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Annexes

Introduction

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

1. Getting Started with LeJOS on Linux

Getting started with leJOS on Linux

Introduction

This section is a prerrequisite for any project which you use LeJOS project. In previous releases of this ebook, this material was included in some chapter, but with the time, I have thought that this material is better if it is included in the annex and reader only focus in the concepts and less in the way.

To begin any project it is necessay to do the following tasks:

1. Install Ubuntu
2. Install Java
3. Install Eclipse
4. Install a SVN Client
5. Install LeJOS project
6. Install LeJOS plugin for Eclipse

Install Ubuntu

Ubuntu is a Linux distro and now it is very easy to install using a Pendrive. The way to install in your computer Ubuntu using this method is really easy. Download the ISO for Ubuntu 10.04 in Ubuntu's website. Once you have stored that file (ubuntu-10.04-desktop-i386.iso) Download from Unetbootin's website latest release of the software to install ubuntu from a website. Using a pendrive, execute Unetbootin to convert a pendrive into a installer of ubuntu.

In your computer, check BIOS to configurate to install from USB drive. If you previous task ok, You will see some menu when computer start.

In this moment, you will install Ubuntu in a normal way.

http://www.ubuntu.com/

http://ubuntu-manual.org/?lang=en_GB

http://unetbootin.sourceforge.net/

Install Java

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 an 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.

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

Note:

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

Install Eclipse

Develop any Java program in general is easy, but it is more confortable 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.

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/

Install a SVN Client

LeJOS project is a live project and continously is improving so we recommend to install a SVN client to update your local copy of the project. One benefit to have this software appear when LeJOS Developer Team launch an internal release for developers to tests new concepts.

Eclipse IDE has a SVN plugin but for eclipse exist some problems so it is better if you use an external SVN client as RapidSVN.

```
sudo apt-get install rapidsvn
```

http://rapidsvn.tigris.org/

http://www.eclipse.org/subversive/

Note:

Test RapidSVN to make a checkout from LeJOS project:

https://lejos.svn.sourceforge.net/svnroot/lejos/trunk

Install LeJOS project

In this section, you will learn how to use leJOS in a Linux System. The process has been tested in Ubuntu. 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 Some libraries/utilities used in leJOS
    1. gcc
    2. Libusb
    3. Ant
    4. Bluez
2. Download and Install latest leJOS release
3. Configurate some files in Linux
4. Test

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: /user/local/

```
root@system1:/usr/local# tar xvf lejos_NXJ_0_9_0beta.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/*
```

Configurating a LeJOS Release

Any LeJOS Relase in a Linux System has to be configurated. The steps to configurate 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. Stablish 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,lisbusb,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 #
```

Configurating 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 your connect your NXT brick, the value change:

```
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
```

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:

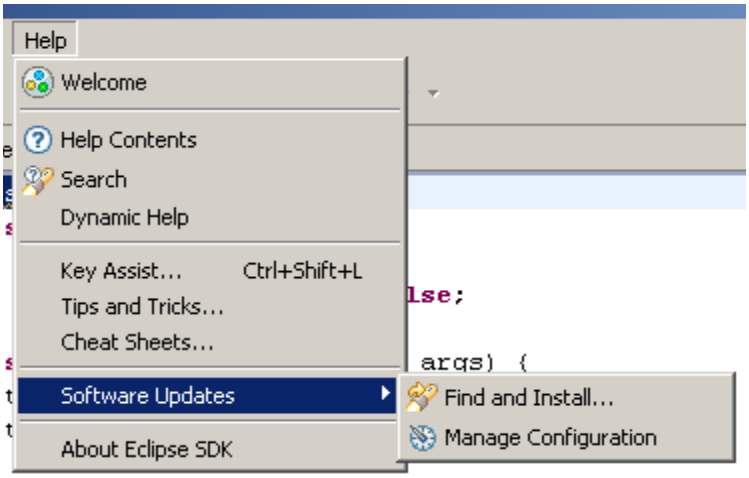
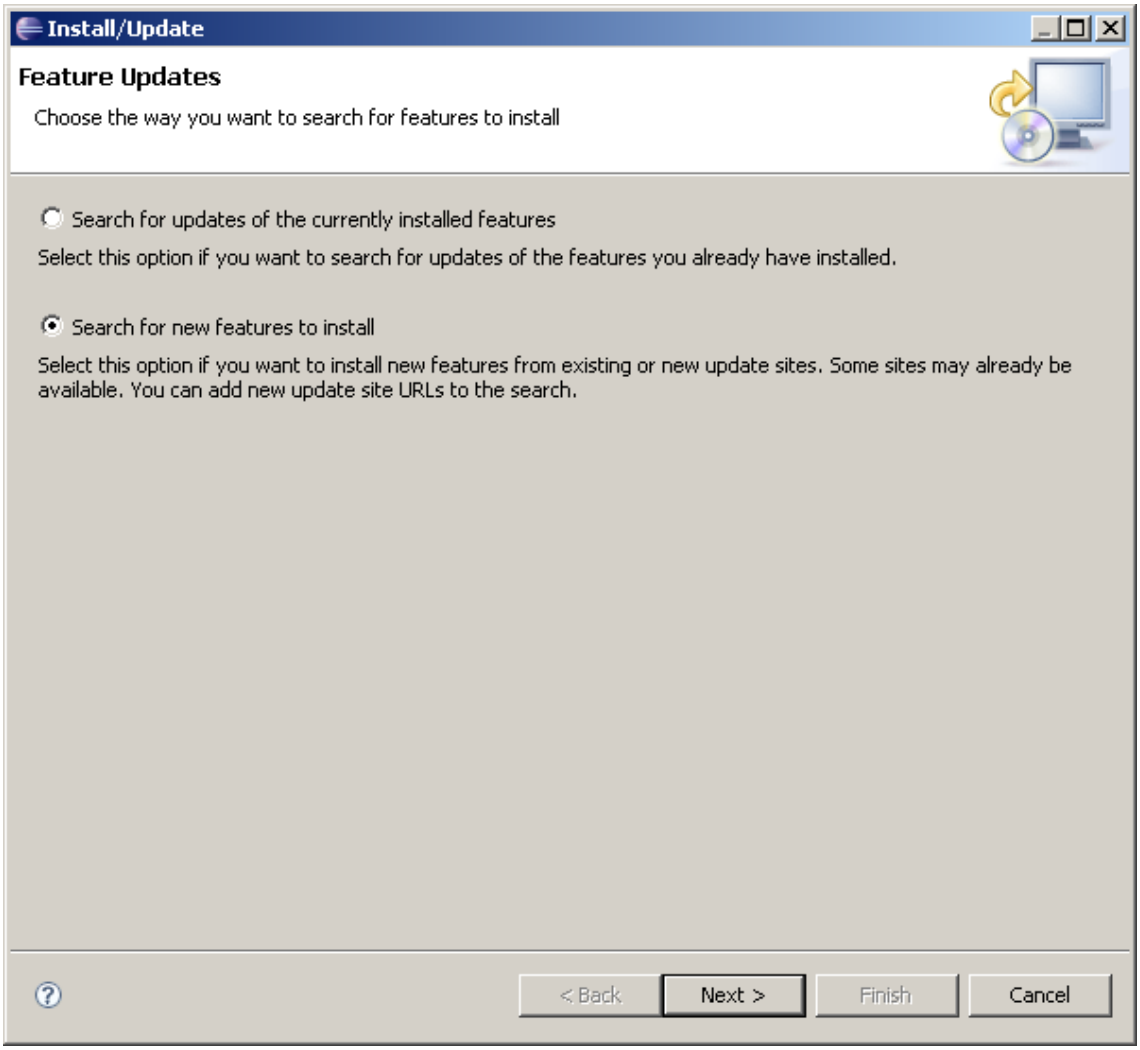
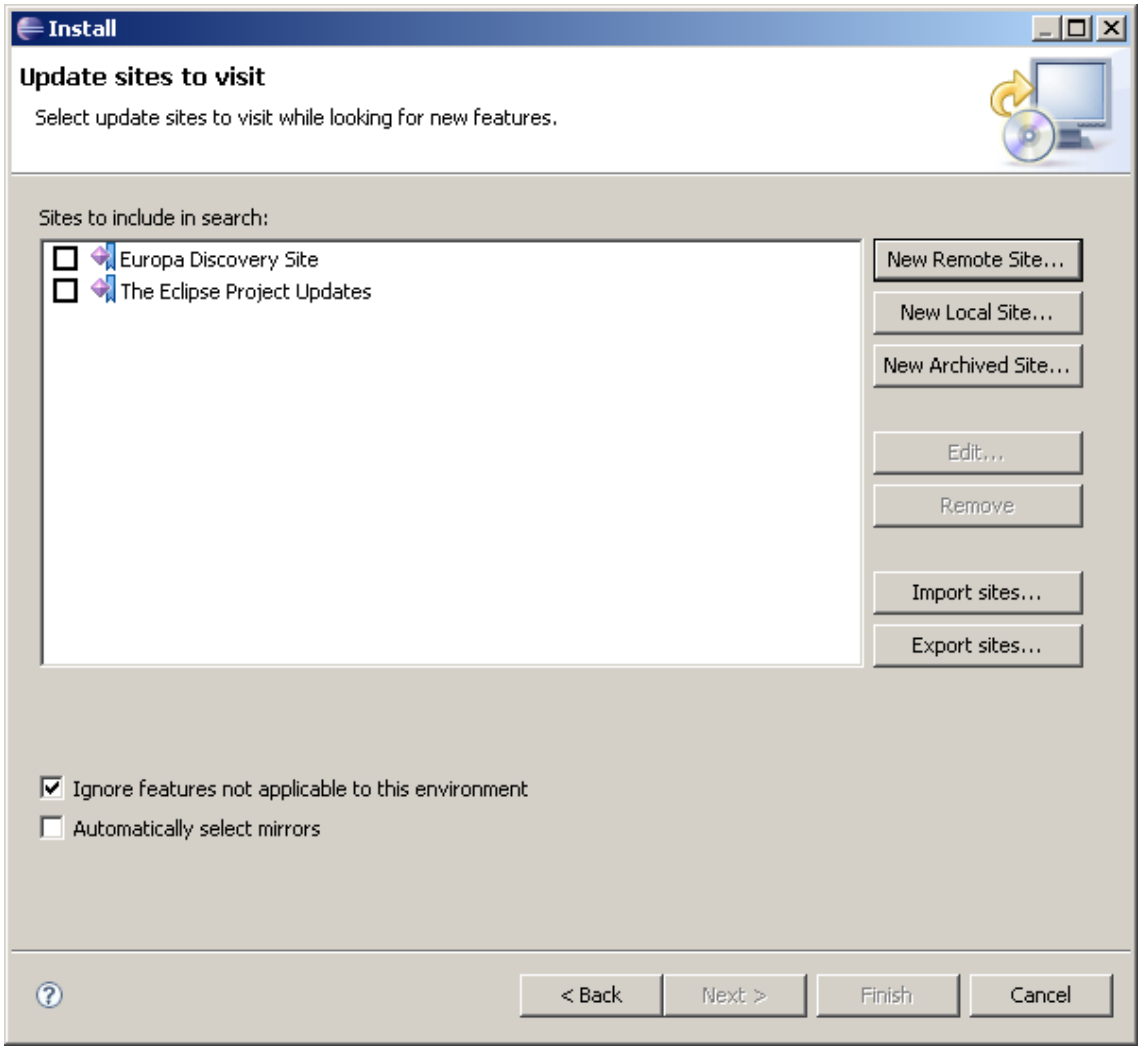


Illustration 1: Eclipse: Software update option

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:



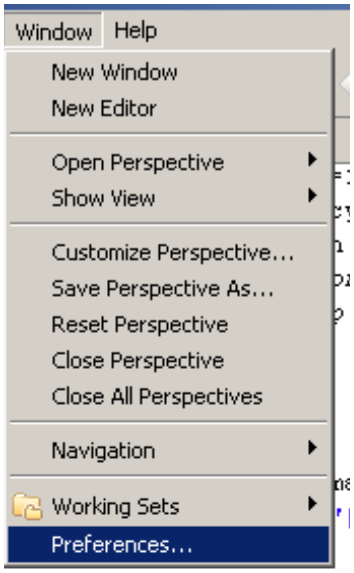
The parameters to write in the next window are:

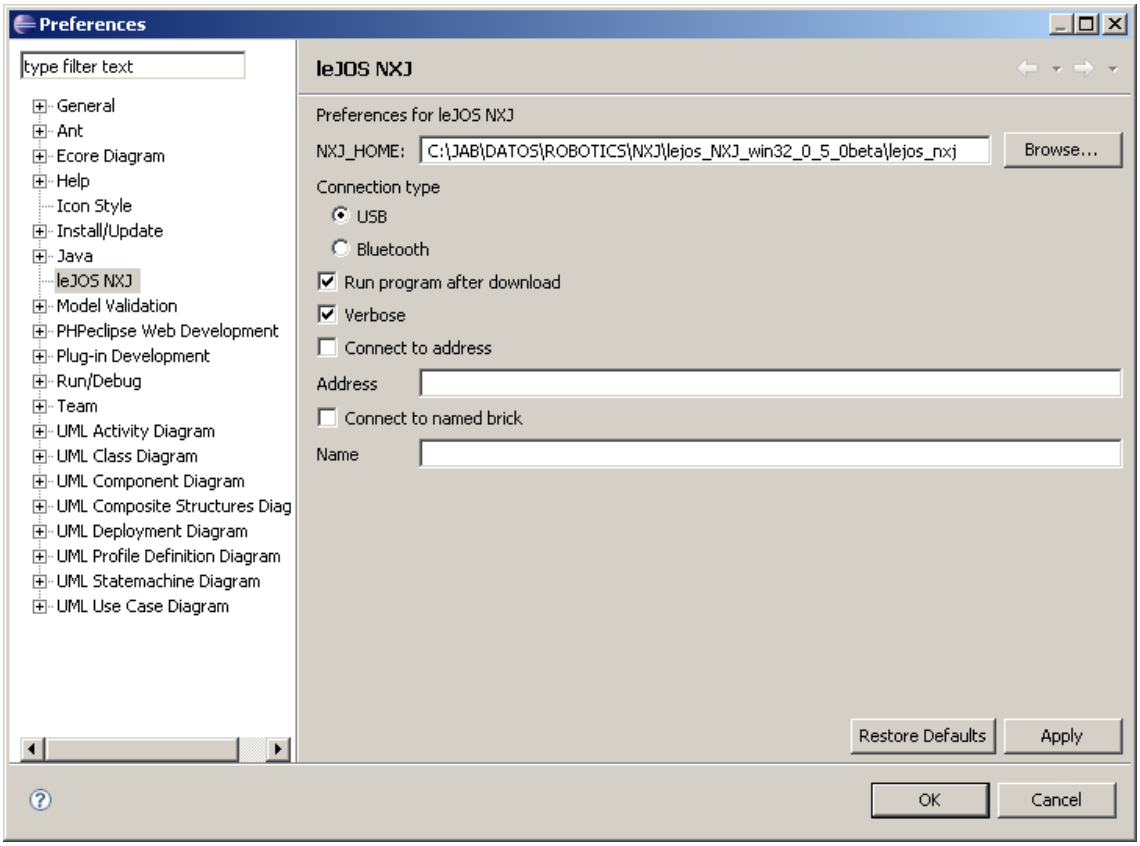
Name: leJOS NXJ

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

Configuring Eclipse plugin for leJOS

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

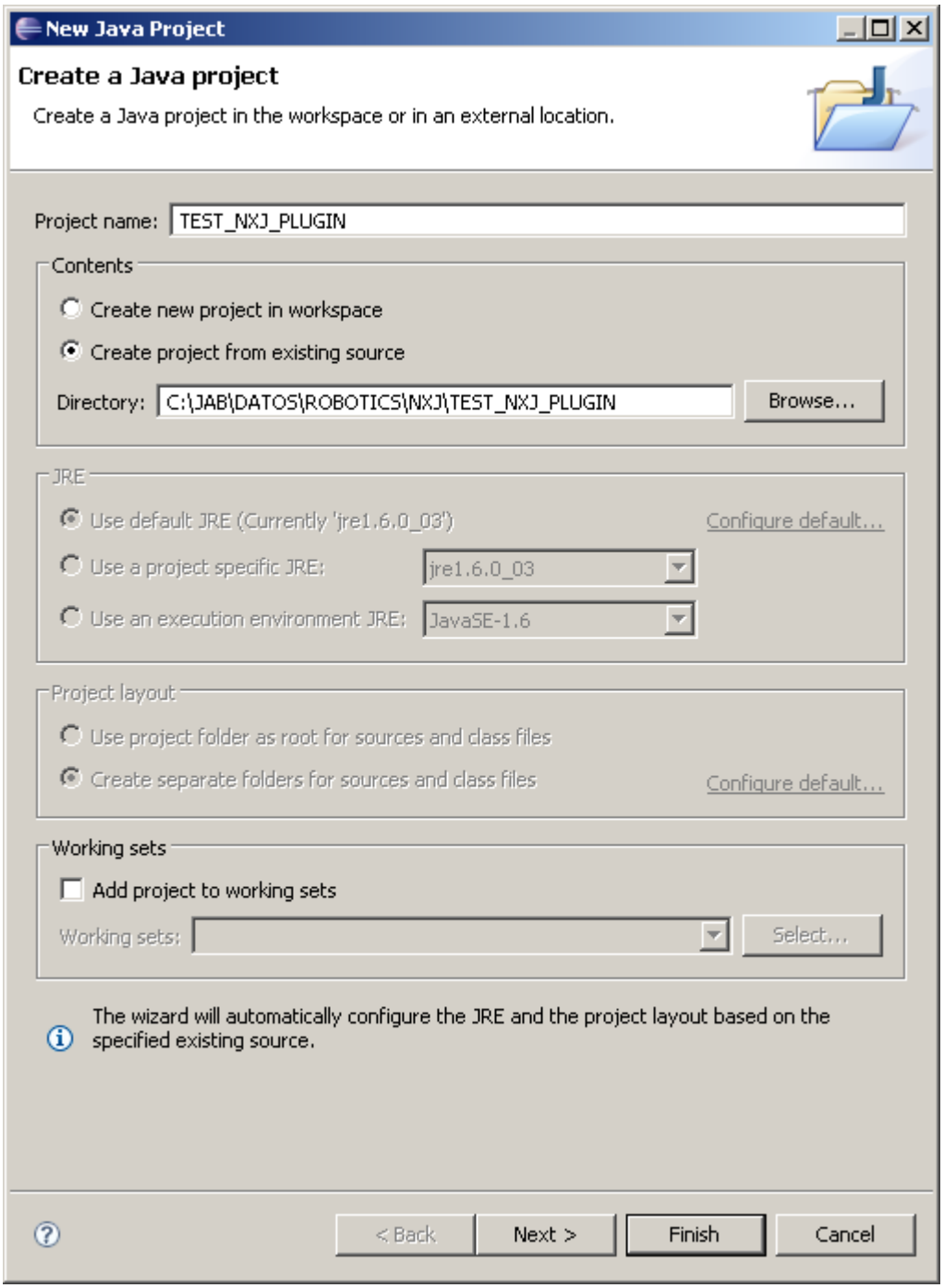




Creating a new project in Eclipse IDE

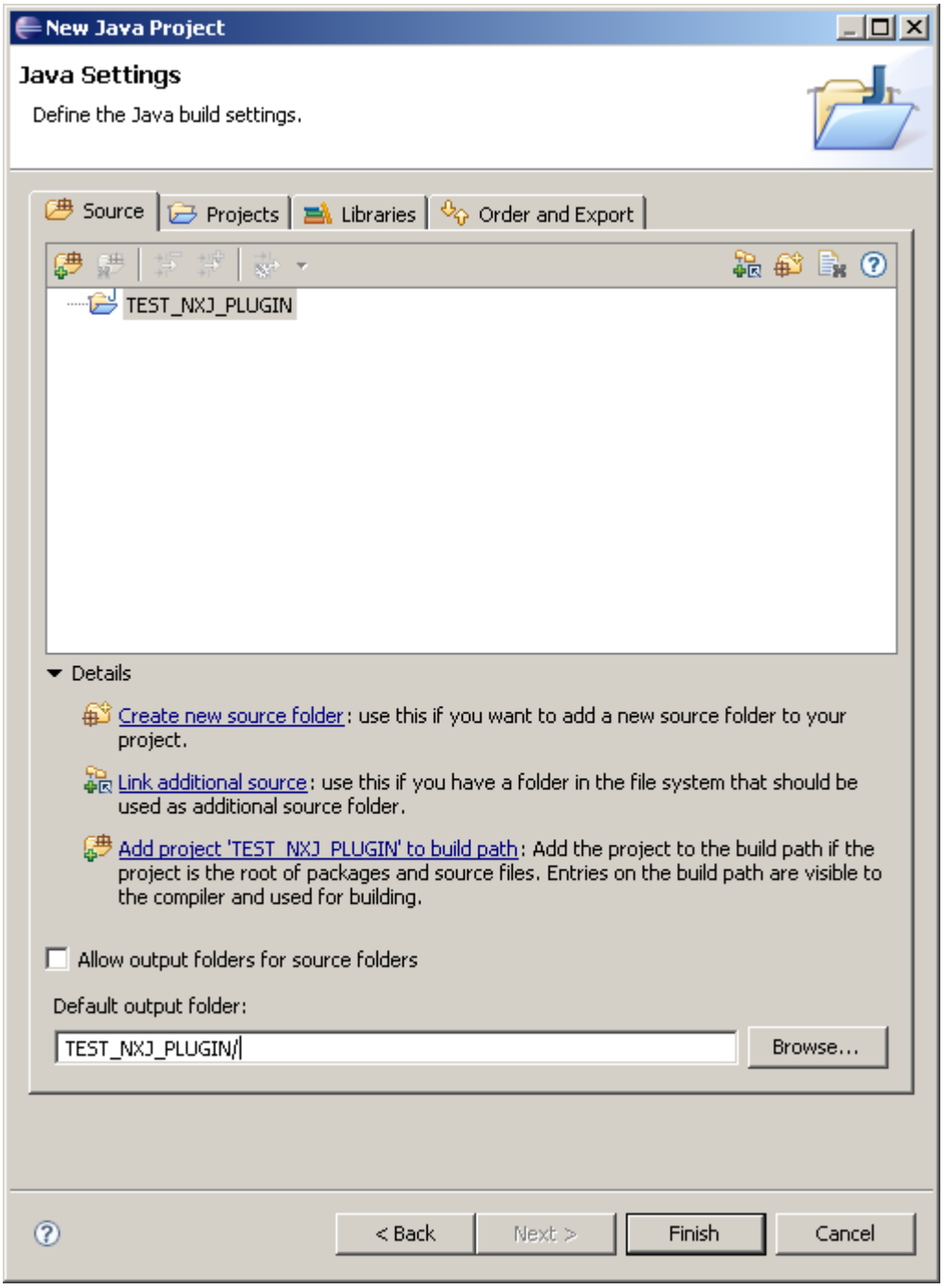
In Eclipse, you can create a Java Project. To create a Java project, go to File > New > Java Project:

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:



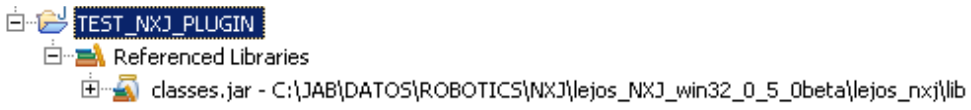
Click in next button. In next window, you have to indicate where you want to store .class files. You

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.



NXJ Plugin Features

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 anoher 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:

Install latest Developer LeJOS firmware

LeJOS is a open source project which launch new releases every year 2 times more less. Meanwhile LeJOS developer team releases continuosly internal releases for developers to test new features, concepts and refactors.

The way to use latest firmware for internal purposes is:

1. Make a backup of your folder /bin/ and /lib/
2. Download a copy of LeJOS repository
3. Find the folder snapshot and copy the folder /bin/ and /lib/ into your leJOS's installation
    1. Remove .bat files from bin folder
4. Test the operation with some LeJOS utility
    1. nxjcontrol
5. Update firmware with the command nxjflash or nxjflashg

Summary

In this chapter you should be learnt how to Install leJOS in your Linux system. With the time the process should last lest 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.

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.