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Annexes

Introduction

In this section, you will read some useful concepts related with this ebook.

1. Getting Started with LeJOS in Linux

Getting started with leJOS in Linux

Introduction

In this section, you will learn how to use leJOS in a Linux System. The process has been tested in Ubuntu & OpenSuse. This chapter is a complement for the file README included in any leJOS release

The process to install leJOS on your Linux System is the following:

1. Install Java
2. Install Some libraries/utilities used in leJOS
 1. gcc
 2. Libusb
 3. Ant
 4. Bluez
3. Download and Install latest leJOS release
4. Configure some files in Linux
5. Test

Java Instalation

LeJOS project is a project based on Java Technology so it is necessary to have installed in your computer latest JDK release. If you use a Debian Distro, I suppose that you have experience with APT manager.

To install latest JDK, open a shell window and type:

```
sudo apt-get update  
sudo apt-get install sun-java6-jre sun-java6-jdk sun-java6-plugin
```

Testing your Java JDK

Once you have installed in your system a Java JDK, it is necessary to test it. To test any Java JDK, it is necessary to check the following commands:

1. `javac`: Used to compile any Java program.
2. `java`: Used to executed any Java program compiled into bytecodes.
- 3.

Use the following example to check it:

```
class Test {  
    public static void main(String[] arg) {  
        System.out.print("Hi from a Linux System\n");  
    }  
}
```

Compile and test:

```
jabrena@system1:~/Desktop/> javac Prueba.java  
jabrena@system1:~/Desktop/> java Prueba  
Hi from a Linux System
```

Note:

If your example runs nice in your system then It is the moment to download latest LeJOS release.

Installing LeJOS

Download latest LeJOS release from the following URL:

<http://lejos.sourceforge.net/>

Extract the file and rename the folder lejos_nxj into lejos and paste the folder in the path: /usr/local/

```
root@system1:/usr/local# tar xvf lejos_NXJ_0_8_5beta.tar.gz
```

when you have the folder lejos in that path, update the permissions for the folder bin:

```
jabrena@system1/usr/local/lejos> chmod +x bin/*
```

Configuring a LeJOS Release

Any LeJOS Release in a Linux System has to be configured. The steps to configure are the following:

1. Install some programs
 1. C Compiler, gcc
 2. Ant
 3. Bluez Library
 4. Libusb
2. Build LeJOS project with Ant
3. Establish some variables in your system
4. Test your compilation
5. Give IO permissions to manage a NXT brick
6. Test leJOS

Build LeJOS project with Ant

Once you have installed gcc, libusb, bluez and Ant, you could build the project with Ant:

```
jabrena:/usr/local/lejos/build # ant
```

Buildfile: build.xml

clean:

[echo] saving existing files to .bak files

libnxt:

clean:

jlibnxt:

[cc] 1 total files to be compiled.

[cc] Starting link

make:

jbluez:

clean:

jbluez:

[cc] 1 total files to be compiled.

[cc] /usr/local/lejos/src/jbluez/jbluez.c: In function
'Java_lejos_pc_comm_NXTCommBluez_search':

[cc] /usr/local/lejos/src/jbluez/jbluez.c:61: warning: 'name_str' may be used uninitialized in this
function

[cc] Starting link

make:

copy.binaries:

[copy] Copying 1 file to /usr/local/lejos/bin

[copy] Copying 1 file to /usr/local/lejos/bin

clear:

build:

[echo] Done.

BUILD SUCCESSFUL

Total time: 1 second

jabrena:/usr/local/lejos/build #

Configuring some variables in the system.

To use the system, it is necessary to edit some files to use leJOS in any Linux session. You have to paste the following commands in the files: `.profile` y `/etc/profile`

```
export NXJ_HOME=/usr/local/lejos
PATH=$PATH:$NXJ_HOME/bin
export LD_LIBRARY_PATH=$NXJ_HOME/bin
```

Note:

When you finish this steps, your system can execute leJOS commands as `nxjc` or `nxj` for example.

USB Permissions

A NXT brick is a USB device. In linux systems it is necessary to stablish permissions to read & write. If you use the command `lsusb` you will see all usb connected to your system:

```
jabrena:/usr/local# lsusb
Bus 005 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 003 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 003: ID 046d:c016 Logitech, Inc. M-UV69a/HP M-UV96 Optical Wheel Mouse
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 001 Device 002: ID 0694:0002 Lego Group
Bus 001 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
```

Bus 004 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub

```
jabrena:/usr/local # ls -la /dev/bus/usb/
```

The solution in this case would be:

```
sudo chmod a+w /dev/bus/usb/001/002
```

But every time when you connect your NXT brick, the value changes:

```
system1:/dev/bus/usb/001 # ls
```

```
001
```

```
system1:/dev/bus/usb/001 # ls
```

```
001 003
```

```
system1:/dev/bus/usb/001 # ls
```

```
001
```

```
system1:/dev/bus/usb/001 # ls
```

```
001 004
```

```
system1:/dev/bus/usb/001 #
```

So this kind of solution is not good. To solve the problem it is necessary to create a file in the path: /etc/udev/rules.d/

```
system1:/etc/udev/rules.d # ls
```

```
10-board.rules          56-sane-backends-autoconfig.rules
```

```
10-vboxdrv.rules        60-pcmcia.rules
```

```
40-alsa.rules           65-wacom.rules
```

```
40-bluetooth.rules      70-kpartx.rules
```

```
41-soundfont.rules      70-persistent-cd.rules
```

```
51-lirc.rules           70-persistent-net.rules
```

```
51-packagekit-firmware.rules 71-multipath.rules
```

```
52-irda.rules           77-network.rules
```

```
55-hpmud.rules      79-yast2-drivers.rules
55-libsane.rules    99-pcsc_lite.rules
56-idedma.rules
```

Create a file named 70-lego.rules with the following content:

```
# Lego NXT
BUS=="usb", SYSFS{idVendor}=="03eb", GROUP="lego", MODE="0660"
BUS=="usb", SYSFS{idVendor}=="0694", GROUP="lego", MODE="0660"
BUS=="usb", SYSFS{idVendor}=="0694", GROUP="lego", MODE="0660"
```

Besides, create a group named lego_

```
groupadd lego
```

and add all linux users who will use NXT brick.

Once you have done previous task, reboot your system and test LeJOS.

Testing your configuration

If you have done previous tasks, now you can generate nxj files for you NXT brick and send programs to your NXT brick using leJOS technology.

Create a simple example in a notepad and save the file as HelloWorld.java

```
import lejos.nxt.*;

public class HelloWorld {

    /**
     * @param args
     */
}
```



```
public static void main(String[] args) {  
    System.out.println("Hello World");  
    Button.waitForPress();  
}  
}
```

Once you have saved the file, execute the following commands:

```
jabrena@system1:~/projects/lejos/examples/HelloWorld> nxjc HelloWorld.java  
jabrena@system1:~/projects/lejos/examples/HelloWorld> nxj -r HelloWorld  
leJOS NXJ> Linking...  
leJOS NXJ> Uploading...  
leJOS NXJ> Linking...  
leJOS NXJ> Uploading...  
Found NXT: GPSNXT 0016530050A6  
leJOS NXJ> Connected to GPSNXT  
leJOS NXJ> Upload successful in 744 milliseconds  
jabrena@system1:~/projects/lejos/examples/HelloWorld>
```

Summary

In this chapter you should be learnt how to Install leJOS in your Linux system. With the time the process should last less than 1 hour in the process. In my personal opinion, now I prefer to use Linux System than windows system. Linux is more robust and stable than Windows XP. When you have done some instalations, the process last 15 minutes.

