



Quick Start Guide

Contents

Terminologies	3
Basic Setup at Glance	3
Preface	4
1. Installing the toolchain	5
2. Basic Hardware Setup	9
3. Compiling Senseenuts Code	10
3.1 Importing a project in Eclipse	10
3.2 Compiling the project	13
4. Flashing Radio Modules	15
5. Installing USB Gateway Drivers	16
6. Creating a new project in Eclipse	17

Terminologies

- bin file:- The executable file created after the compilation of the C code
- Flashing:- Programming the microcontroller with the bin file compiled
- SNGW:- SENSEnuts Gateway Module
- SNRD:- SENSEnuts Radio Module
- SNES/ SNTL:- SENSEnuts Temperature Light Sensor Module
- SNHTP:- SENSEnuts Humidity, Temperature and Pressure (barometric) Sensor Module
- SNGAP:- SENSEnuts GPS, Accelerometer and PIR Sensor Module

Basic Setup At Glance

- 1) Install the toolchain
- 2) Plug in the gateway and install the USB drivers
- 3) Connect the gateway with the Radio Module
- 4) Open SENSEnuts GUI and wait for the message which says that the SENSEnuts device has been found
- 5) Select the bin file to be flashed
- 6) Click on Download button and wait till the microcontroller is programmed
- 7) That's all folks

Preface

SENSEnuts is a platform for wireless sensor network research, development and implementation. The platform finds its application in numerous domains, though the back-end is running on IEEE's 802.15.4 standard. It is pragmatic for researchers willing to realize their algorithms and visualize them to be practically implemented in the fields. It is suitable for carrying on research in algorithm development and testing, on the other hand, it apposite for end applications like home automation and many more.

SENSEnuts WSN platform is diverse in itself, it is programmable to accomplish different tasks. This guide is designed in order to give a quick push to a user working for the first time on SENSEnuts platform. There is no programming specific information present in this guide. On the other hand, a user must read this guide thoroughly in order to understand the information in all other guides. This guide covers the following points in exact sequence:

1. Installing The Toolchain
2. Basic hardware setup
3. Compiling SENSEnuts code
4. Flashing radio modules
5. Installing USB Gateway drivers
6. Creating a new project in Eclipse

1. Installing The ToolChain

SENSEnuts toolchain provides all the software environment needed for developing applications on the platform. The toolchain can be downloaded from the website link provided to the end users, or may be installed from the CD supplied along with the package. The setup must be installed on a Windows platform and it will install the following software/programs on the system:

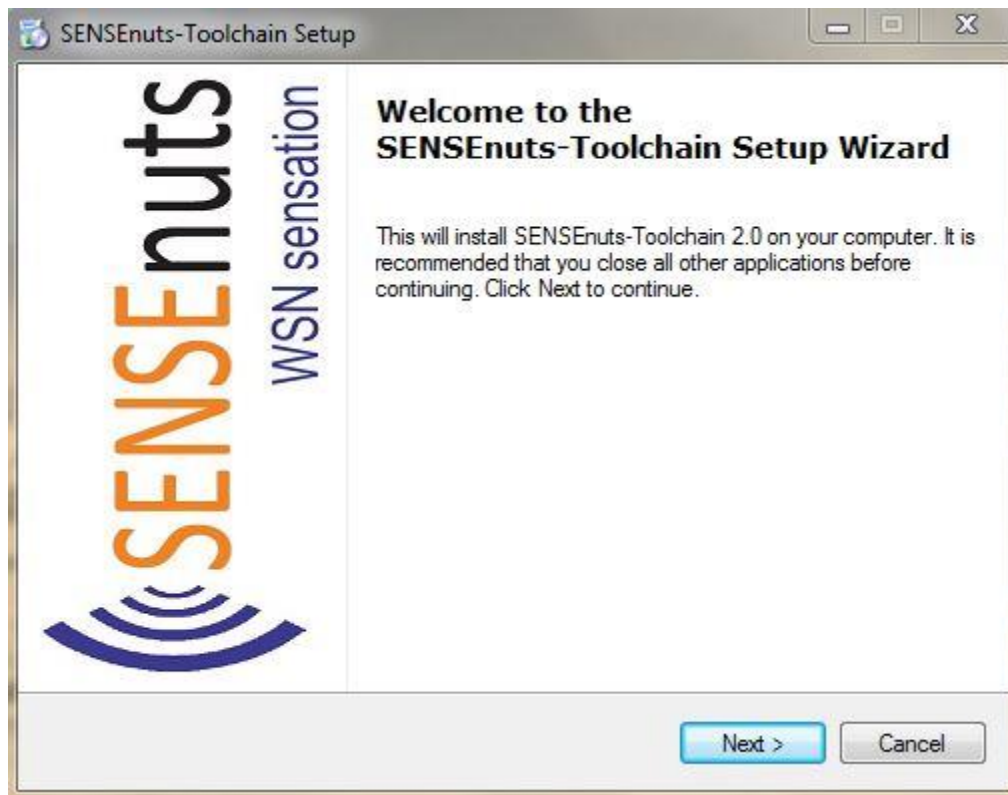
- **Cygwin**:- it provides a Linux environment on Windows.
- **Eclipse**:- It is the IDE which is used for writing and compiling the code written for SENSEnuts platform
- **SENSEnuts GUI**:- It is used to program the motes and display the data received from the network on the computer system.
- **JRE**:- JRE or Java Runtime Environment is needed by Java based software.
- **Compiler**:- Compiler tools to build the applications for SENSEnuts Platform

Supported Platforms

- Windows 7
- Windows 8
- Windows 10

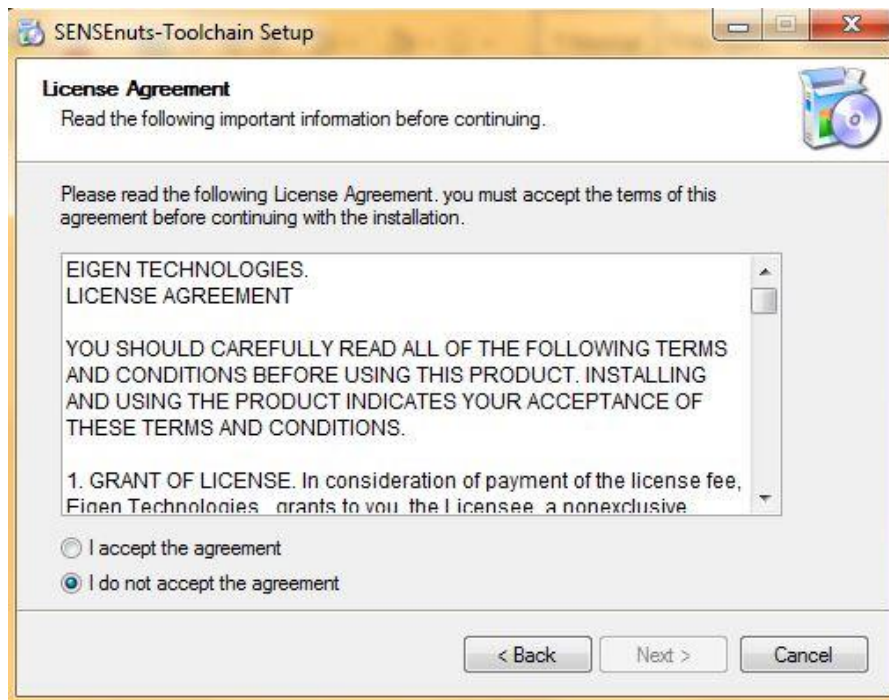
Installation Steps

- 1) Copy the installation file from the CD or download it from the link provided.
- 2) Double click on the installer file. This will open the installation wizard as shown in the image, which will guide you with the installation process.
- 3) Click “Next” to begin the installation.



