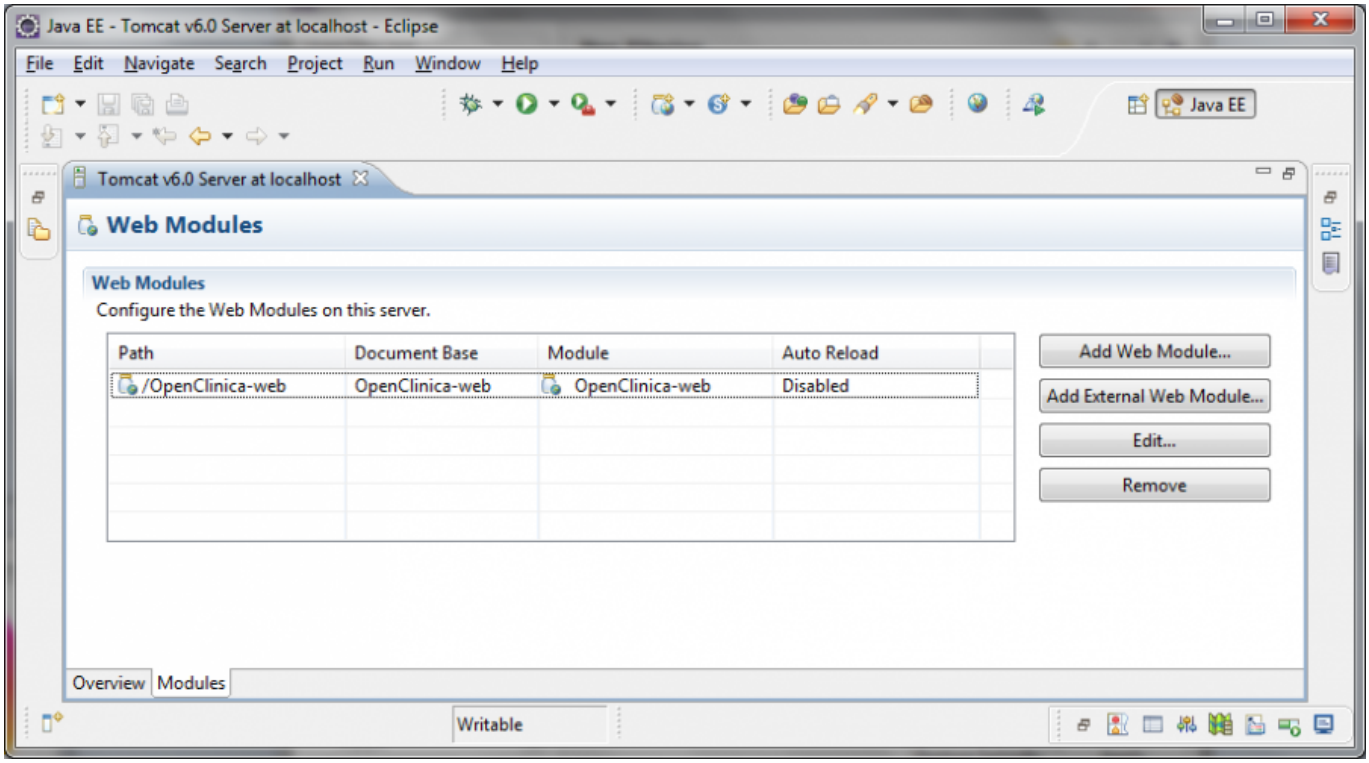


Click "Ok" to close the preferences window. Ensure that "Project" > "Build automatically" is checked.

Configure server for JRebel

Double-click the entry in the "Servers" view corresponding to your Tomcat server to open the server configuration page. Under the section "JRebel Integration", check "Enable JRebel agent".

On the bottom-left corner of the server configuration page, click the tab "Modules". A list of web modules deployed to the server is displayed. For each deployed module, select it in the list and click "Edit...". Uncheck the box "Auto reloading enabled". Once all the modules are configured, click "File" > "Save" to save the server configuration. Your modules configuration should look like the screenshot below.



