Application User Guide

AUG 076 / Rev. 1.1

eWON Flexy JAVA J2SE Toolkit User Guide

This document describes how to install the JAVA development environment on your PC, how to create and how to debug a JAVA application with eWON Flexy.

Table of Contents

1. Introduction

JAVA (J2SE) and eWON Flexy

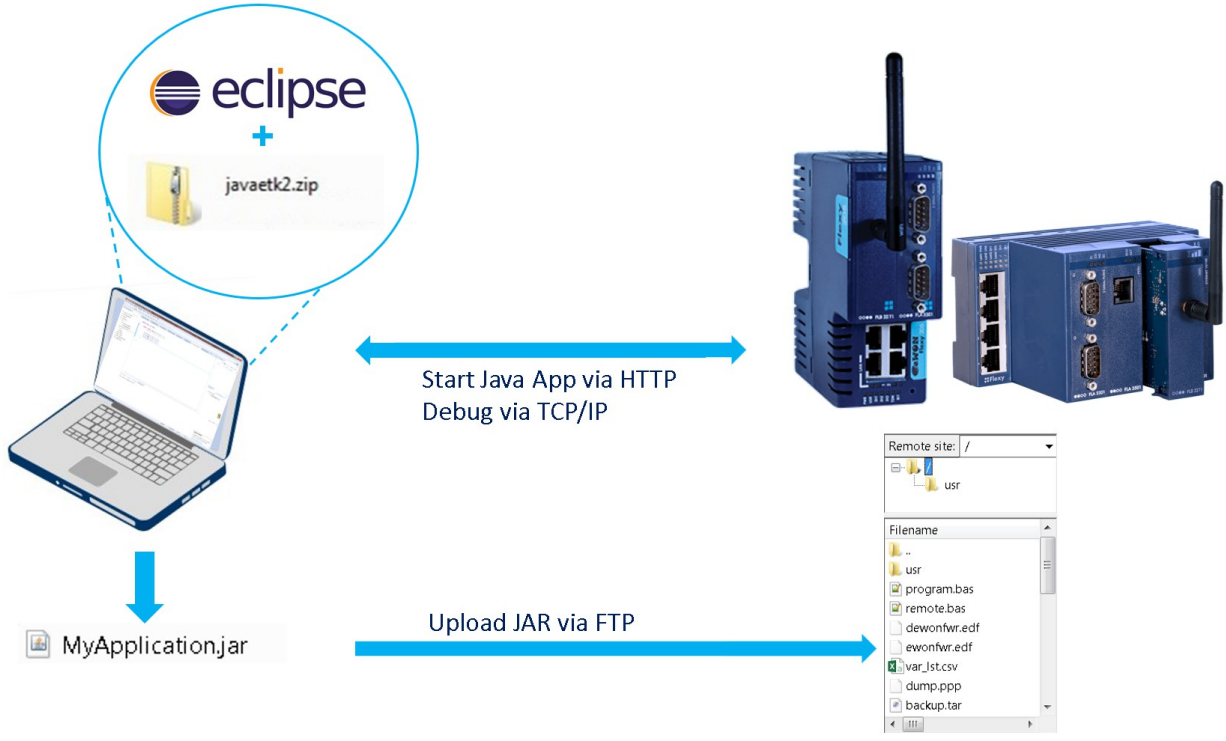
The eWON JAVA J2SE toolkit is designed around the JVM version **1.4**

The J2SE JVM is supported by the eWON Flexy family from the firmware **12.2.**

Even though this compliance is interesting for using existing JAVA libraries, these libraries may require lots of resources to be executed and make this compatibility purely theoretical.

It will be nevertheless possible to use a large range of existing tools and libraries to work with a powerful high-level programming language on eWON Flexy.

eWON Flexy JAVA development Platform



The JAVA application is coded and debugged using the **IDE Eclipse**.

In Eclipse you will need to declare the eWON Flexy JAVA ETK as a new JRE environment and some different tools to be able to compile, deploy and debug the application using Eclipse.

Typical development work flow

- Develop and compile your application with Eclipse.
- Upload your application from Eclipse to your Flexy.
- Debug you application with Eclipse using :
  - Breakpoints
  - Watches
  - Step-by-step
  - Logs
  - ...
- Upload your final JAR in the eWON /usr directory.
- Create a jvmrun text file in the Flexy /usr directory to autorun your JAVA application at the Flexy boot time.

2. JAVA J2SE environment Setup

Eclipse Installation

The JAVA IDE recommended and supported for developing J2SE JAVA applications for eWON Flexy is **Eclipse**.

In order to find all the features required to develop/deploy and debug the JAVA application, you will first need to install "Eclipse".

You can download it from https://www.eclipse.org/downloads/

Select the Windows 64 bit version or the 32 bit version according to you computer. This manual was written with the version "NEON" of Eclipse but should apply to newer Eclipse versions.

Your download will contain an "exe" file. Run it and select "Eclipse IDE for Java Developers"

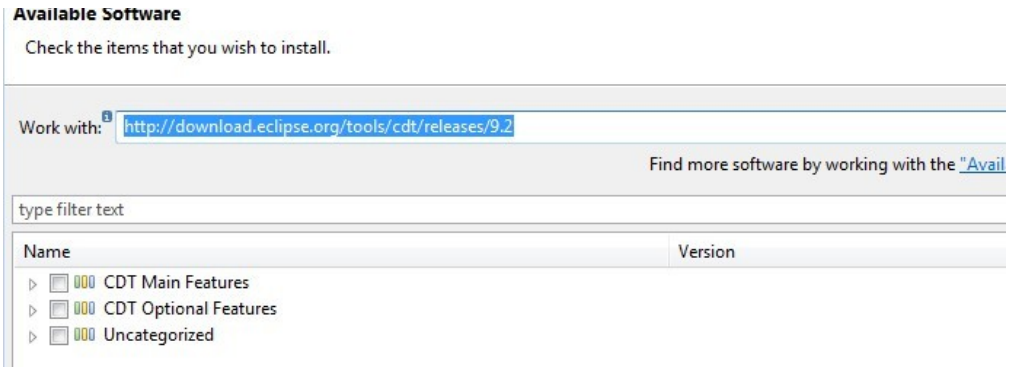
Once Eclipse is installed, run it and add the CDT support. This option is required to enable online debugging.

To do so, follow the next procedure :

- Go to the CDT download page: https://eclipse.org/cdt/downloads.php and look for the "p2 software repository" corresponding to your Eclipse version.

NB : This is the valid version for Eclipse Neon (9.2).

- Copy this link to the clipboard
- Now in Eclipse, go to "Help → Install New Software..." and paste the URL in the "Work with" field: http://download.eclipse.org/tools/cdt/releases/9.2 (use your applicable URL)



- Select the CDT Main Features and install them (accept all defaults and accept to restart Eclipse).

eWON JTK Installation

At this point you have a tool to program in JAVA, but you are missing the eWON Flexy specific Java libraries/framework (also named JRE – Java Runtime Environment) and the tools to deploy and debug your JAVA application.