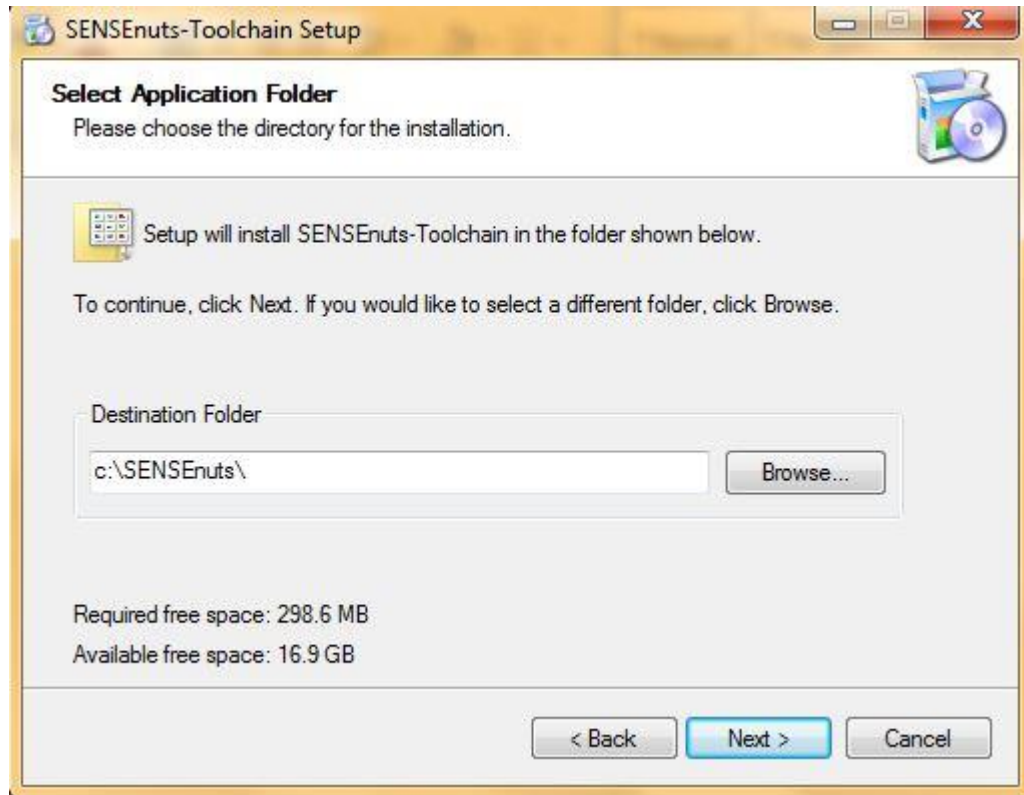
SENSEnuts installation wizard

- 4) Read the license agreement carefully and select “I accept the agreement” to proceed with the installation. Click on “Next” to continue.



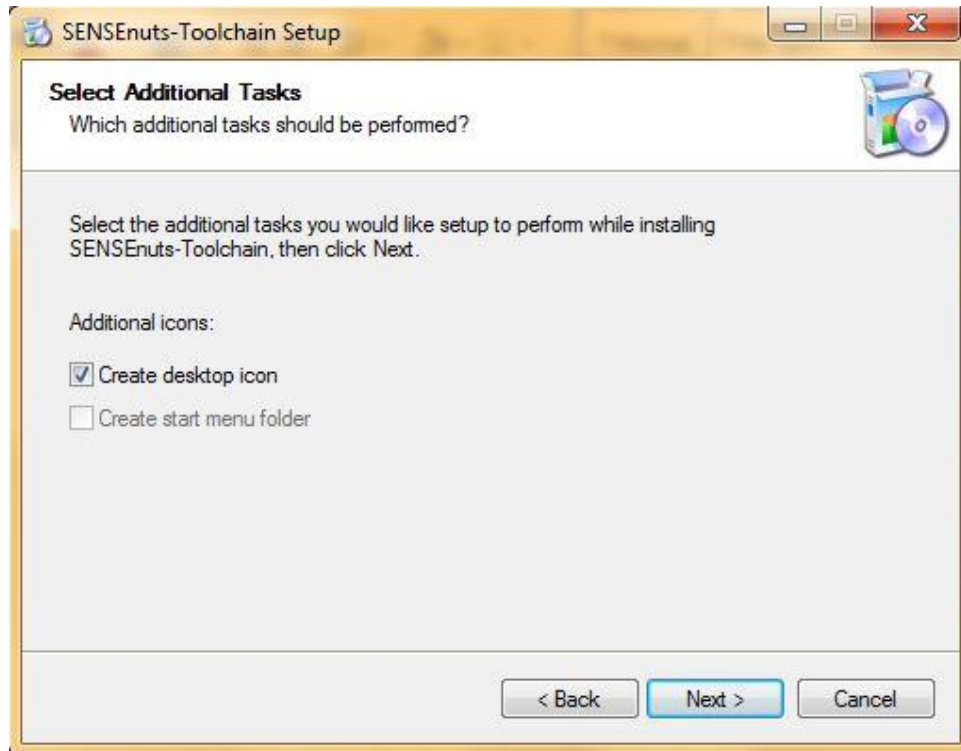
License Agreement

- 5) Select the destination folder where you want to install the software toolchain. Click on “Next” to proceed.



Path Setup

- 6) Check if you would like to create a desktop icon or a start menu folder. Click on “Next” to proceed with the installation

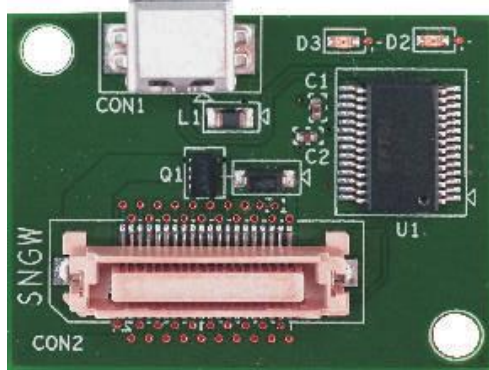


- 7) Click on “Finish” to finish the installation.



2. Basic Hardware Setup

The minimal hardware needed for SENSEnuts devices is a gateway module (SNGW), a radio module (SNRD) and a USB cable for a connection between SENSEnuts platform and the user interface (Computer).