Configure Maven for JRebel

Create or edit your ~/.m2/settings.xml file, where ~ corresponds to the users home directory. If you dont have one, copy it from the $M2_HOME/conf/settings.xml. Add the following XML fragment within the <settings> tag of your file:

```
<profiles> <!-- This tag may already exist in your file -->
...
<profile>
    <id>JRebel</id>
    <properties>
        <useJRebel>true</useJRebel>
    </properties>
</profile>
...
</profiles>

<activeProfiles> <!-- This tag may already exist in your file -->
    <activeProfile>JRebel</activeProfile>
</activeProfiles>
```

Open a command prompt and build your project with the command mvn clean install -Dmaven.test.skip=true. Refresh the project in Eclipse.

Check the JRebel configuration

Start your server in the "Servers" view of Eclipse. Once the server is started, switch to the "Console" view. Scroll to the very beginning of the log file and make sure JRebels header is there.

```
#################################################################

 JRebel 4.5.1 (201110191452)

 (c) Copyright ZeroTurnaround OU, Estonia, Tartu.

[...]

#################################################################
```

The log file should also describe files monitored or changed by JRebel

```
JRebel-Spring: Monitoring Spring bean definitions in [...]
```

You can now change Java classes or JSP files and have JRebel redeploying them without restarting the server.

Customize Properties With a Build Profile

A development filter file can be used to override the default properties during development. This filter is applied only to the developers environment and has no effect on other developers, instances or distribution packages.

Un-comment out the filters on lines 545-548 in the top-level "pom.xml". Otherwise, developer-specific Maven build profile instructions will not work.

Create a Filter File

A filter file can be used to create an OpenClinica package with configuration values different from the default.

For example, here are the steps required to create a sandbox configuration.

- Create a file named sandbox.properties in the source/main/filters directories of all modules. There is a file named default.properties in these directories that can be used as a template. Or, use an empty file and define on it only the values that are different from the ones defined in default.propertes (i.e., if a property is not specified in sandbox.properties, the value defined in default.properties will be used).
- Make sure the filter file was created for all OpenClinica modules (core, web, and ws). The build will fail if it cannot find the filter file for a module.
- Build OpenClinica using the sandbox configuration in the command line, by typing:

```
mvn clean package -Dconfig.id=sandbox
```

Now, create a filter file following the example above. Just dont build the project with Maven yet, as a slightly different configuration should be used. For the file name, follow the dev-<username>-<optional_identifier>.properties convention (e.g., the user John Doe could create a file named dev-jdoe.properties or dev-jdoe-quickfix.properties).

Its important to create the filter file for all Maven modules (core, web, and ws) otherwise the Maven

build will fail.

Build from source

Use this file to override properties defined in the default.properties file during the build. Its possible to copy all the content on the default.properties file to it, but thats not recommendable - copy only the properties that will be changed, as all missing properties will still be taken from default.properties.

Create a Maven Build Profile

A Maven build profile will add the filter to the build process. Open the Mavens user settings file (normally located on ${user.home}/.m2/settings.xml, where ${user.home} correspond to the users home directory) and add create a profile tag within the profiles tag of the file, following the example below (make sure the value of the <config.id> tag matches the name of the filter file created previously):

```
<profile>
    <id>config-local</id>
    <activation>
        <activeByDefault>true</activeByDefault>
    </activation>
    <properties>
        <config.id>dev-jdoe</config.id>
    </properties>
</profile>
```

Build the Project

Build the whole project using

```
mvn clean install
```

in the root project level. Notice that the -Dconfig.id parameter should not be used here, as this configuration was already defined in the build profile.

Optional step: Check the properties files in the target directories to make sure the properties were replaced according to the defined filter.

Restart Eclipse (to reload the profile configuration), refresh the project files and perform a clean build. Start Tomcat and the changes made to the filter file should be reflected in the application.