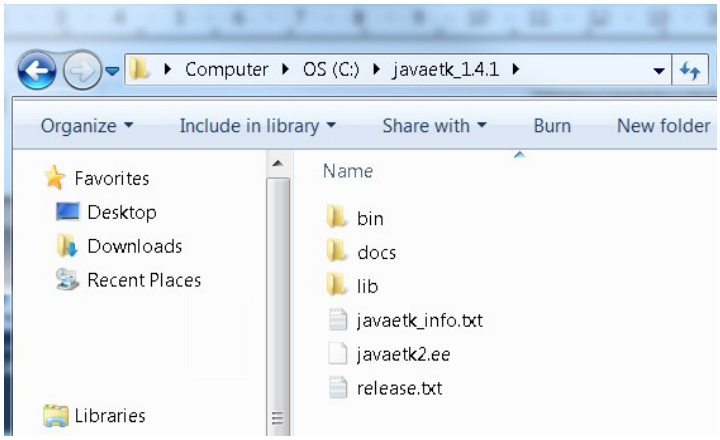
Install the JAVA ETK toolkit on your system

You have to download from the eWON Web site a file called "javaetk_1.4.x.zip".

Go to https://developer.ewon.biz/content/ewon-programming → JAVA to get the latest version of the toolkit.

This file contains a "javaetk_1.4.x" directory that you need to copy to your PC (in your "User" or "Program Files" directory.

In this document, the directory used is *c:\javaetk_1.4.1*



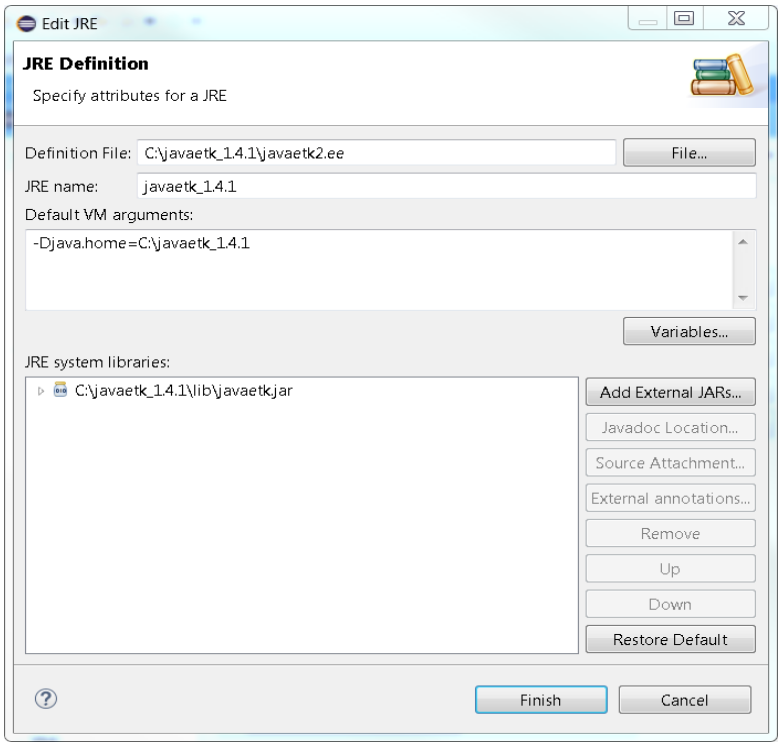
eWON Java ToolKit Configuration in Eclipse

In Eclipse, you must install the needed support to create applications for your eWON Flexy.

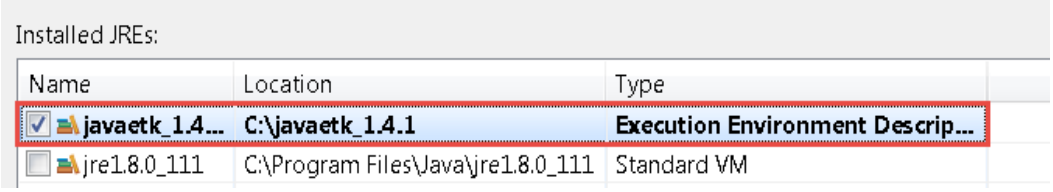
This support is provided by adding the JAVA eWON Toolkit as a new JRE environment.

- From the Eclipse editor, select: "Windows → Preferences → Java → Installed JREs"
- In the dialog box, select "Add" → "Execution Environment Description" → "Next"
- Browse to the location where your copied the JavaETK (here c:\javaetk_1.4.1) and select the "javaetk2.ee" file.

The window fields should then be updated automatically:



Click "Finish" and select your new JRE as default:



3. Develop your first JAVA application for eWON Flexy

The "HelloWorld" application is a simple example that shows how to create, compile, debug and execute a JAVA project.

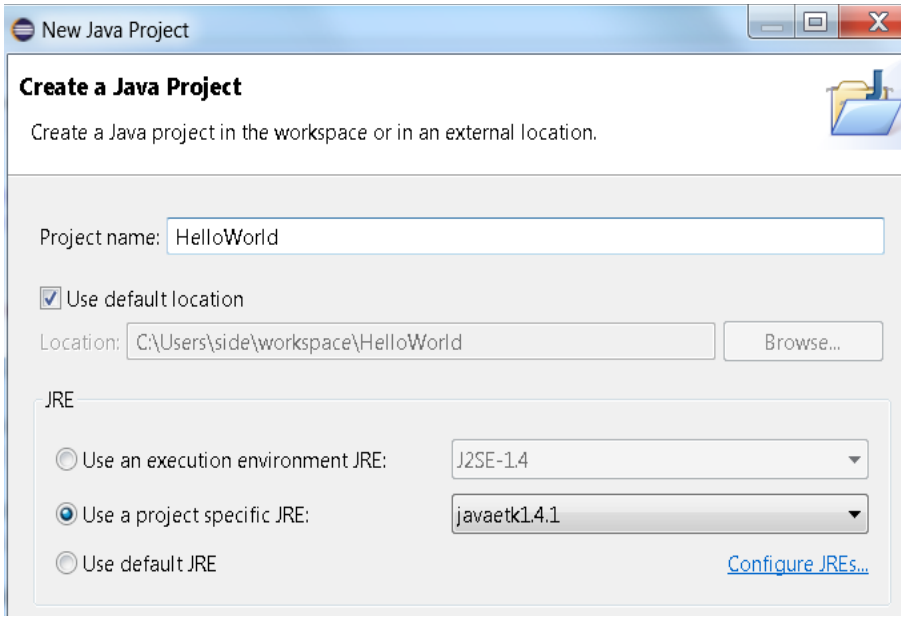
Create the "Hello World" project

From the Eclipse IDE, select:

File → New → Java Project

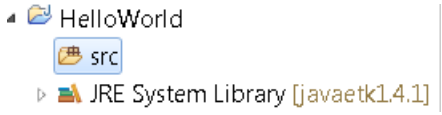
Next, configure the project.

- Select a name: *HelloWorld* (don't put space in the name)
- Configure the JRE to "Use a project specific JRE: javaetk_1.4.1"



- By default the sources of your project will be located in the "Workspace" area of Eclipse, you can see the actual path below the project name.
- When using the javaetk_1.4.x JRE, you automatically enable the Java version 1.4 compliance level.

In the "Package Explorer", you can find the following structure.