Gateway Module Top View

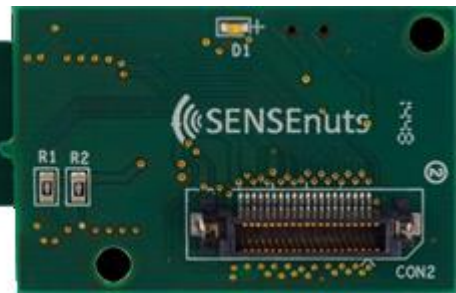


Gateway Module Bottom View

Connect the USB mini cable to USB mini connector on the gateway module (CON1), and other end of the cable to the laptop or a PC. Wait for the drivers to get installed. If the automatic driver installation fails, install the drivers manually as explained in section 5. Once the installation of drivers is complete, you can proceed to connect the Radio Module with the Gateway Module by plugging CON3 on Gateway Module with CON1 on Radio Module (or CON2 on Gateway Module with CON2 on Radio Module). Turn on the switch (SW1) on the Radio module in order to start Radio Module.



Radio Module Top View



Radio Module Bottom View

Open the SENSEnuts GUI and you should see a message stating “SENSEnuts device found”. Now you can the program of the Radio Module or receive the data from the Radio Module connected with the system (if the module is previously programmed to send data to the system).

Caution

Do not connect the Radio Module with the Gateway Module unless the Gateway Module is connected to a computer system with the help of a USB cable.

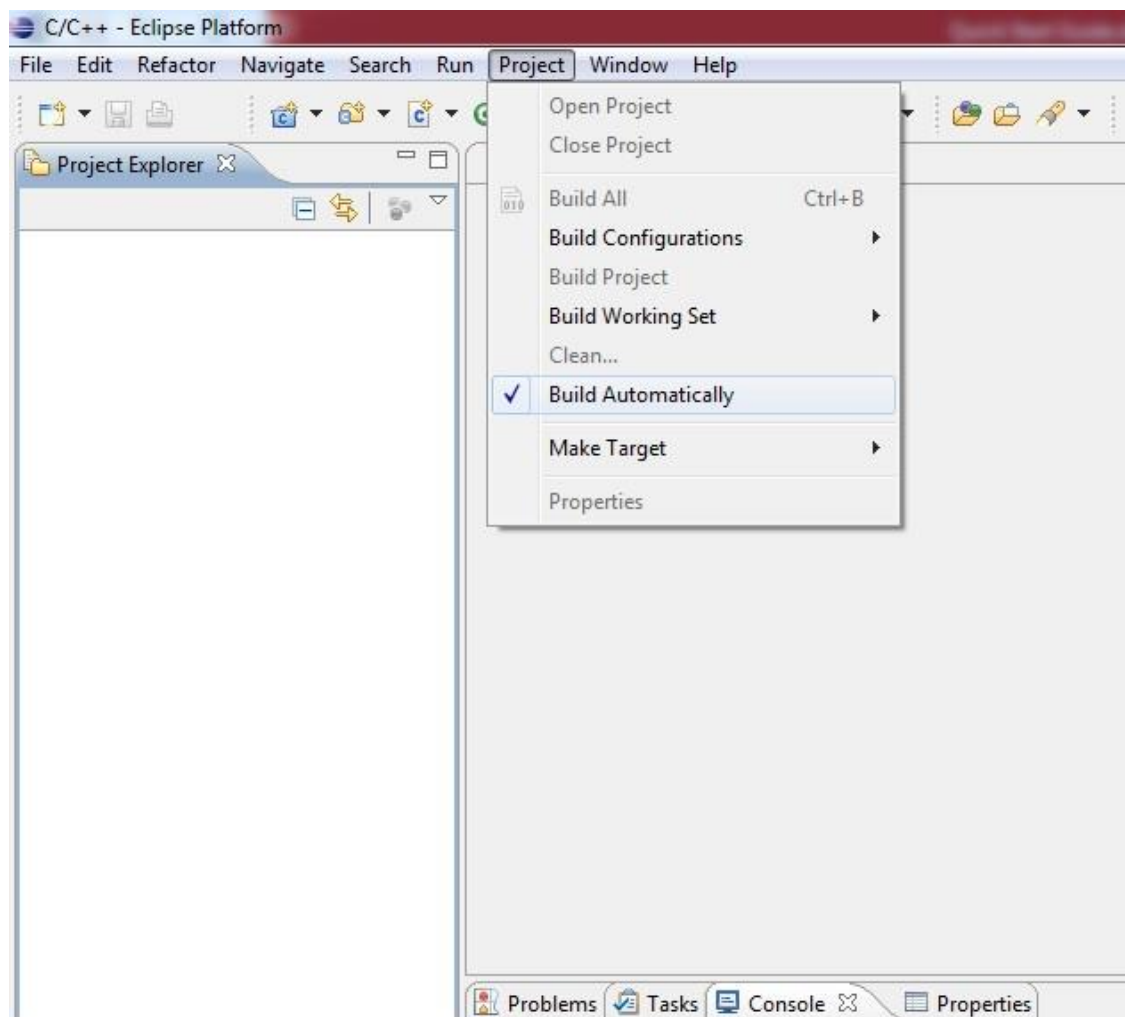
3. Compiling SENSEnuts Code

3.1 Importing a project in Eclipse

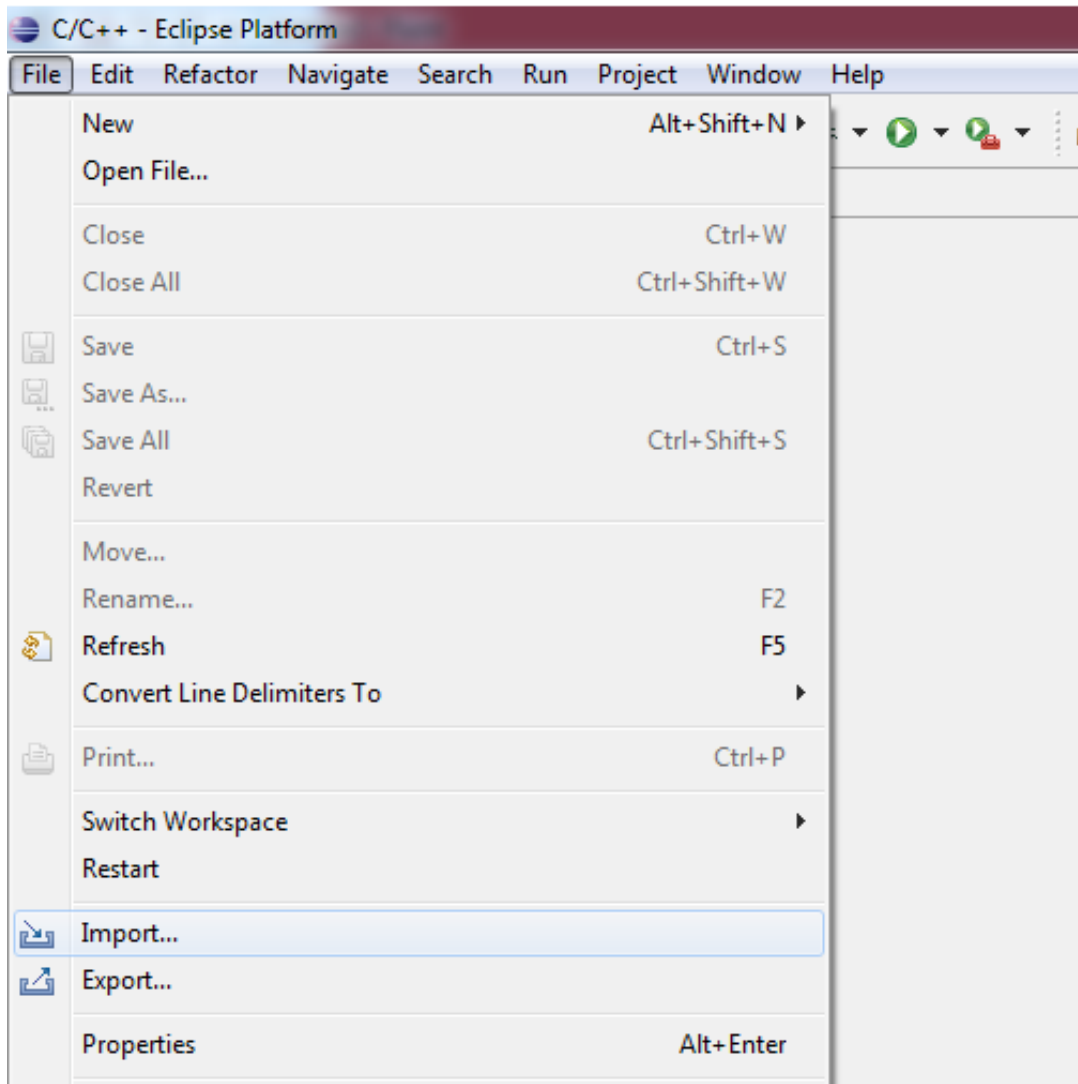
SENSEnuts platform makes use of Eclipse IDE for the programming of the devices. Eclipse IDE is installed along with the toolchain, hence no separate installation of Eclipse is needed.