Eclipse IDE and Eclipse plugin for leJOS

Introduction

Develop any Java program in general is easy, but it is more comfortable if you use a development tool. In the java market, many developers in the world use Eclipse IDE or Netbeans. In this section I will explain how to develop with Eclipse and the plugin for eclipse.

Installing Eclipse

Eclipse is an extensible, open source IDE (integrated development environment). The project was originally launched in November 2001, when IBM donated \$40 million worth of source code from Websphere Studio Workbench and formed the Eclipse Consortium to manage the continued development of the tool.

The stated goals of Eclipse are "to develop a robust, full-featured, commercial-quality industry platform for the development of highly integrated tools." To that end, the Eclipse Consortium has been focused on three major projects:

1. The Eclipse Project is responsible for developing the Eclipse IDE workbench (the "platform" for hosting Eclipse tools), the Java Development Tools (JDT), and the Plug-In Development Environment (PDE) used to extend the platform.
2. The Eclipse Tools Project is focused on creating best-of-breed tools for the Eclipse platform. Current subprojects include a Cobol IDE, a C/C++ IDE, and an EMF modeling tool.
3. The Eclipse Technology Project focuses on technology research, incubation, and education using the Eclipse platform.

Download Eclipse Europa 3.3 Classic from eclipse's website. Use the following URL:

<http://www.eclipse.org/downloads/>

Installing Eclipse plugin for leJOS

When you execute Eclipse and you want to install any Eclipse plug-in, in this case NXJ Plug-in, you have to go to help > software updates > find and install:

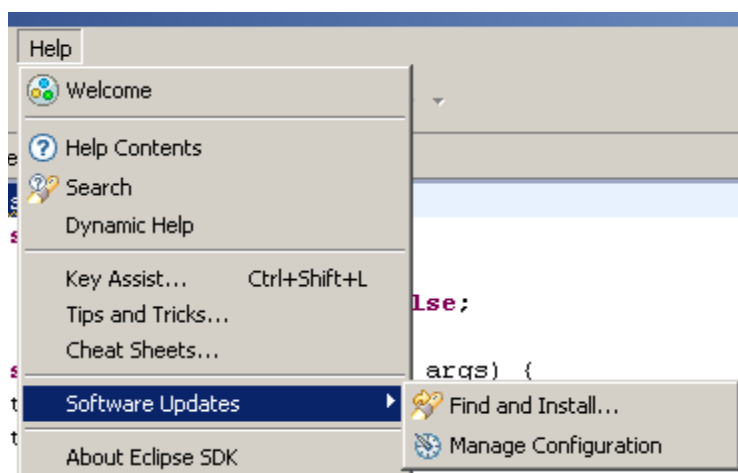
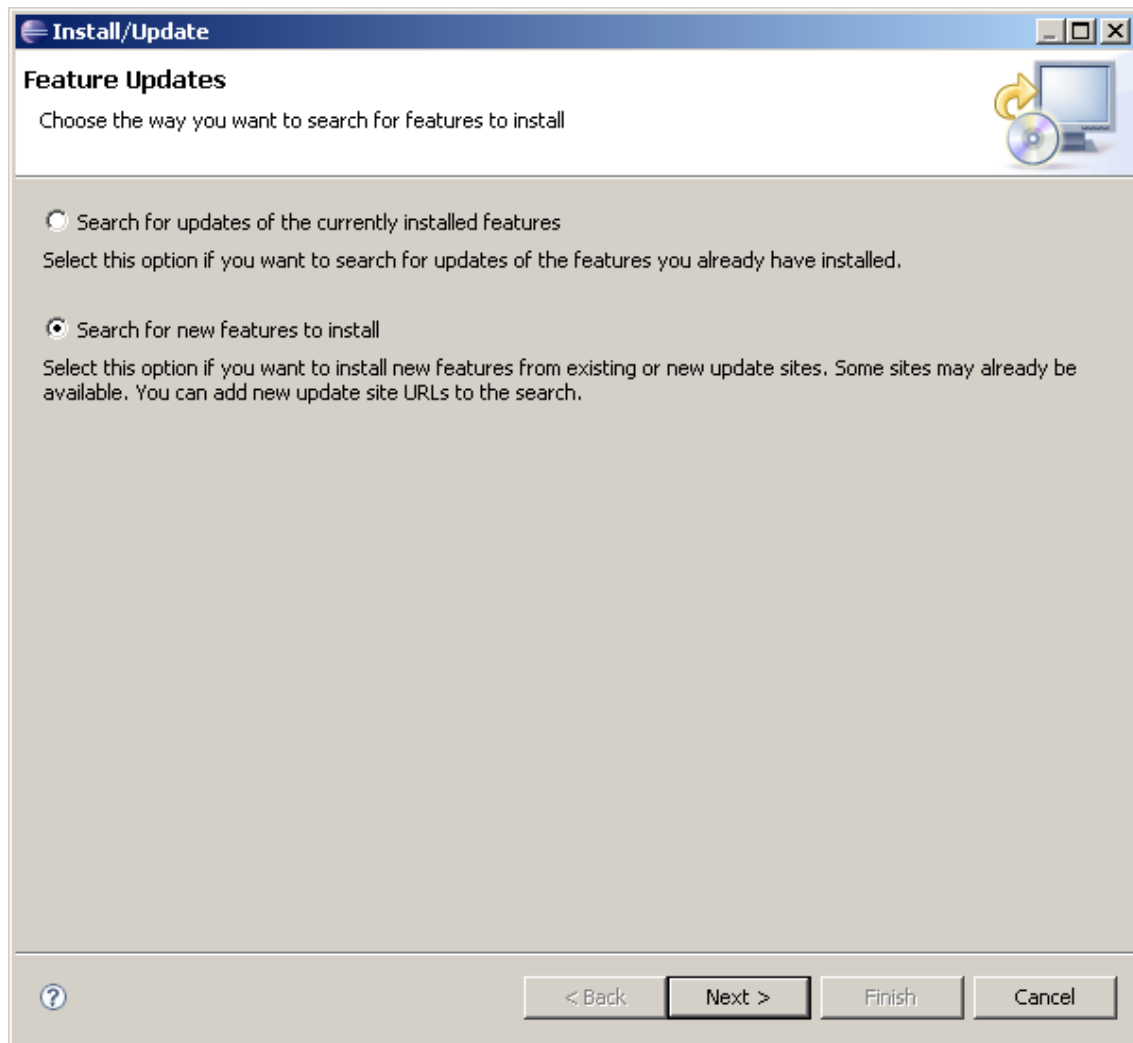
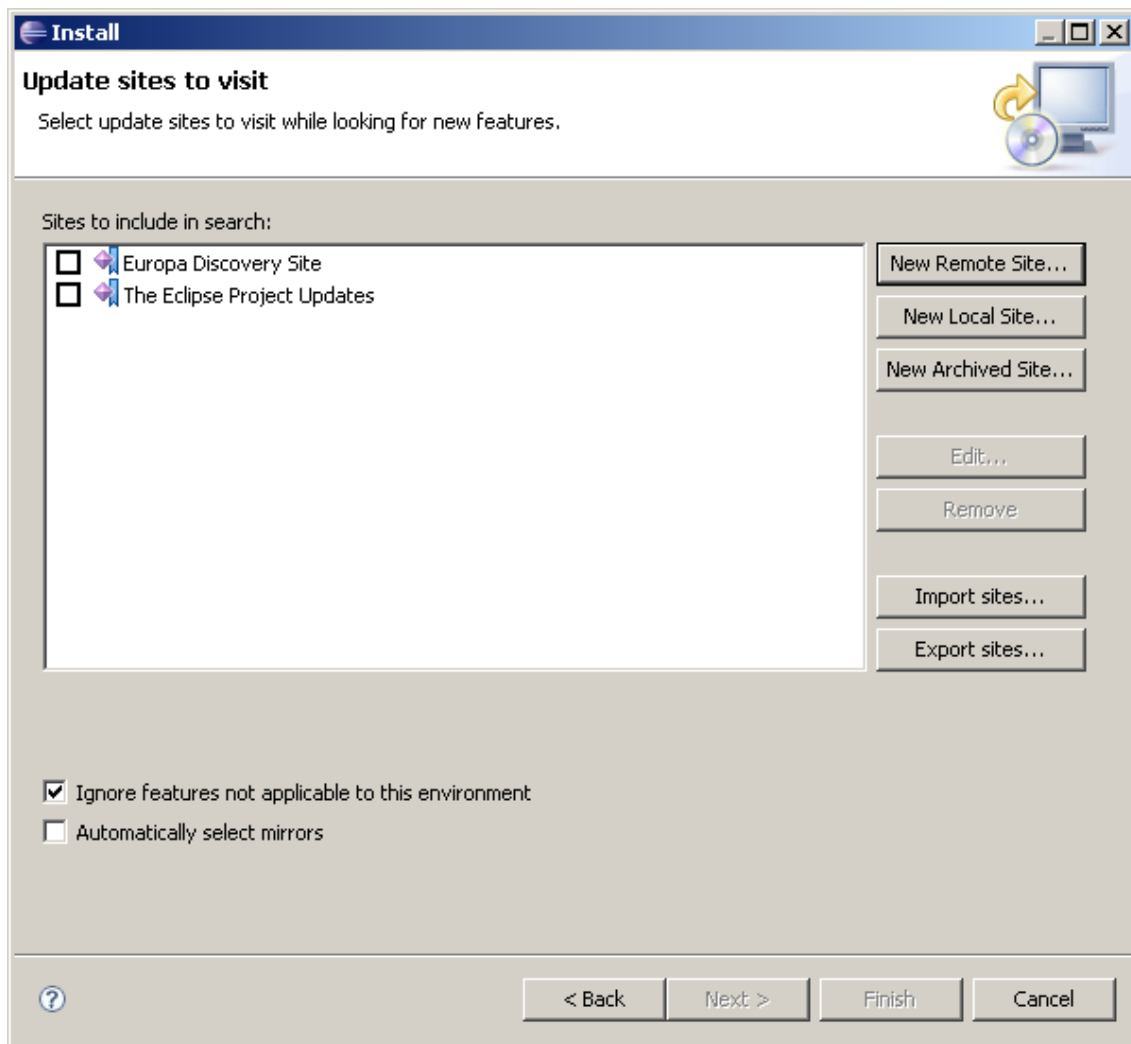