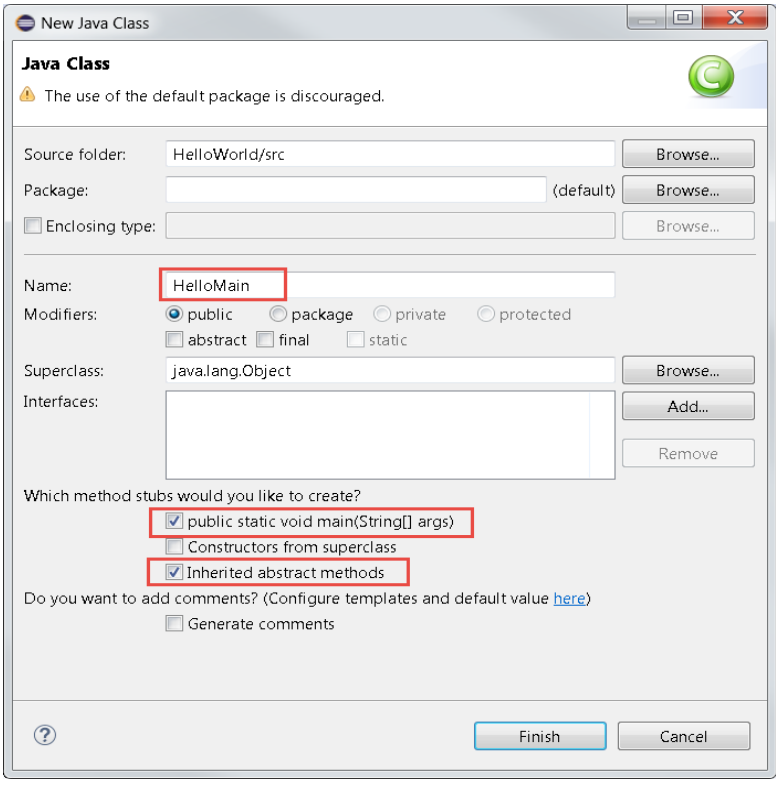
Add the project main class

Right click the "src" folder in the "Package Explorer" and select

New → Class

Then configure your class:

- Use for example the name "HelloMain"
- Define it as main class :



You now have a basic application with a main class called "HelloMain".

In this project, we will simply create a log entry into the Real Time logs of your eWON Flexy by using the code line :

```
System.out.println("Hello World");
```

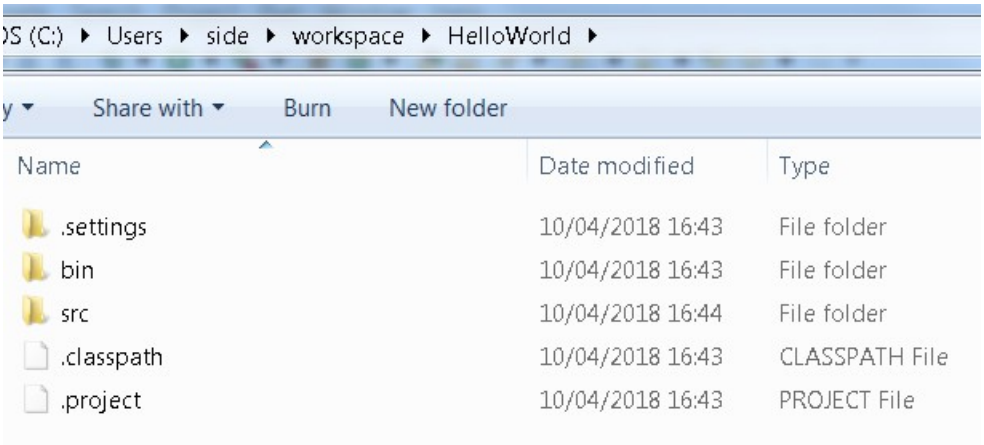
```
public class HelloMain {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        System.out.println("Hello World");
    }

}
```

Build your project

By default , Eclipse compiles your project continuously. Any error you make is displayed immediately, and your classes are compiled at any time.

You can disable that from the "Project → Build automatically" menu.

If you look in the Workspace folder, there is a "bin" directory that contains all the compiled Java files.



To send and execute your project into your eWON Flexy, you will need to compile your project into a *.jar file. A *.jar file is actually a *.zip file containing all your JAVA classes.

For this, we will use and "ant" builder file that is present in the javaetk_1.4.x directory. Go to the directory of the eWON Java ToolKit (Here, c:\javaetk_1.4.1\) and copy the "build.xml" file in your "Workspace\HelloWorld" directory (see above).

Now, go back to your Eclipse project and from the "Package Explorer", right click and click "refresh".

You now have an additional file called "build.xml" in your project tree

Edit it in Eclipse and adapt the different parameters according to your setup :

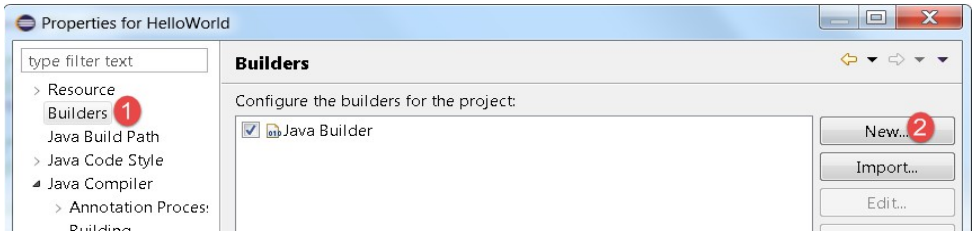
```
<!-- #########  Type your Application/Flexy Parameter ######### -->

<!-- The project name -->
<property name="ProjectName" value="TypeProjectName"/>

<!-- The main class to run (where the main function is) -->
<property name="MainClass" value="TypeClassName"/>

<!-- The JAVA heapsize -->
<property name="HeapSize" value="5M"/>

<!-- The Flexy Admin login -->
<property name="FlexyLogin" value="adm"/>

<!-- The Flexy Admin password -->
<property name="FlexyPassword" value="adm"/>

<!-- The Flexy IP address -->
<property name="FlexyIP" value="10.0.0.53"/>

<!-- Enable Debug mode -> Type 'true' if online debug is used -->
<property name="Debug" value="false"/>

<!-- ############################################################ -->
```

For the "HelloWorld" project we will have :

```
<!-- The project name -->
<property name="ProjectName" value="HelloWorld"/>

<!-- The main class to run (where the main function is) -->
<property name="MainClass" value="HelloMain"/>
```