To program the devices, open Eclipse platform and follow the steps:

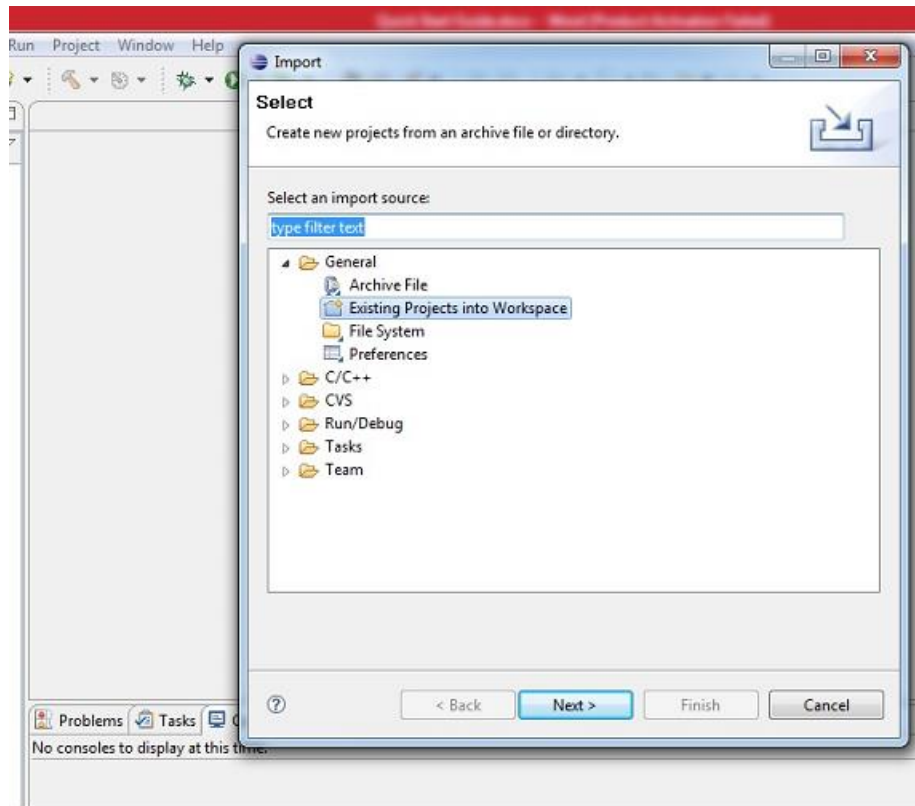
- 1) Go to “Project” and make sure that “Build Automatically” option is **unchecked**. As shown in the image, click on “Build Automatically” in order to uncheck the same.



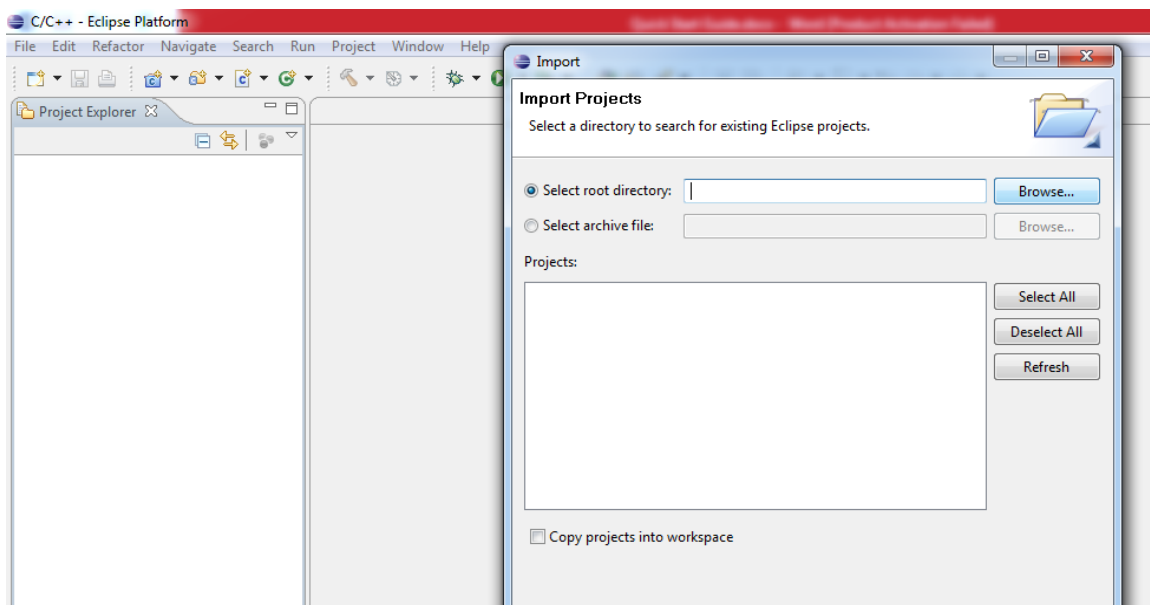
2) Go to “File” and click ”import”



- 3) From the import window, select “Existing Projects into Workspace” and click “next”.