Illustration 1: Eclipse: Software update option

Then you will see the following assistant. Select the second option: “Search for new features to install”



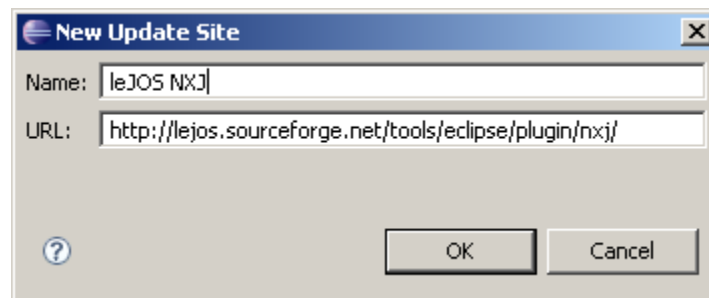
Click in the button next to indicate where is NXT Plug-in. Click in New remote Site:



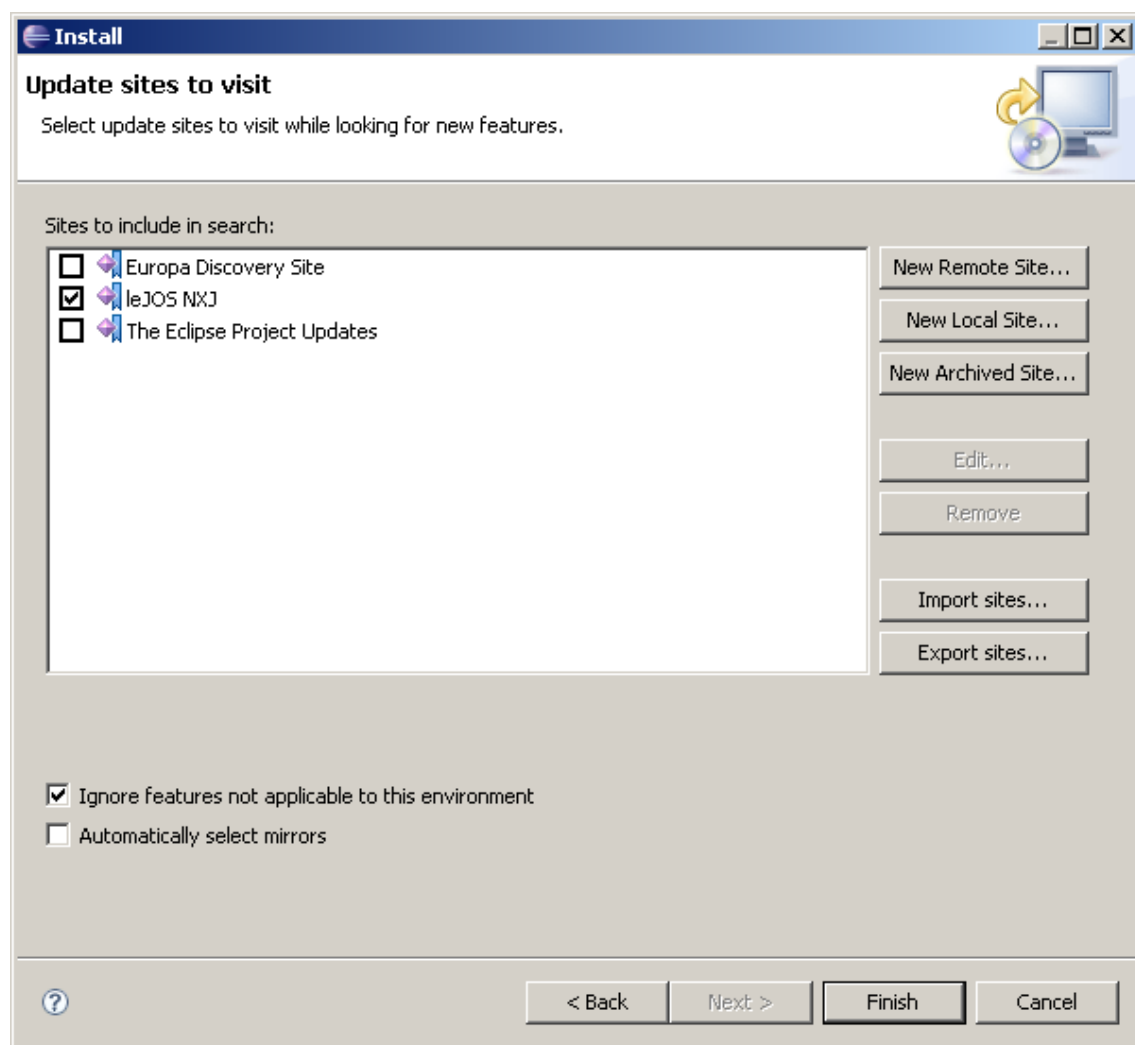
The parameters to write in the next window are:

Name: leJOS NXJ

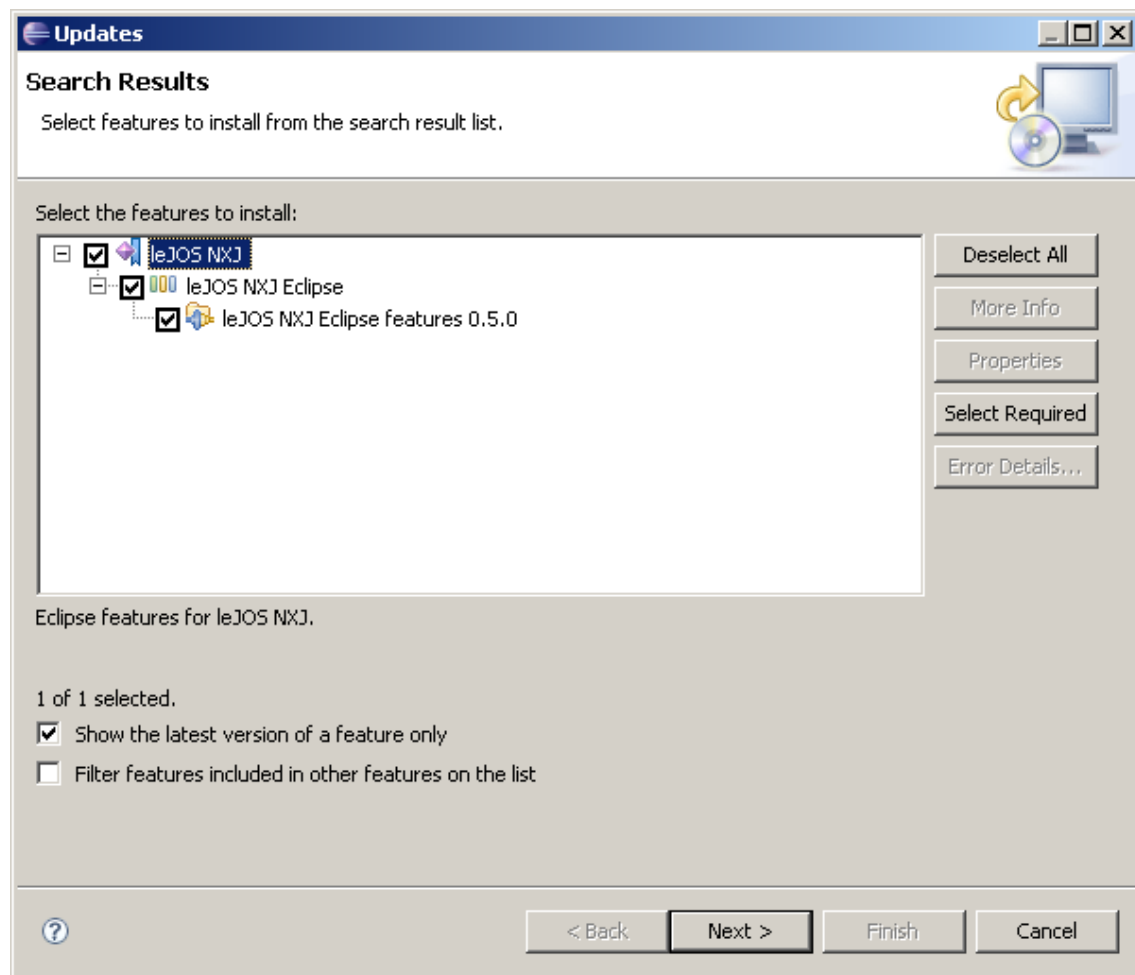
URL: <http://lejos.sourceforge.net/tools/eclipse/plugin/nxj/>

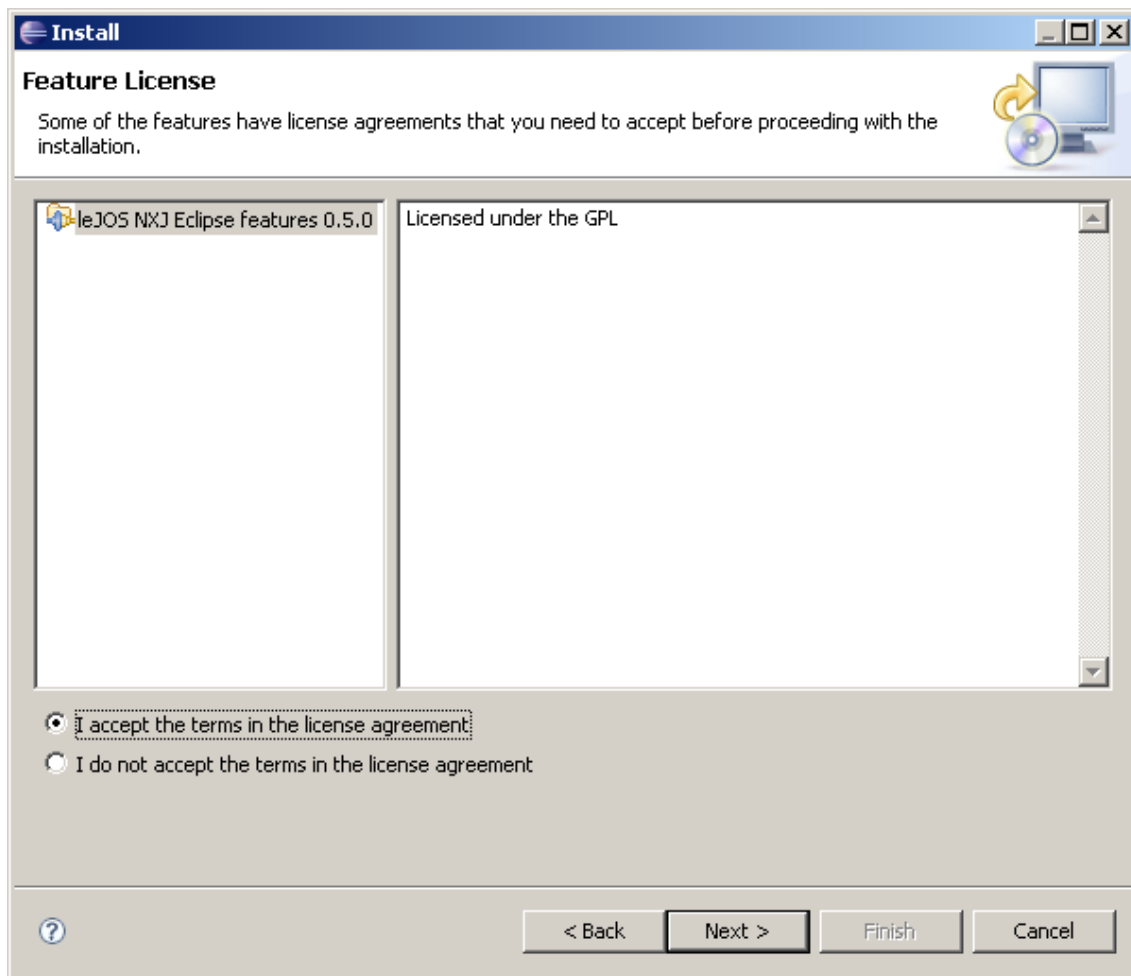


Then, select the site leJOS NXJ:

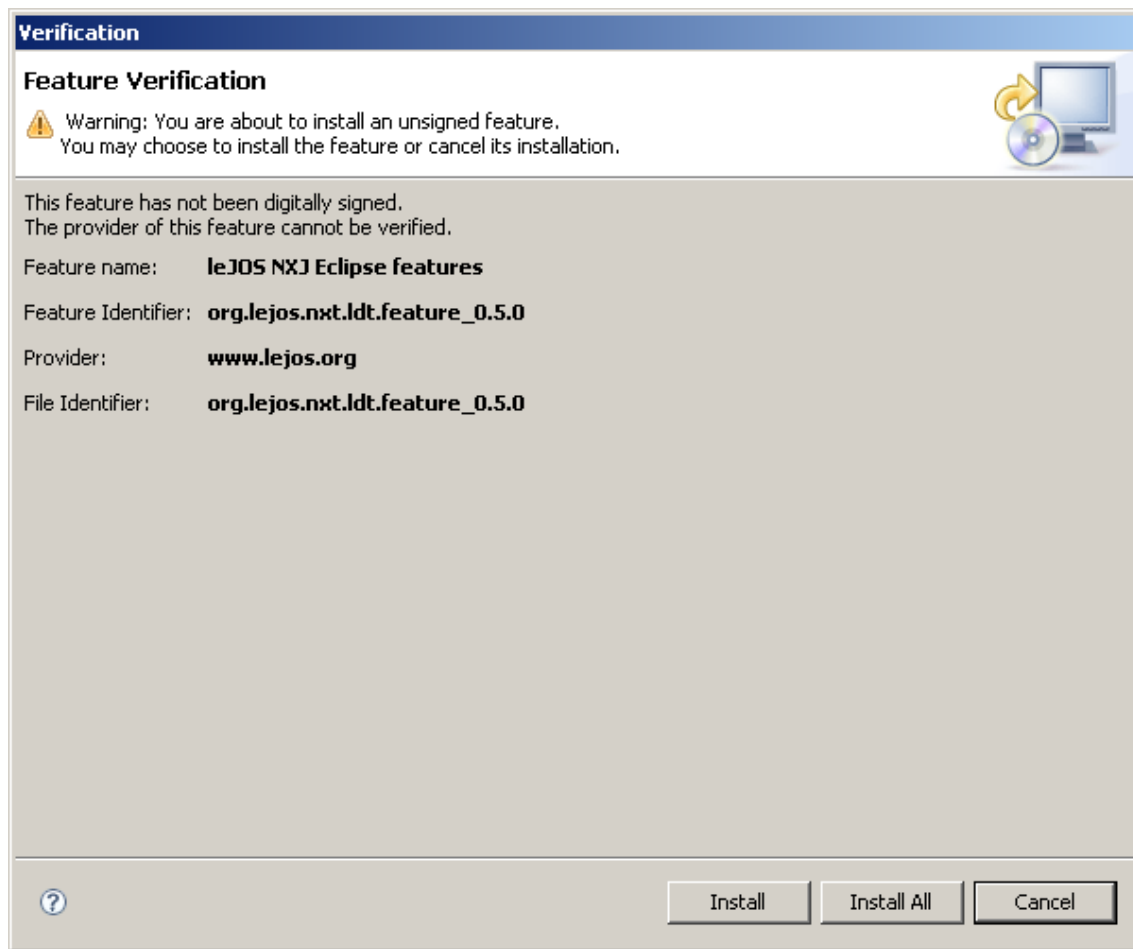


And click in Finish button. In next window, Check all options and click in next button.





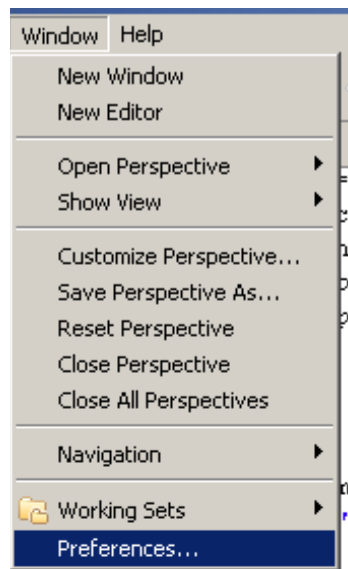
Then you have to accept the terms in the licence agreement and click in next button to install the NXJ plug-in.



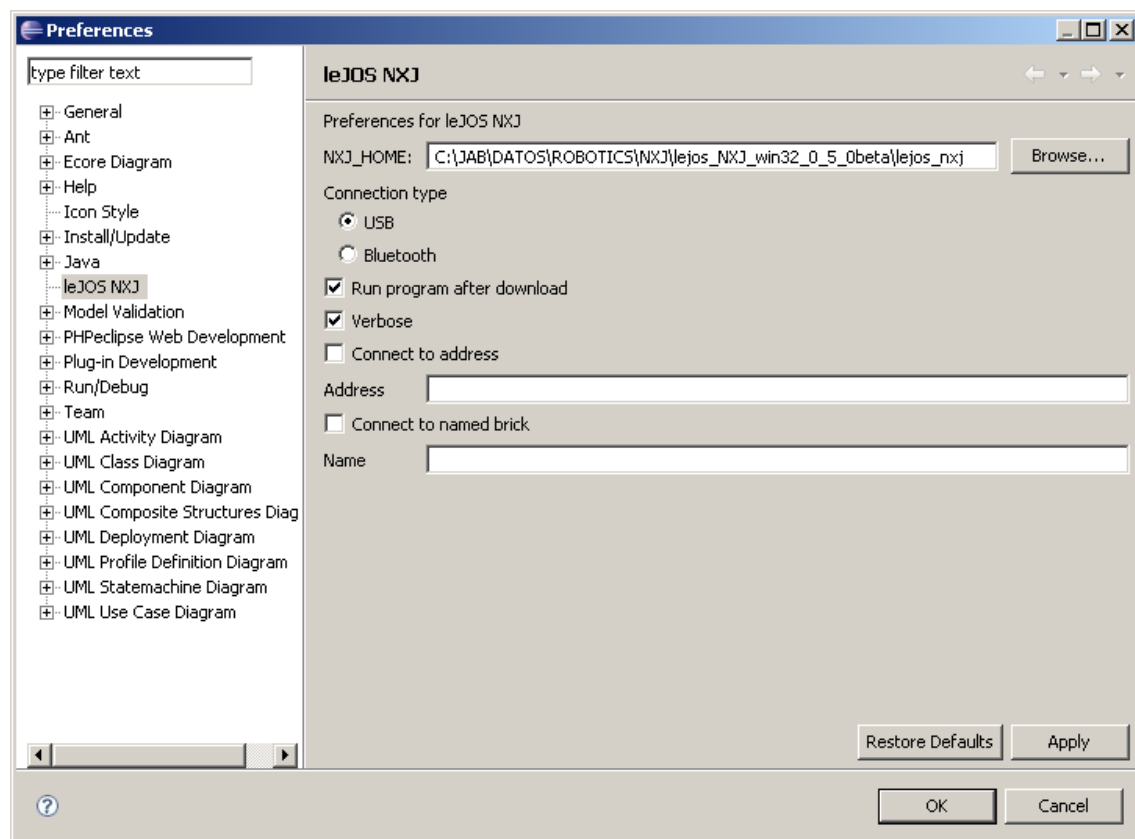
If you have reached to this window, you have finished installing the NXJ plug-in.