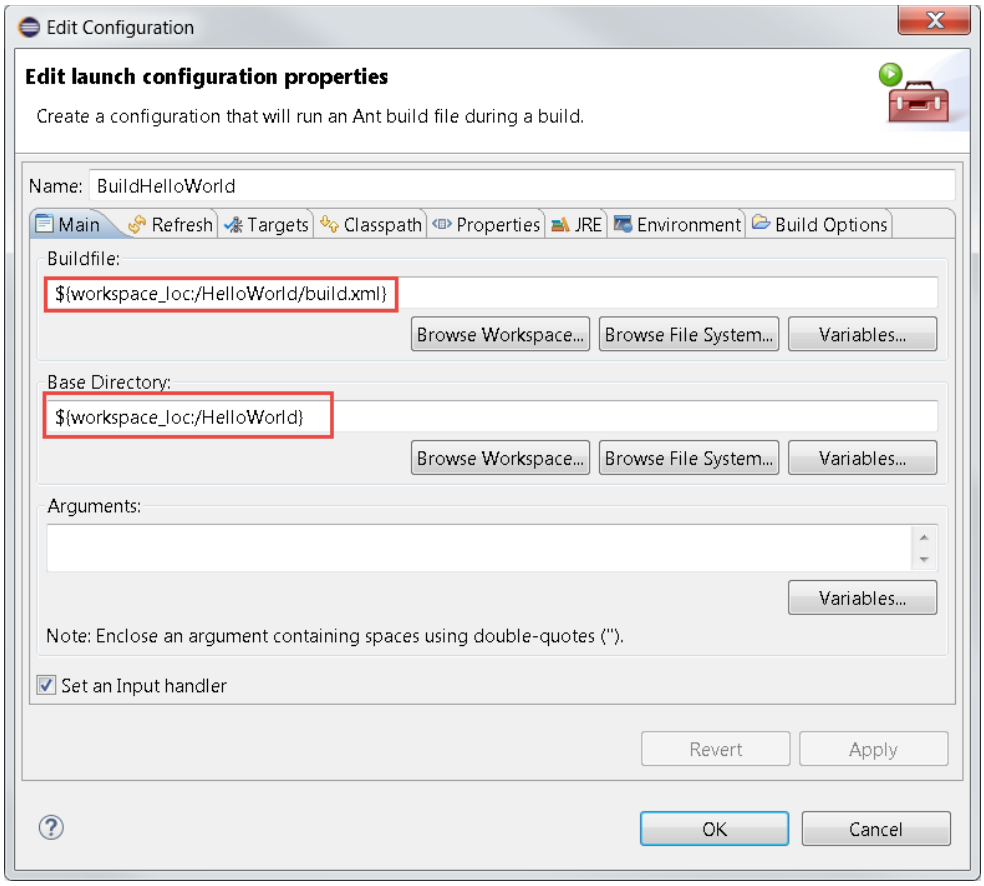
To associate the *Ant* builder to your project :

1. Right click on the "HelloWorld" project in the "Package Explorer"
2. Select "Properties… → Builders" and click "New..."

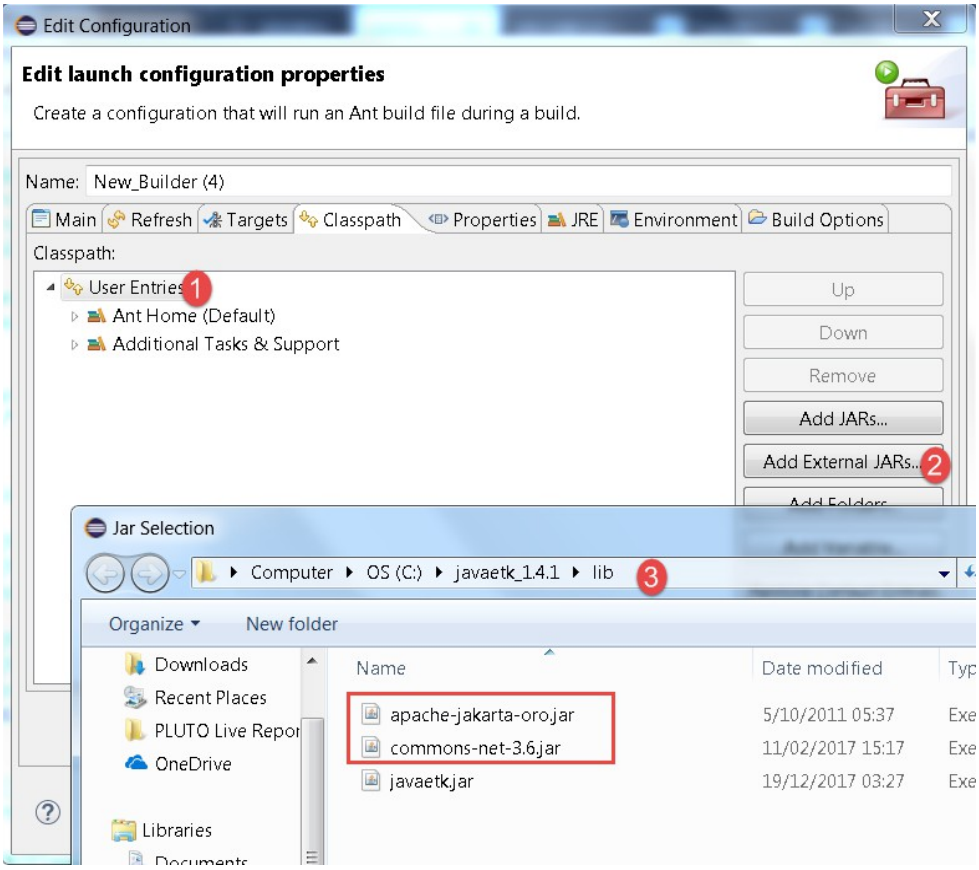


3. Select "Ant Builder"

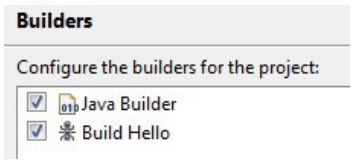
4. Type a Name: "BuildHelloWorld" for example
5. **Buildfile**: Browse the Workspace and select the "build.xml" file.
6. **Base directory**: Browse the workspace and select the project node.



7. Go to the tab "ClassPath"
8. Select "User entries"
9. Click "Add external JARs".
10. Browse your eWON JAVA ToolKit directory → /lib (Here, c:\javaetk_1.4.1\lib) and select the libraries "apache-jakarta-oro.jar" and "commons-net-3.6.jar". These libraries are used to perform the FTP connection.



Your builder list now looks like this:



This means that the build process will first compile all the Java files. Then the *Ant* builder will create a JAR file with all the compiled classes, push it to your Flexy and start the application.

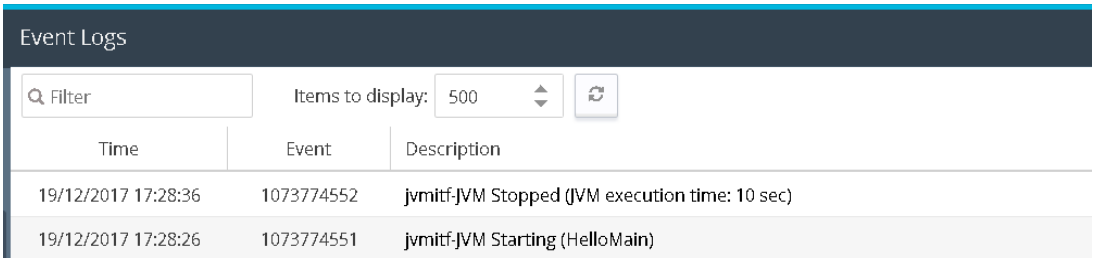
If you now select your project from the "Package Explorer", then click:

Project → Build Project

If everything happens successfully you should see the message "Application uploaded and started"