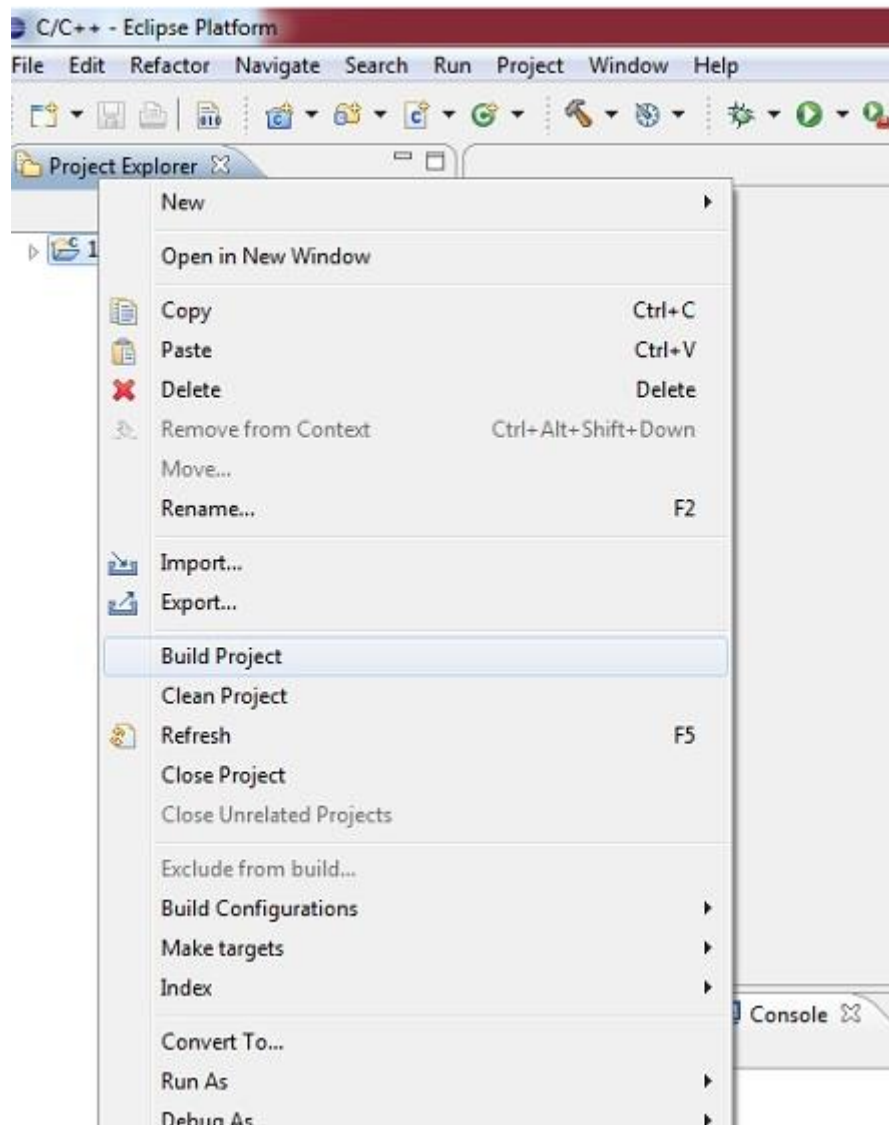


- 4) Select “Select root directory” and click on browse. Browse for the directory of the project that you want to import in Eclipse and click on finish.

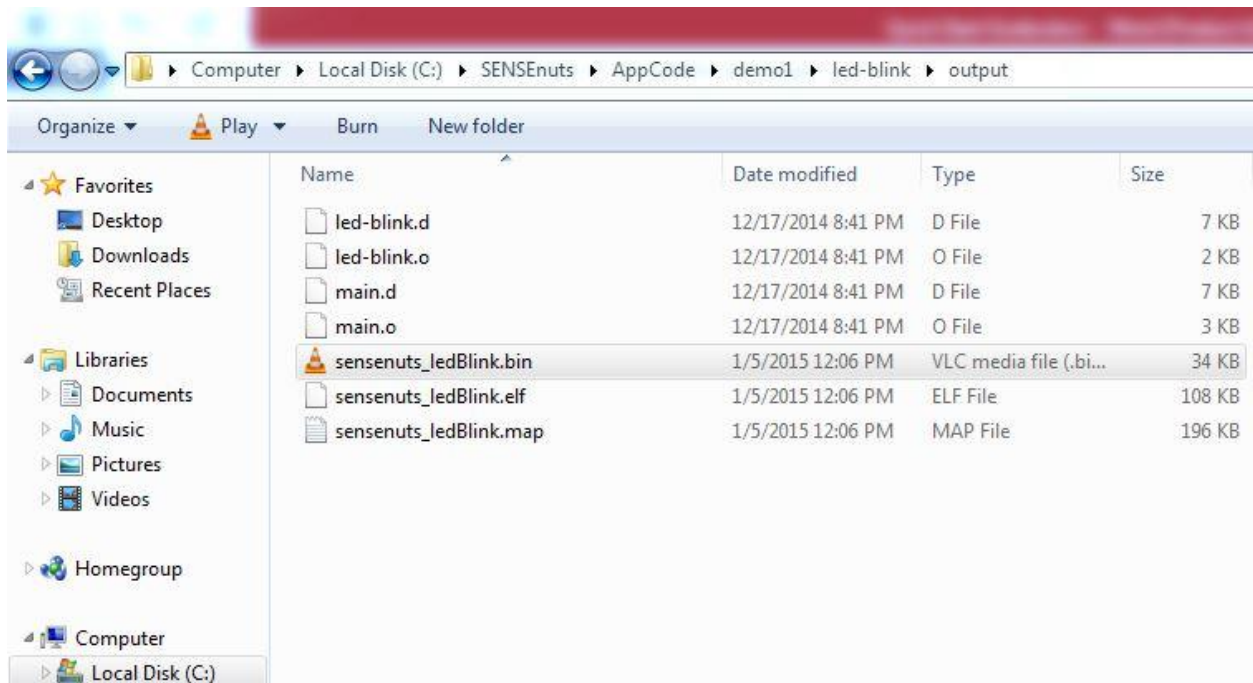


3.2 Compiling Project

Right click on the project in the “Project Explorer” that you have just imported, and click on “Build Project”



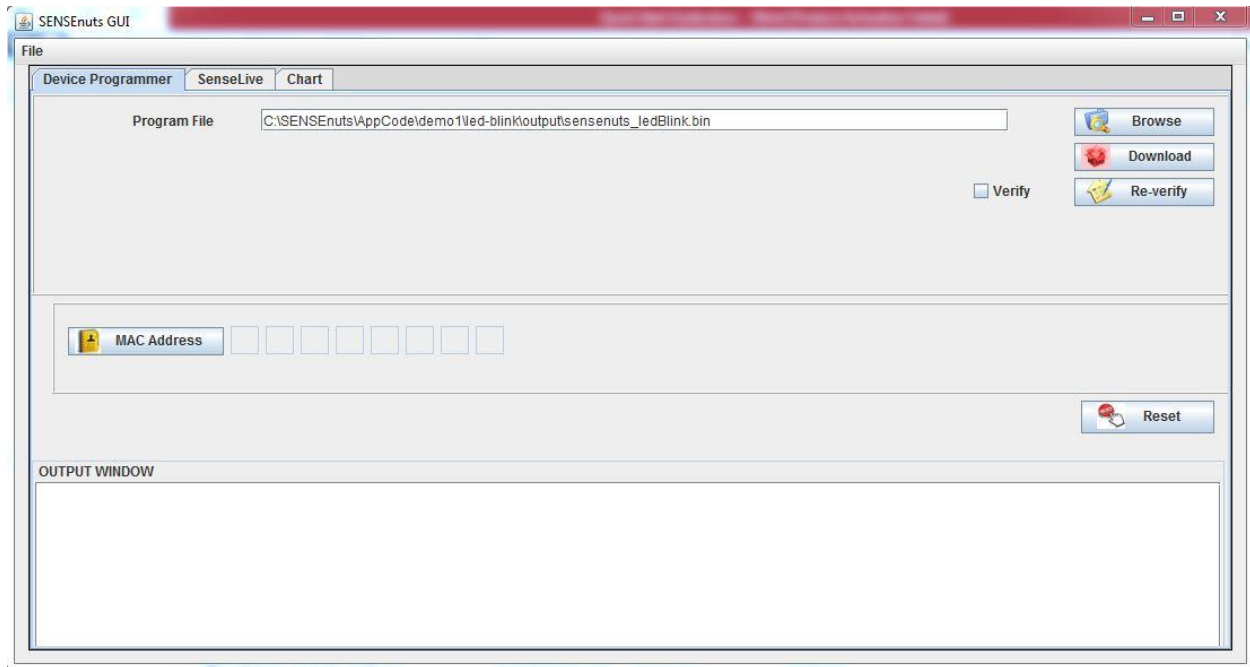
The building process will create a bin file with the same name as the source file or as specified in the **Makefile** on the “output” folder of the source directory. This bin file is then used by SENSEnuts GUI to program a Radio Module as per the algorithm written in the source code.