Switch to another configuration

The steps to switch to a different configuration are:

1. Create the filter files for all modules
2. Change the value of the <config.id> property in the settings.xml file
3. Restart Eclipse, if open - Eclipse seems to read the settings.xml file only during startup

To use the default configuration (i.e., all values read from default.properties only), simply comment the whole config-local profile in the settings.xml file.

Development Tools

Mercurial Source Control

- Mercurial PowerPoint Slides - by Doug Rodrigues, OpenClinica, 16-Nov-2011
- TortoiseHg
- MercurialEclipse
- MacHG
- HgInit: Subversion Re-education - Explains the conceptual differences between Subversion and Mercurial)
- Mercurial SCM - Mercurials home page. Contains very interesting information in the user guide and wiki.
- Mercurial Cheat Sheet

11.1 Using the OpenRosa API in OpenClinica (experimental)

Starting with version 3.5, OpenClinica will begin to support the OpenRosa API, which will let you run Enketo, ODK Collect, or any of a number of OpenRosa-compliant data capture clients. If you're not familiar with Enketo, ODK, or OpenRosa, here's a primer. You can also see this blog post on how OpenClinica LLC is using Enketo and the OpenRosa API in its products.

To try it yourself:

1. Build/install the latest OpenClinica code from github or distros
2. Install an OpenRosa client, such as enketo or ODK Collect
3. Add the property 'PortalURL' to datainfo.properties with the URL of the OpenRosa Client

   ```
   PortalURL = http://www.example.com
   ```

4. Issue a /formList request from the client to the OpenClinica:

   ```
   GET /OpenClinica-web/rest2/openrosa/{studyOID}/formList
   ```

5. Currently supported methods include

   ```
   GET /OpenClinica-web/rest2/openrosa/{studyOID}/formList
   GET /OpenClinica-web/rest2/openrosa/{studyOID}/formXml
   POST /OpenClinica-web/rest2/openrosa/{studyOID}/submission
   ```

Note: These APIs are still experimental, may not work at all, and are certainly not suitable for production use. OpenClinica Participate uses them but the hosted environment includes tools to ensure network security and robustness for production use that are not in the enketo package. We aim to eventually support OpenRosa API as part of the standard OpenClinica API and welcome feedback, testing, and code contriutions. In particular, this is still experimental because:

- Form submission will not really work because it does not create a study subject and study event where the data can go. This will be added in the near future.
- The API is not particularly secure. There is no production-quality authentication mechanism, other than to secure network access to known safe clients.

Alternative CRF design model using XForm

Starting with OpenClinica 3.8, you can use an alternative model for CRF Design based on the OpenRosa XForm specification, instead of the spreadsheet-based OpenClinica CRF Template. To enable:

- Configure your OpenClinica datainfo.properties to activate the Xform feature
  - If you will be uploading images, the default size limit for total images uploaded is 5MB
  - If you will be uploading a large number of images or particularly large images, you should add the following to datainfo.properties:
    - pformMaxSubmissionSize=100000000
    - This maximum submission size setting is a safe bet to cover most image upload needs (this specific setting allowed for 15 files of 4.72MB each to be loaded. Feel free to adjust the number as needed to meet your needs.)
- When adding a CRF or CRF version, select the 'Upload as Xform' tab
- Paste your OpenRosa-compliant XForm code into the textarea (you can use an OpenRosa-compliant form design tool such as XLSForm to generate the XML from a spreadsheet)
- Upload any media files (images, videos, audio, etc) that you want to be embedded in the form

The primary use case right now is to support having images & video embedded in participant forms. It also enables you to use a growing list of features available in the enketo form engine that are not

available in the traditional OpenClinica CRF engine. Your CRFs should still function in the traditional OpenClinica CRF engine, though they may not look as pretty or support all the features of a typical OpenClinica CRF because only a minimal amount of required metadata is parsed from the XForm into the OpenClinica form metadata model. Most of the display/layout information as well as any edit checks and skip logic is left only in the XForm.