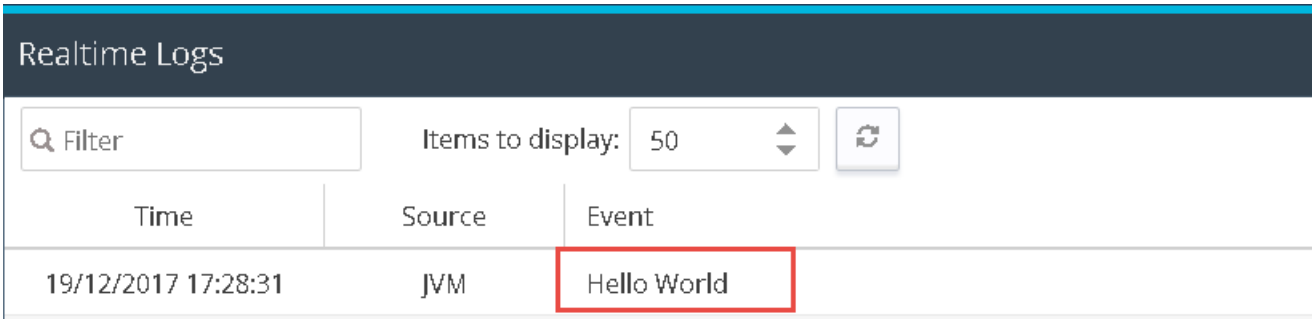
```
Problems  Javadoc  Declaration  Console
<terminated> BuildHelloWorld [Ant Builder] C:\Users\side\workspace\HelloWorld\build.xml
startdeploy_debug:

startdeploy:
         [get] Getting: http://192.168.120.91/rcgi.bin/jvmCmd?cmd=start&runCmd=%20-hea
         [get] To: C:\Users\side\workspace\HelloWorld\start.log
         [get] .
        [echo] Application uploaded and started
BUILD SUCCESSFUL
Total time: 1 second
```

In the Flexy events log, you can now find information about the JVM execution:



In the realtime logs, you see the message coming from the code line

```
System.out.println("Hello World");
```



4. Debug your JAVA application with Eclipse

At this point, you have your Eclipse project ready to compile and upload your application to your Flexy. Now, let's see how to debug your JAVA application.

The process for debugging the JAVA project is the following:

- Compile and upload the JAR file to the /usr directory of the Flexy by FTP.
- Start the Flexy JVM with the right arguments using an HTTP request.
- Start the Java debugger in Eclipse and connect it to the Flexy JVM.

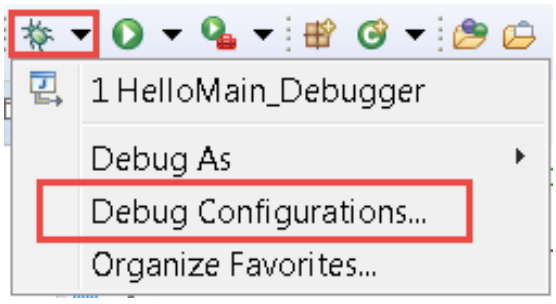
Eclipse tools

Eclipse has several useful tools to automate operations related to the deployment and the debug processes. The *launch group* (which is part of the Eclipse CDT package which is why we had to install it) allows you to create a sequence of several eclipse operations. In our case, we will need to execute the previously created Ant builder in Debug mode and then start a Remote Java Debug session.

Configure the Remote Java Debug

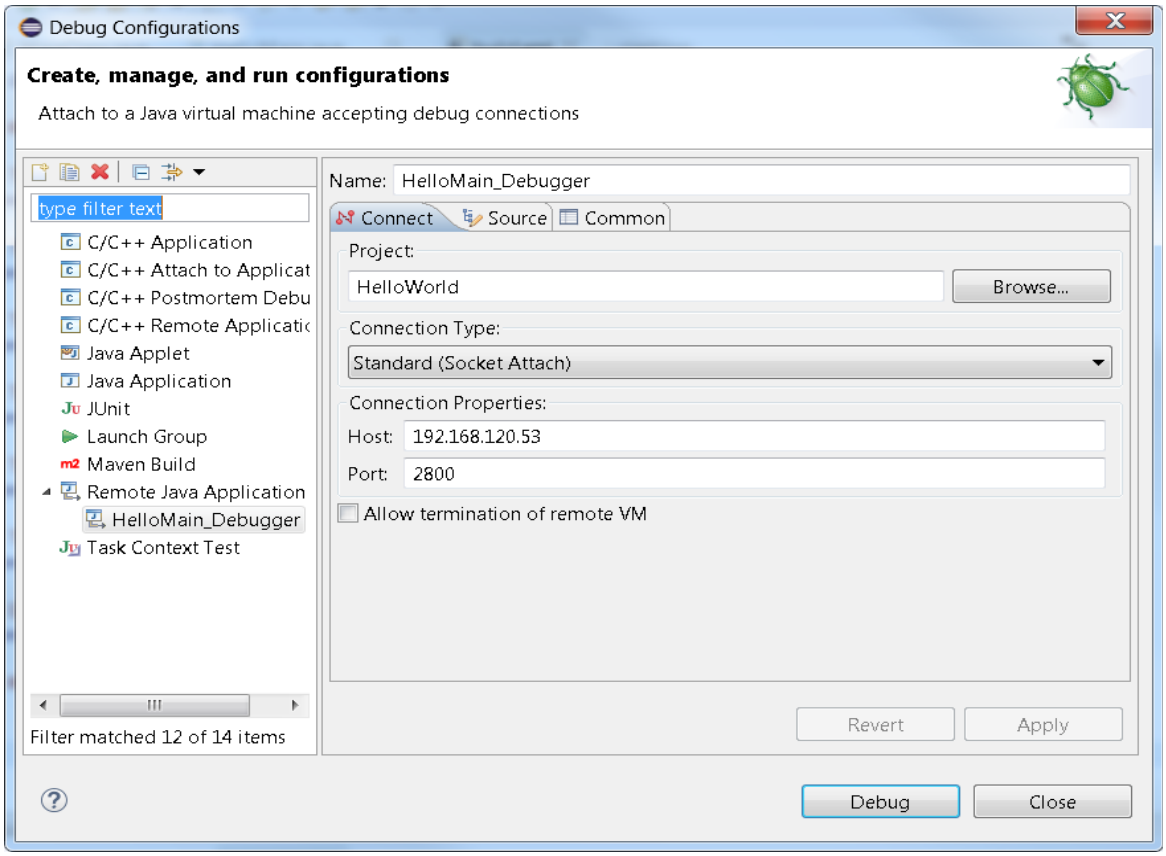
The Remote Java Debug Application is a standard way for a debugger to communicate with a JVM running in debug mode. This mechanism works over TCP/IP with a protocol called the *Java Debug Wire* protocol allowing you to debug your program step by step by using breakpoints, variables inspection.

Click the Debug icon and select "Debug Configurations...".



Right click on "Remote Java Application" and select "New".

- Set the "Host" to your eWON Flexy IP address.
- Set the port to 2800



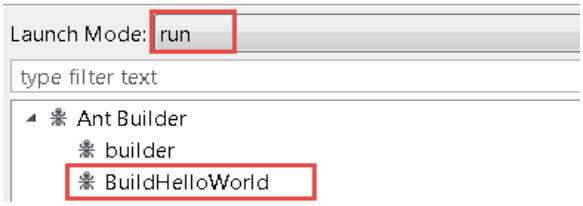
Create the Launch group.

Click ***Launch Group*** and create a New Launch Group.

You will have 2 entries.