bin file created after compilation

4. Flashing Radio Modules (using SENSEnuts GUI)

Open SENSEnuts GUI which is installed with the SENSEnuts toolchain. The default window that opens with the GUI is Device Programmer. Device programmer is used to program the microcontroller on the radio Modules. To flash the device, follow the following steps:-



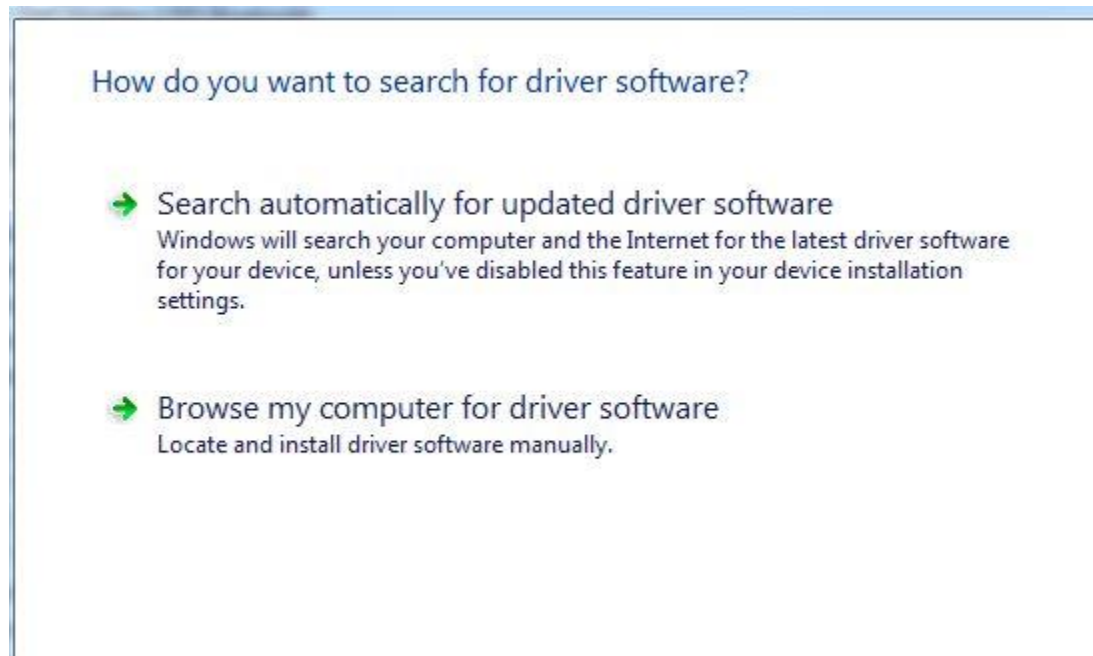
SENSEnuts GUI

- 1) Select the file to be flashed by clicking on “Browse” and locating the file in the system.
- 2) Click on “Download” button in order to push the bin file into the flash memory on the Radio Module. Wait till the program bar says 100%.
- 3) Check the “Verify” box before clicking on “Download” button if you want to check if file written on the microcontroller doesn’t get corrupted during the flashing process. It is an optional process and can be avoided.

5. Installing USB Gateway Drivers

If the automatic installation of Gateway drivers fail, they should be configured manually. Follow the steps as shown below in order to configure the same:

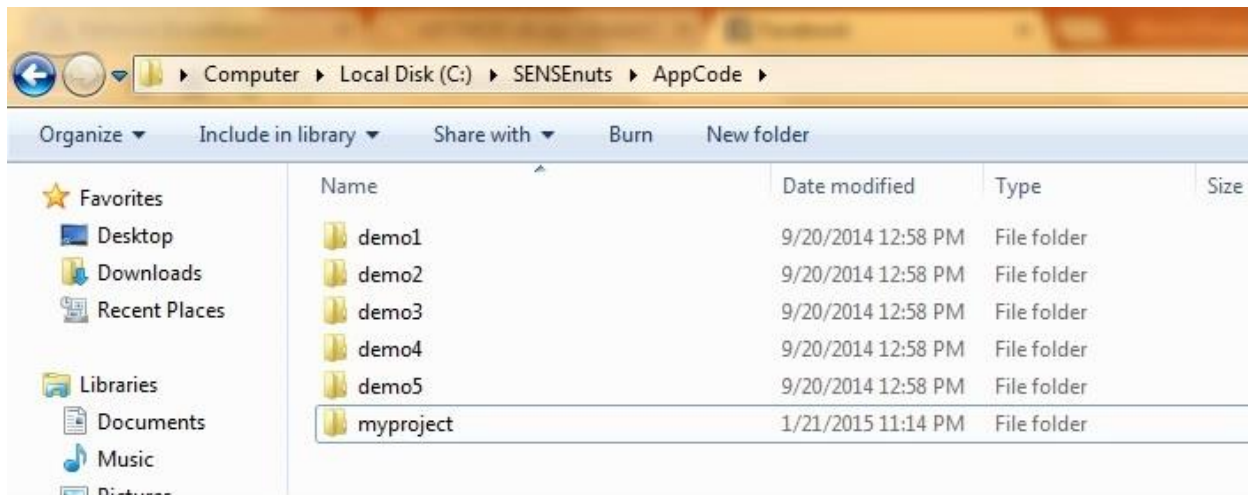
- 1) Go to the device manager and look for FT232RL in the unknown devices section.
- 2) Right click on the same and click on “Update Driver Software”.
- 3) In the next window, click on “Browse my computer for driver software” and locate the FTDI drivers saved on the hard disk.