Configuring Eclipse plugin for leJOS

Once you have installed NXJ Plug-in, you have to set NXJ_HOME variable in preference area in Eclipse.



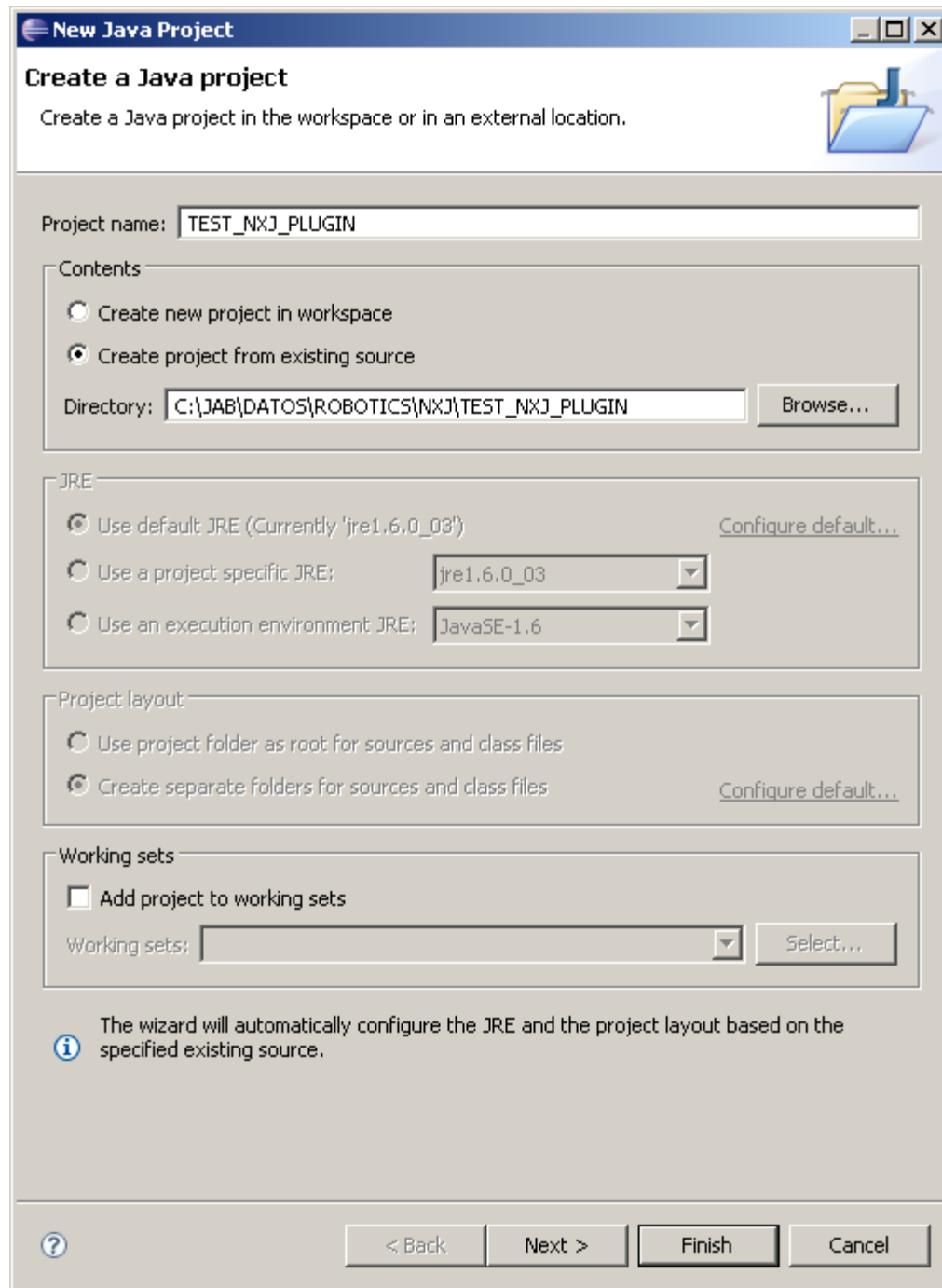
`NXJ_HOME = C:\JAB\DATOS\ROBOTICS\NXJ\lejos_NXJ_win32_0_5_0beta\lejos_nxj`



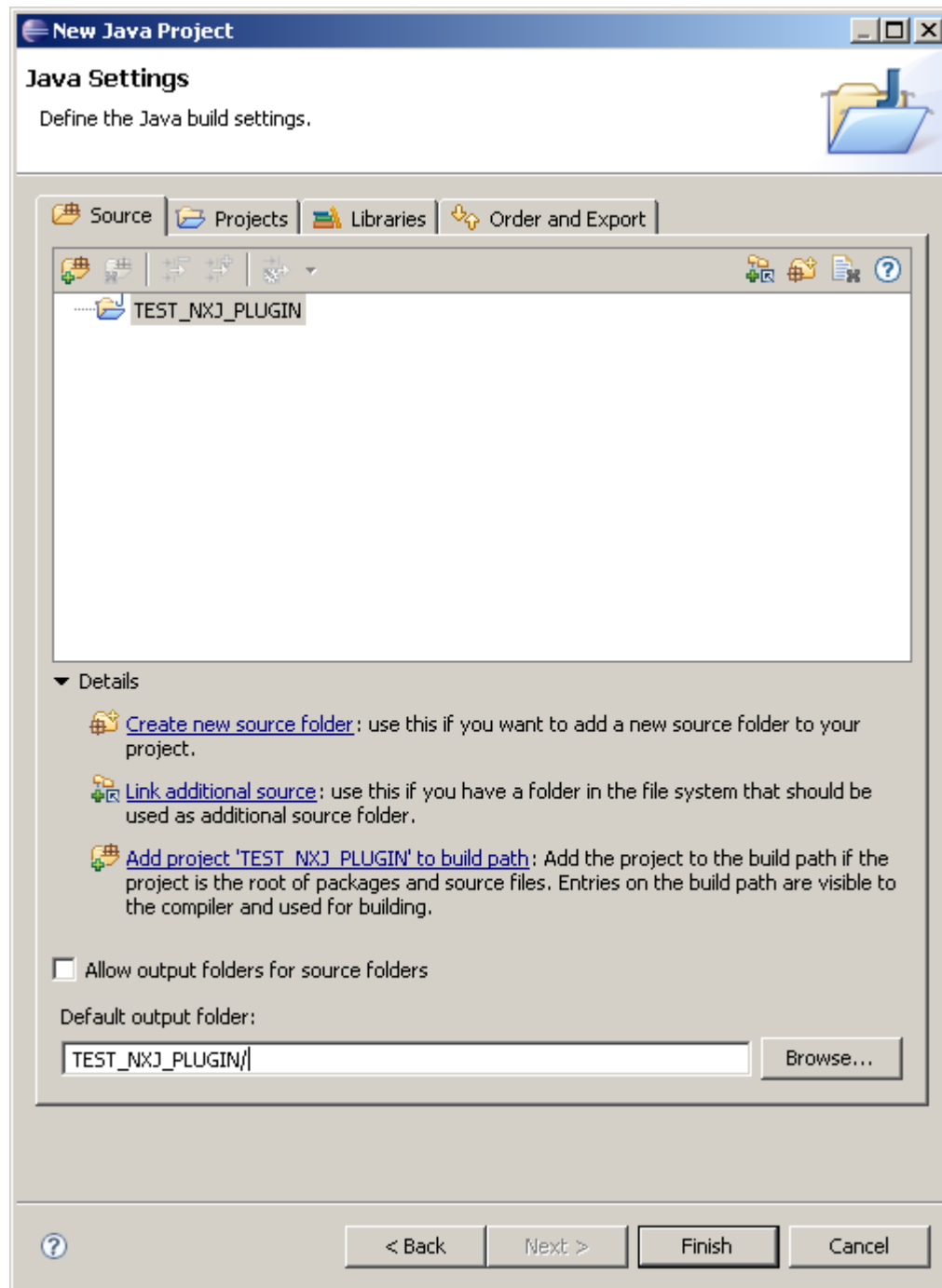
Creating a new project in Eclipse IDE

In Eclipse, you can create a Java Project. To create a Java project, go to File > New > Java Project:

Then you will see an assistant where you have to indicate the name of the Java Project and where you want to store your Java Classes and Byte codes:



Click in next button. In next window, you have to indicate where you want to store .class files. You have to indicate that class files have to store in the same path where you have java files.



Then you will see in tree menu in Eclipse IDE a new Java Project named TEST_NXJ_PLUGIN. Select

it and click in “Convert to leJOS NXJ project”



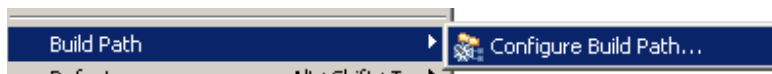
Then your project will be associated with lib path in your NXJ release.



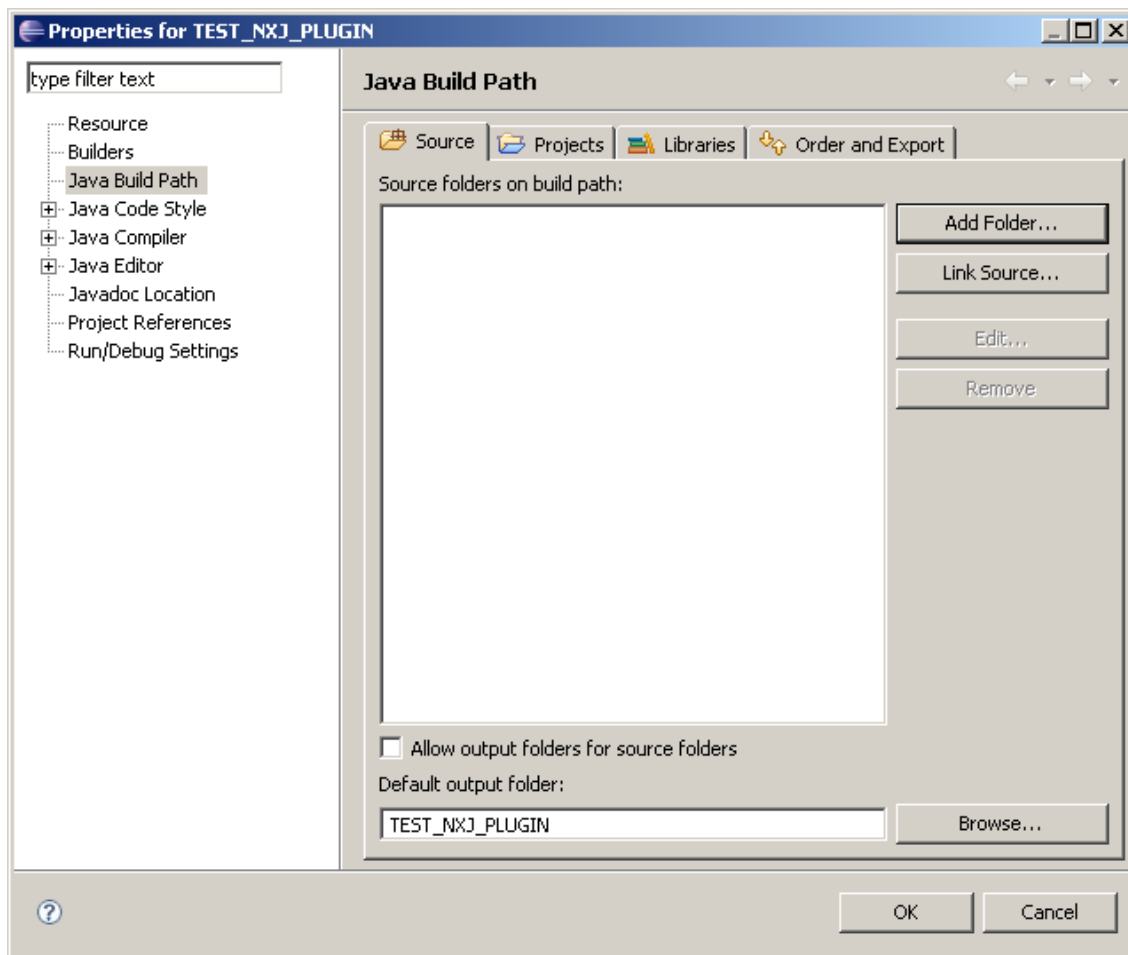
Besides, in Eclipse console window, you will see the following message:

Project TESTING_NXJ_PLUGIN now is a leJOS NXJ project

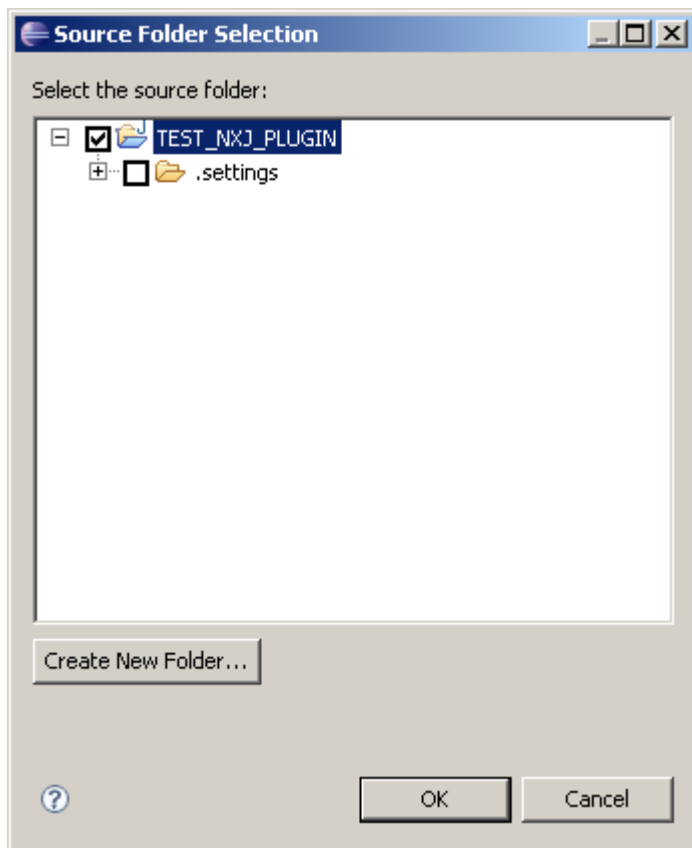
Then, it is necessary to define Build path. Select your NXJ Project and click in Configure Build Path in context menu:



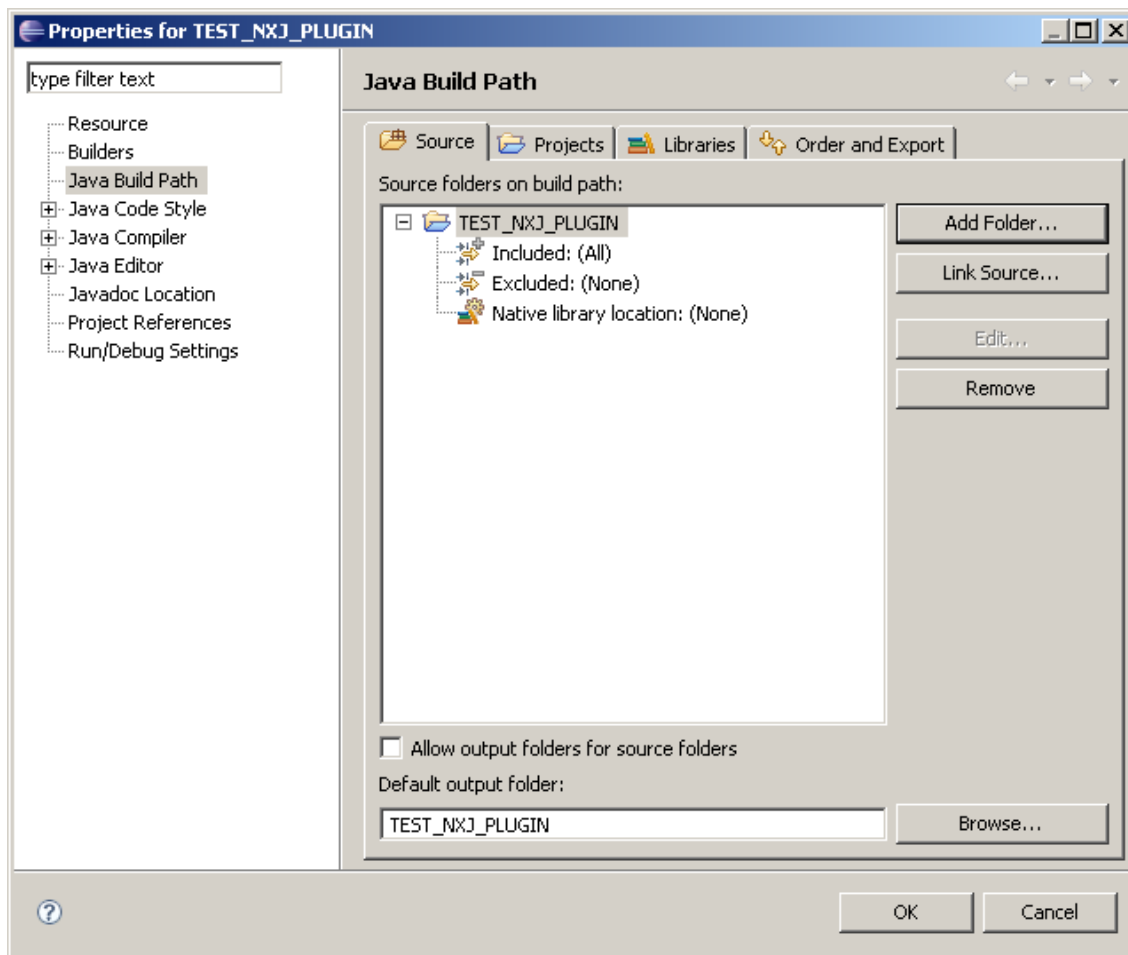
Add new folder:



And check the folder TEST_NXJ_PLUGIN:



Then, click in Ok button to see the changes in your project:



Then you have to click in Ok button to finish this step.



NXJ Plugin Features

Introduction

NXJ Plug-in allow to NXJ developers to do the following actions:

1. Upload latest firmware into NXT Brick
2. Upload NXJ programs into your NXT Brick
3. Convert any Java project into NXJ project

In this section, we explain the first and second feature.

Besides, NXJ Plugin includes a excellent documentation.

Upload firmware

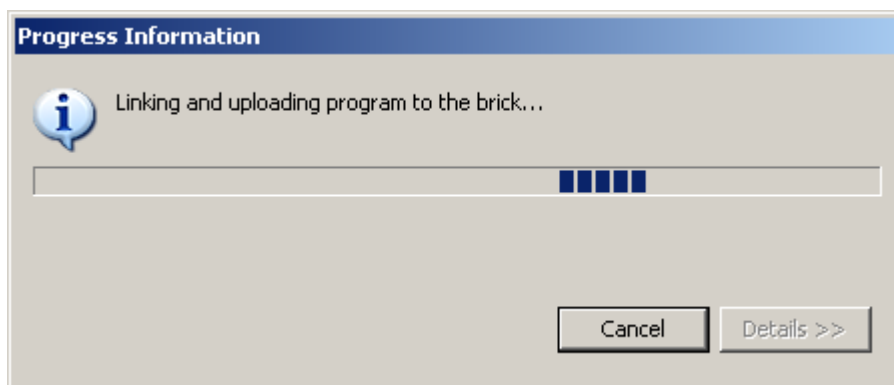
If you have to upload leJOS firmware to NXT brick, you can use this plug-in. Connect your NXT brick by USB wire to your computer and click in Upload firmware:

Upload Program to the NXT brick

Normally you send programs to NXT brick using DOS console or using Eclipse manually or another IDE. With NXJ Plug-in the process to send NXJ programs is so easy.

When you finish developing your NXJ Program, simply selecting the class and with context menu, selecting the option Upload Program to the NXT Brick:

Then if your class doesn't have any syntactic error, connect your NXT brick and click in the option, then you will see the following window:



Then your program will be running in your brick!

How to reinstall Lego Firmware

Introduction

LeJOS is an excellent platform to develop software for NXT Lego Mindstorm but it is not the unique solutions.

If you read the section NXT Programming Software written by Steve Hassenplug in <http://www.teamhassenplug.org/NXT/NXTSoftware.html> then you will notice that exist several options to develop software in the NXT brick. If you have installed LeJOS firmware and you decided to reinstall Lego firmware, read this section to know how to do.

Download latest Lego firmware

To reinstall Lego Firmware is necessary to have latest firmware in your computer. Visit <http://mindstorms.lego.com/support/updates/> to download the firmware.

Set your NXT brick in update mode

Once you have stored latest firmware, it is necessary to set your NXT brick in Update mode. To update the mode in your NXT brick then you have to push reset button. To find that button see at the back of the NXT, upper left corner and push it for more than 5 seconds then you will hear an audibly sound.

If you want to be sure, check your Lego Devices connected with your computer then you will see:

Reinstall Lego firmware

Use Lego Software that you received with your NXT Kit to download Lego Firmware.

Execute the software and search the option Update NXT Firmware in Tools tab.

When you click in that option then you will see an assistant to download the firmware. Select the firmware that you downloaded and click in download button:

When the process finish then you will see all steps with green color and your NXT brick will have Lego Firmware.

How to be a new LeJOS Developer

Request a user

In previous section, we see that if you create new code, it is necessary to authenticate then you need a LeJOS user. Write us to get your LeJOS user to collaborate with us.

How to use beta software from leJOS SVN?

If you are an active user then you know that leJOS project releases software every 4-6 months more or less. But in this period, the project suffers many changes and If you want to use latest works into your NXT projects, I recommend you that use the following technique.