1. The Ant Builder that you have already used for compiling and deploying the application.

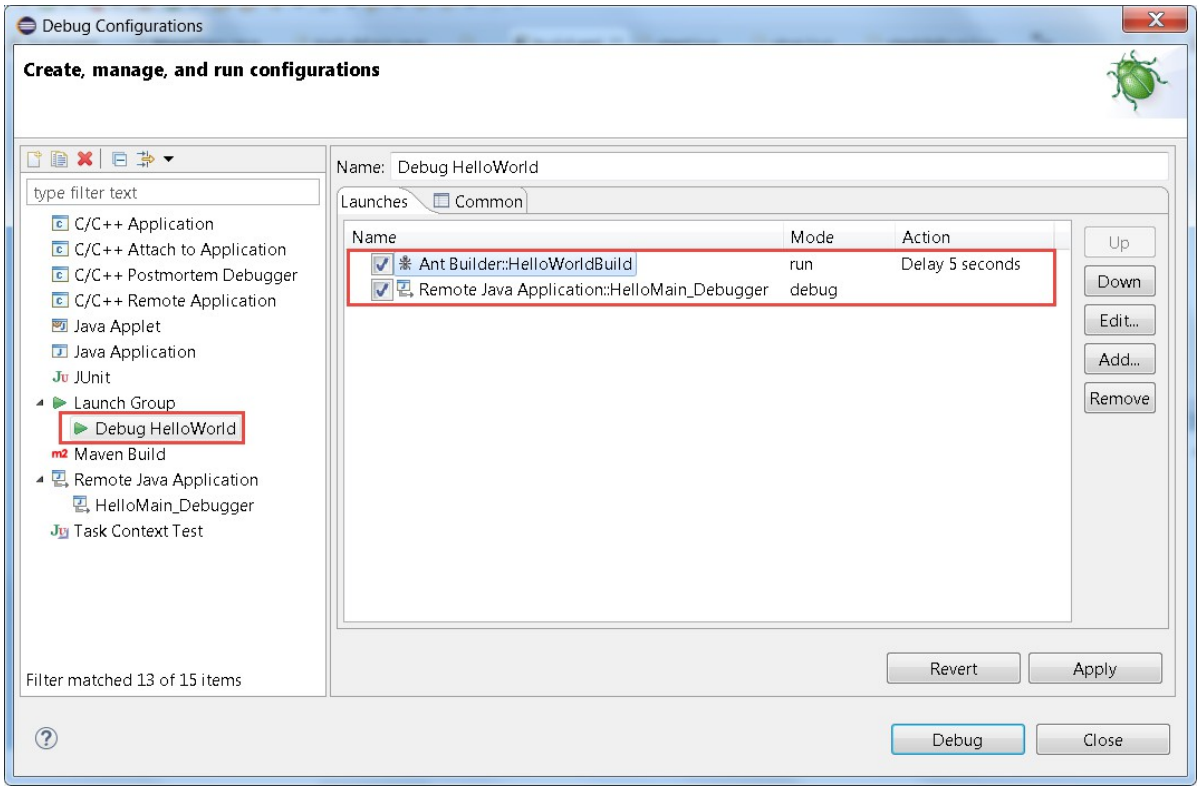
   To be able to select the Ant Builder, the *Launch Mode* must be set to "Run"



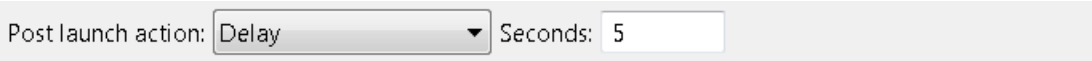
To set the Ant Builder in Debug mode, set the *Debug* parameter to "true" in the build.xml file.

```
<!-- Enable Debug mode -> Type 'true' if online debug is used -->
<property name="Debug" value="true"/>
```

2. The Remote Java Application you have just created.

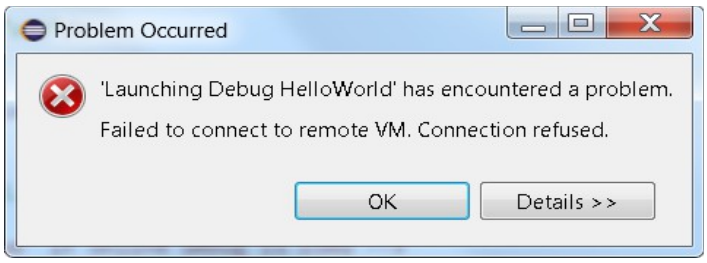


Please note that after the first step (Ant Builder), there is a 5 seconds delay defined.



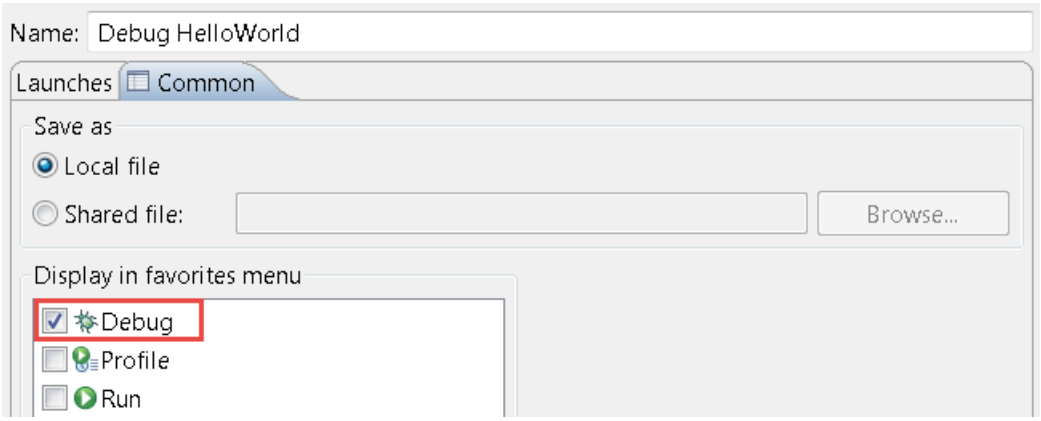
This is used to let the Flexy JVM start before the remote debugging session starts.

If you have an error message like:



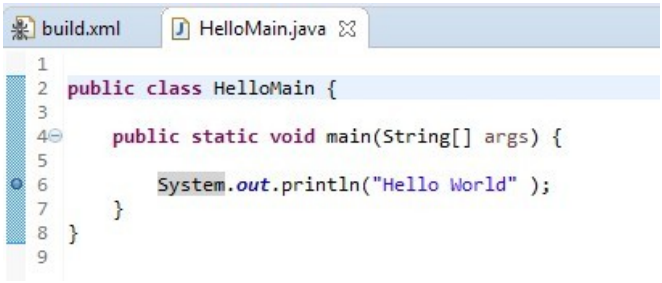
Then try to increase the delay to more than 5 second, to let more time to the eWON Flexy to start its JVM or double-check that the Debug parameter is well set to "true" in the build.xml.

Now go to the tab "Common" and select "Debug" to display the Launch Group in the favorites menu.