- 4) Click on “Next” and wait for the installation process to finish.
- 5) To confirm if the drivers has been installed properly and the gateway is detected by the SENSEnuts GUI, plug in the USB gateway and open GUI. You should get the message “A Sensenuts Device Found”

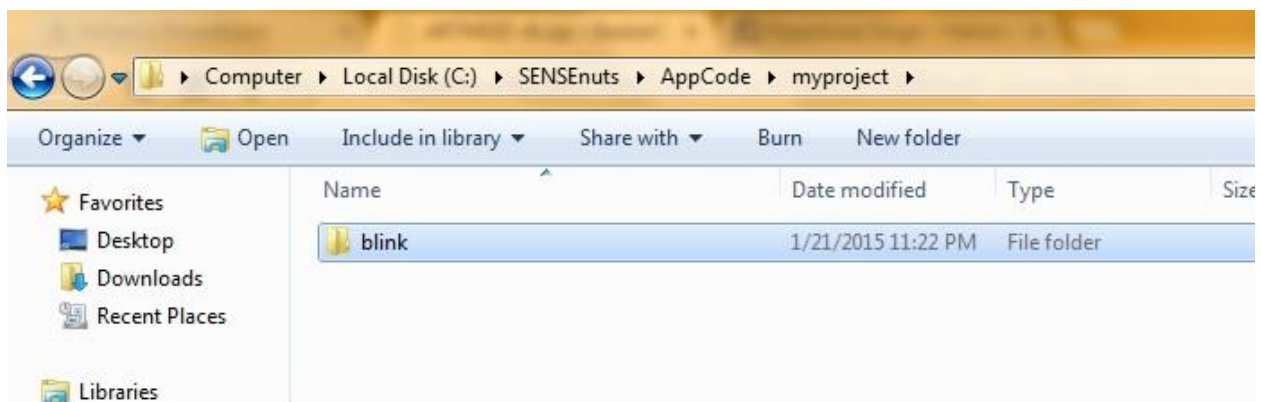
6. Creating a new Project in Eclipse

SENSEnents installation process creates several directories. All of the user application code should reside in *AppCode* directory. SENSEnents platform comes with some example codes which can be modified to change the way they behave, according to the needs. A user may want to create a new project from scratch without tampering the demo examples and preserve them for guidelines and references.



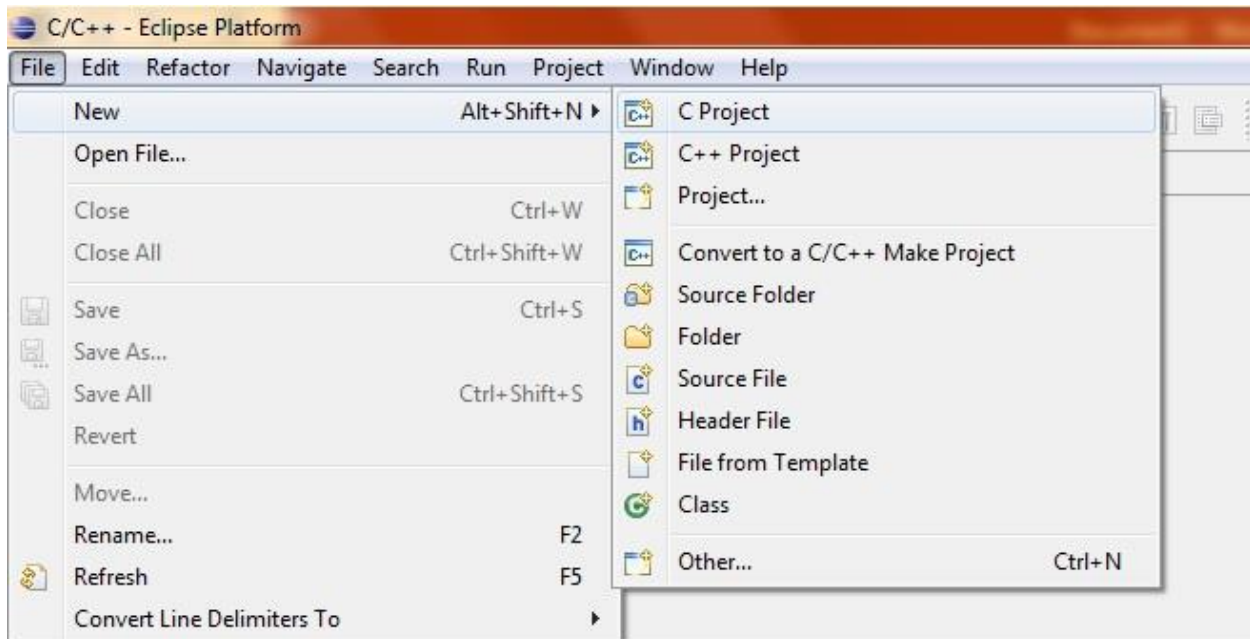
Creating project directory

There may be multiple applications that may have to be created for one project. For example, one application for a PAN coordinator and the other for an End Device. Each application should have a separate directory inside “**myproject**” directory. In this example, we will consider only one application inside the project for blinking the LED on Radio Module. So create a directory with a name “blink” (or a one of your choice).

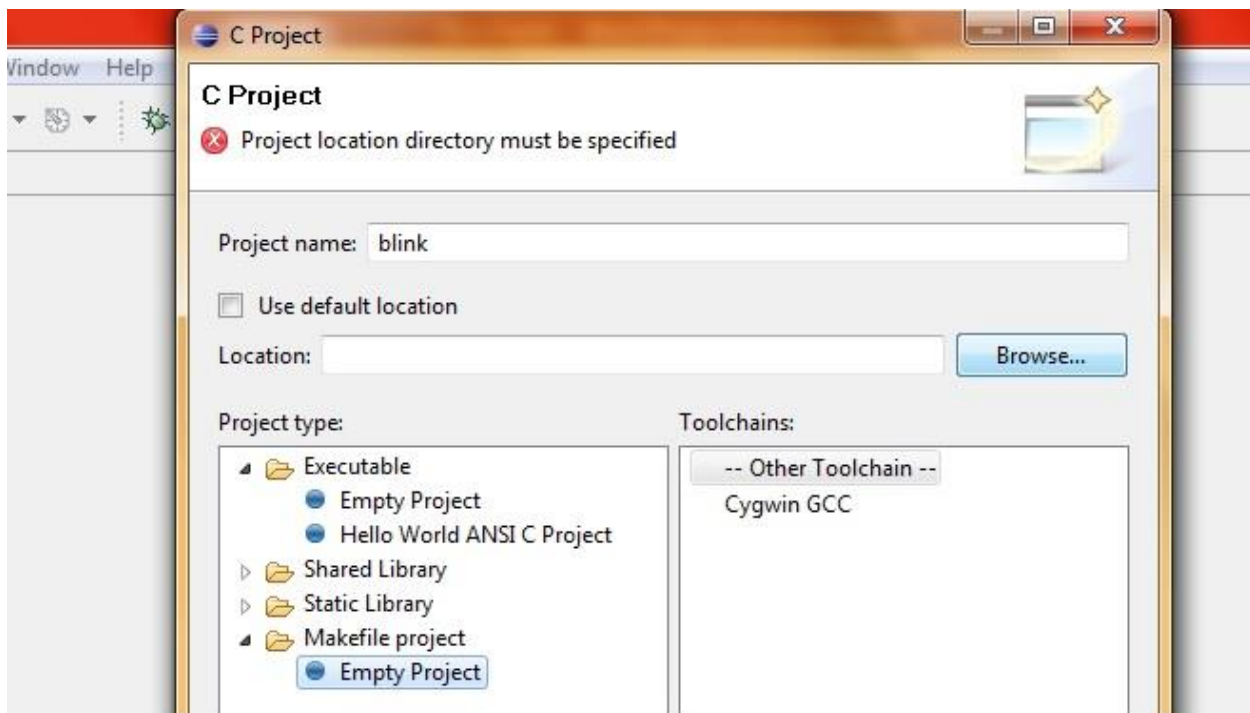


Directory with application name

Now open Eclipse and go to file. Click on “new” and then select “C Project”