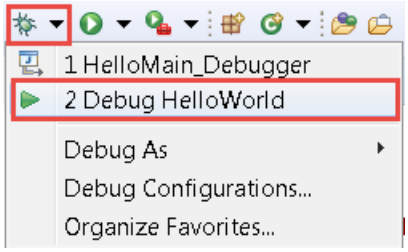


Start your debug session

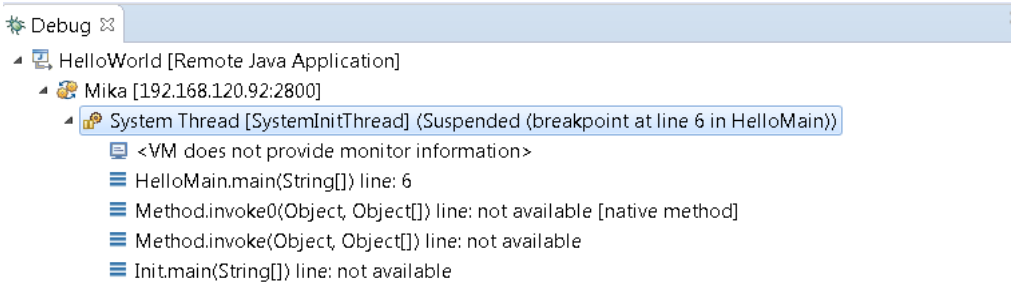
You should first put a breakpoint at the beginning of your program (double click in the margin, you should then see a blue bullet.

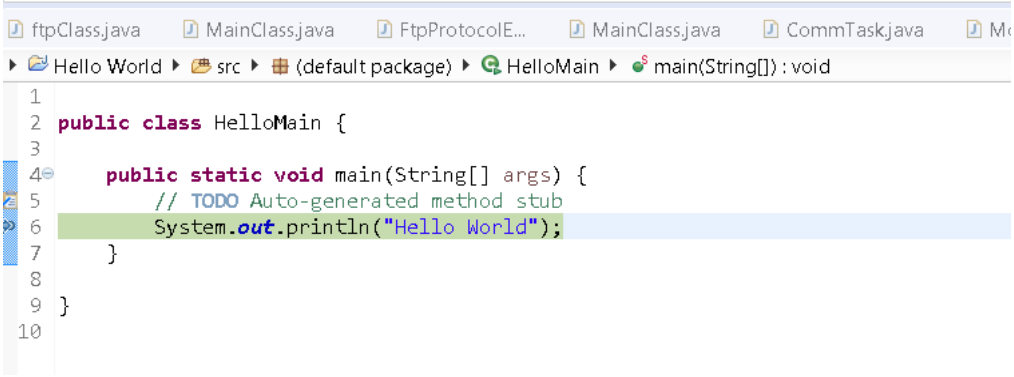


Then start the debug session from the "Bug" toolbar button and select the "Debug HelloWorld" menu which is a shortcut to your "Launch group"



Eclipse should suggest to switch to the Debug view and the execution should stop at your first breakpoint.





5. Transfer the JAVA application manually to the eWON Flexy

Eventually you will have to provide the JAR file to the user. The user will have then to upload the JAR file to his Flexy /usr directory through FTP.

Execute the JAVA application manually using the Web Interface

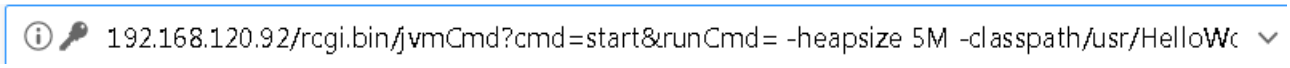
JAVA execution can be manually started through the Flexy web interface by calling a specific web form.

To run the Hello World application, the following command must be typed:

```
http://10.0.0.53/rcgi.bin/jvmCmd?cmd=start&runCmd= -heapsize 5M
-classpath /usr/HelloWorld.jar -emain HelloMain
```

NB : 10.0.0.53 must be replaced by your eWON Flexy IP address.

You can start execution of the JVM by typing the execution URL directly in a Web browser:



The Web form is ***jvmCmd*** and the parameters are:

- cmd=start: start the JVM
- runCmd= -heapsize.....: arguments to pass to the JVM as follow:

-heapsize 5M	Memory allocated to JVM (Use 5M as a minimum)
-classpath /usr/HelloWorld.jar	Path to application classes repository
-emain HelloMain	Name of the class containing the main function.

This is a short summary of the JVM possible arguments, please see “JAVA Virtual Machine (JVM) arguments“ on page 22 for more details.

Configure the JAVA application execution at eWON Flexy boot time

Every time the Flexy boots, it looks for a file called "**jvmrun**" in its /usr directory. When it finds it, it reads the file parameters and execute its JVM accordingly. This is typically what you must use in production.

jvmrun syntax

The jvmrun file is a text file with one or more lines.

If a line of the file starts with a # character, it is considered as a comment line and is skipped (Except for the line *#IOServer*. See the eWON_Java_IOServer_interface manual for more details)

The lines not starting with a # are considered as the JVM Run Command and are used for the JVM execution.

See "JAVA Virtual Machine (JVM) arguments" on page 22 for more details.

Example of jvmrun file content:

```
#jvmrun file, place it in /usr
#This file will trigger execution of the JVM at boot time
-heapsize 5M -classpath /usr/HelloWorld.jar -emain HelloMain
```

Be careful that the file must be ended by a carriage return.

6. JAVA Virtual Machine (JVM) arguments

This chapter describes the parameters available to configure the Flexy JVM execution.

This list of arguments is also called the *JVM Run Command*

The JVM can be started through multiple ways:

- Using the Flexy HTTP server by using the jvmForm (see "Execute the JAVA application manually using the Web Interface" on page 20).
- By creating a jvmrun file in the eWON /usr directory (see "Configure the JAVA application execution at eWON Flexy boot time" on page 21).
- By using the com.ewon.ewonitf.RuntimeControl.configureNextRunCommand JAVA function (see JAVA Doc).

When the JVM is started, it receives a number of parameters to configure JVM execution. Here is list of supported parameters :

-watchon	This command is related to the eWON JAVA watchdog mechanism. When watchon is specified, the JAVA watchdog is enabled with a timeout of 1 minute. The watchdog can be handled using the functions from the class *com.ewon.ewonitf.RuntimeControl*. When activated, the function *com.ewon.ewonitf.RuntimeControl.refreshWatchdog* must be called by the JAVA application at least one minute after the JVM was started. Please see the JAVA Doc for more information about watchdog. Default: no watchdog
-debugger	This option is used with the eWON Flexy must listen for a debugger remote connection. REM: this option implies the -suspend option bellow. If suspend is not required, -nosuspend must be specified. Default: no debugger
-suspend	This option forces the JVM to be suspended after startup to wait for debugging connection. This is only useful with the -debugger option which automatically enables the -suspend option.

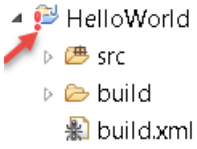
	Default: true if -debugger specified, false otherwise.
-nosuspend	This option will release the execution of the program when -debugger option is specified and will not stop the JVM until the remote debugger is connected. Default: false
-port N	N is the port number on which the eWON JVM will wait for a remote debugging connection. This option is only relevant if -debugger is specified. Default: 2800
-heapsize N -heapsize Nk -heapsize Nm	N is the amount of memory allocated to JVM execution. This memory will be used to store JAVA classes and user allocate variables. The trailing k or m can be used to specify the heap size in kilobytes or megabytes. **A 5 MByte size is a minimum for a normal execution.** Out of memory errors (exceptions) will be reported during JVM execution in case the heap size is too small. Default: 64KBytes
-classpath CP	CP is the eWON Flexy JVM classpath. (CP should not contain any space) The classpath is a list of JAR files or class files separated by ":" Each path must be an absolute path. All paths are case sensitive. Classpath maximum length is 1048 characters. Example of valid classfiles: /usr/MyApp.jar /usr/MyApp.jar:/usr/lib/MyLib.jar /usr/MyApp.class:/usr/lib/MyLib.jar Default: none
-emain MC	MC This is the name of the JAVA class of the user's application containing the main function. Only the name of the class must be specified and is case sensitive. Default: none

7. Open existing project in eClipse

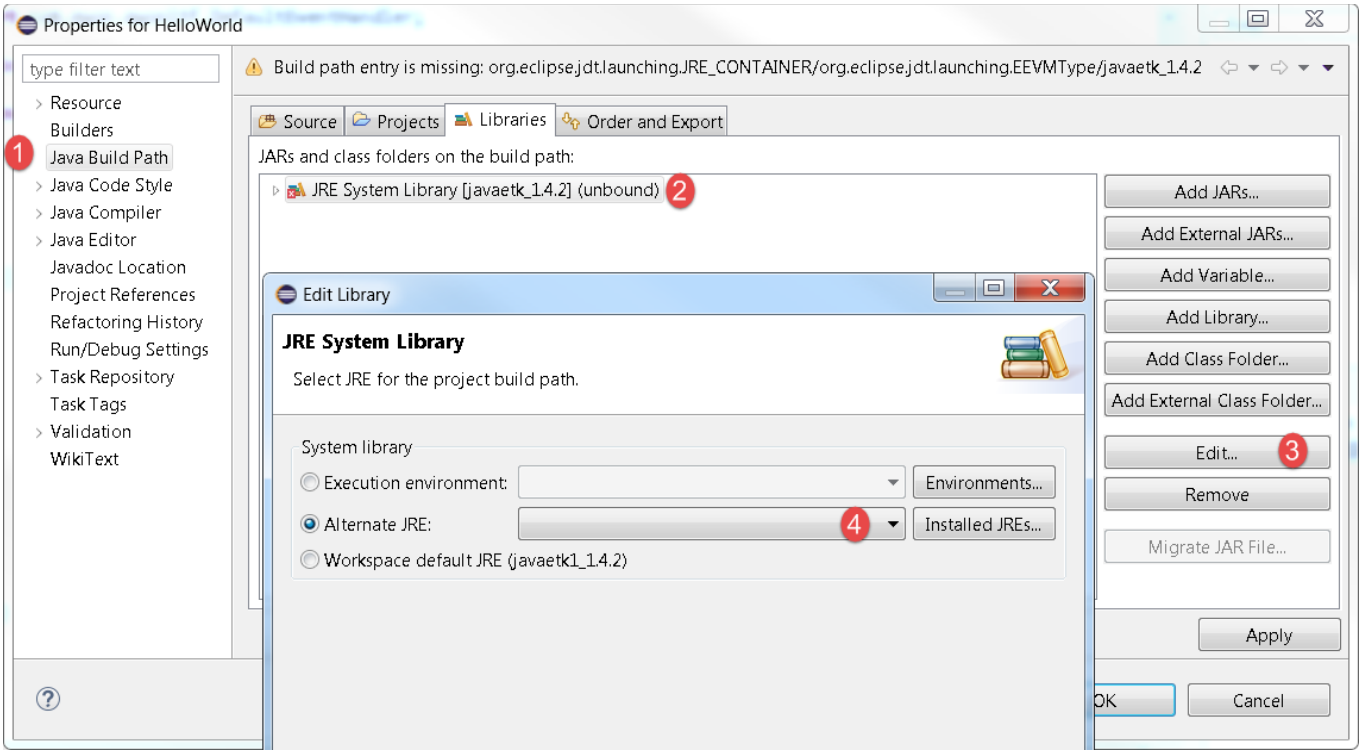
Open someone else project in eClipse

When you open a project coming from someone else computer, the directory to the JAVA ETK defined in the project or the name of the JAVA ETK JRE instance may differ from the one you have configured on your PC.

This is the warning you may have :



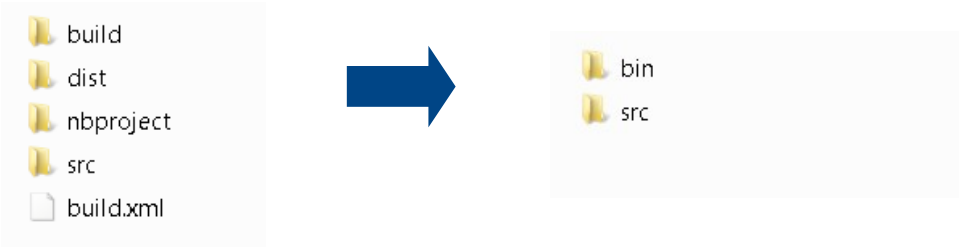
If you have this warning icon, edit the project properties → Java Build Path → Edit the JRE used and select the JAVA ETK JRE you have defined in eClipse.



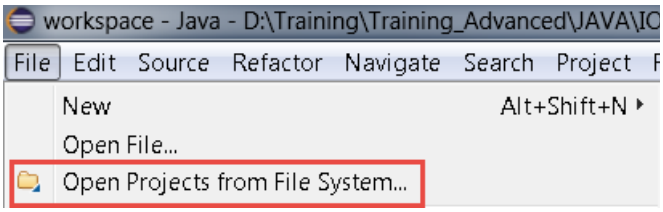
Open existing Netbeans project in eClipse

Here is the procedure to follow to open an existing Netbeans project in eClipse :

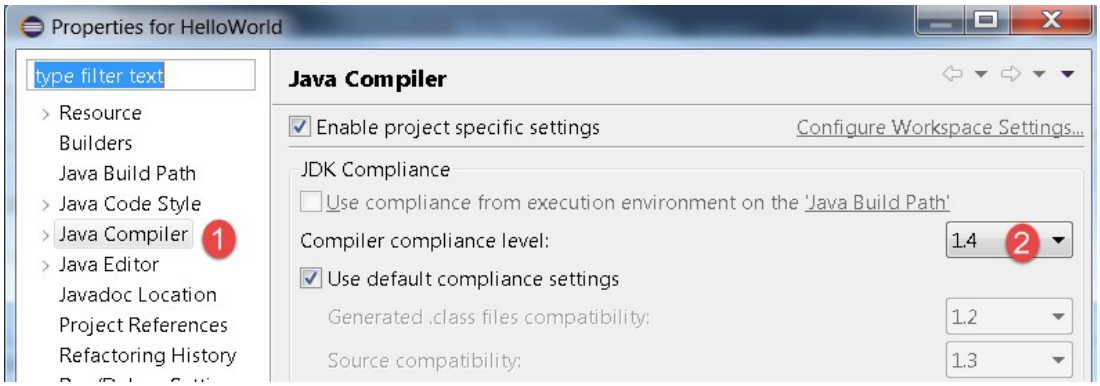
1. Open your Netbeans project
2. Delete the directories "build", "dist" and "nbproject" and the file "build.xml"
3. Create a directory "bin"



4. Click "File → Open Projects from File System..."



5. Select the project directory and click "Finish".
6. Edit the properties of the project, click "Java Compiler" and select the version "1.4" as the compiler compliance level.



7. Follow the procedure explained in the chapter " Build your project"

Revision

Revision History

Revision Level	Date	Description
1.0	11/04/18	Original Document
1.1	29/01/19	ClassPath Syntax updated

Document build number: 154