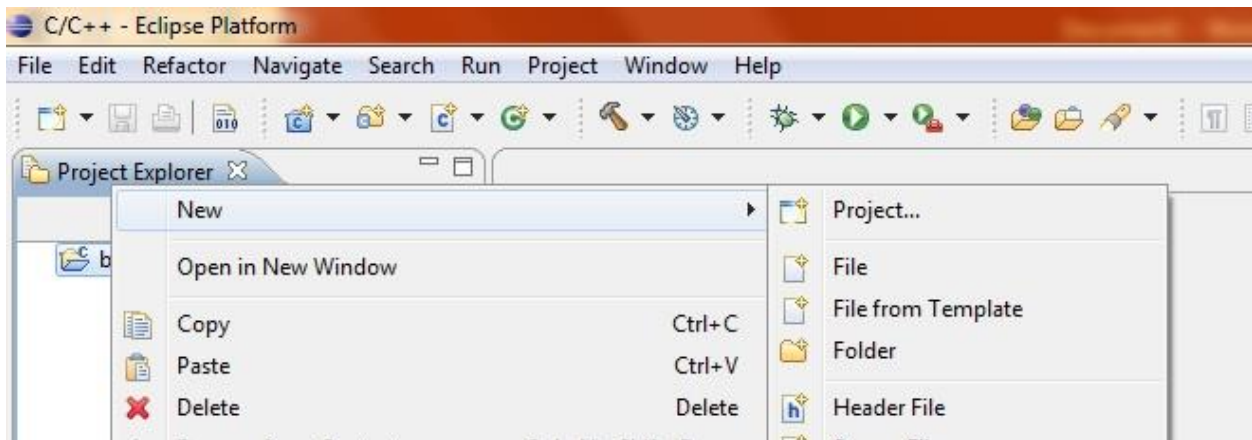
Give a name to the project as shown in the snapshot below. Select the “blink” directory created earlier as the project location. “Project type” should be set to be “Empty Project” under “Makefile project” and click on “Ok”



The Eclipse window should look like as shown with “blink” in the “Project Explorer”



There has to be two directories inside the directory for the application. One directory is for source code and the other for output after compilation. The two directories can be created either from Eclipse or by creating folders inside “blink” directory. To create folders from Eclipse, right click on “blink” under “Project Explorer”, click on “New” and then select “Folder”. Name the folder “source”. Similarly, create another folder named “output”.



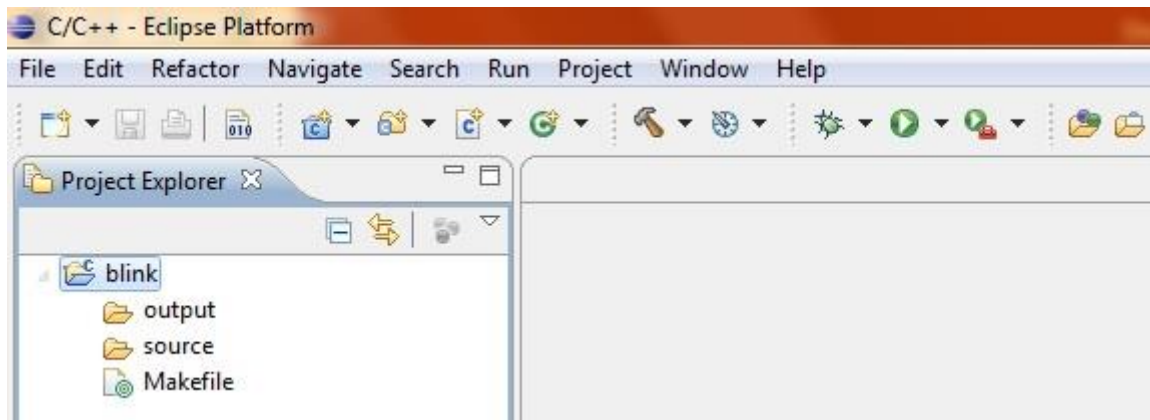
The directory structure under project explorer should now look as under



Directory structure after adding sub-folders

Open demo1 directory inside AppCode directory and navigate to led-blink. Copy “Makefile” from that location to “blink” directory created inside “myproject”. Open the “Makefile” copied into “blink” directory.

Right click on “blink” under “Project Explorer” and click on “refresh” to load the file into Eclipse Platform. The directory structure under Project Explorer now should look as under.

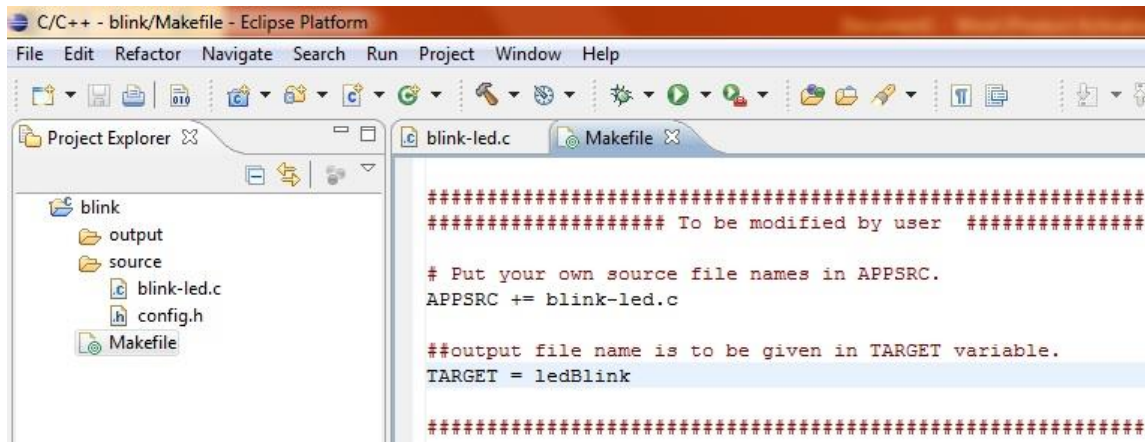


Right click on the “source” folder and click on “new” and then on “source file”. Name the source file as per requirement. In this example, the file is named as “blink-led.c”. Write the code according to the algorithm to be implemented on SENSEnuds devices. Since this example is for LED blinking, the code used here is the same as led-blink inside demo1 example. Save the source file.

Copy config.h file from “source” directory of led-blink inside “demo1” directory to “source” directory in “blink” directory.

Open “Makefile” under “blink” directory as shown above and make the changes in “To be modified by user” section as mentioned below:

- Change the source file name as blink-led.c as shown in the snapshot below
- Change the target file name according to your requirement. This will generate an output file with the same name. This output file is used by SENSEnuds Device Programmer to program the nodes. This is shown in the snapshot below.



Now right click on “blink” under “Project Explorer” and click on “Build”. It should start the compilation process. After compilation, Eclipse would generate an output file with the name “ledBlink.bin” as specified in the “Target” section of the “Makefile”.

Revision History

Version	Date	Comments
6.1.2	09.19.2015	First Release