Gateway Evaluation Kit

for ZigBee

Getting Started Guide

V1.1

11 March 2009

Confidential and Proprietary Information

Revision History

Version	Date	Notes
V1.0	03/02/2009	First release.
V1.1	11/03/2009	Updated references to FAT file system and USB memory

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1 Introduction

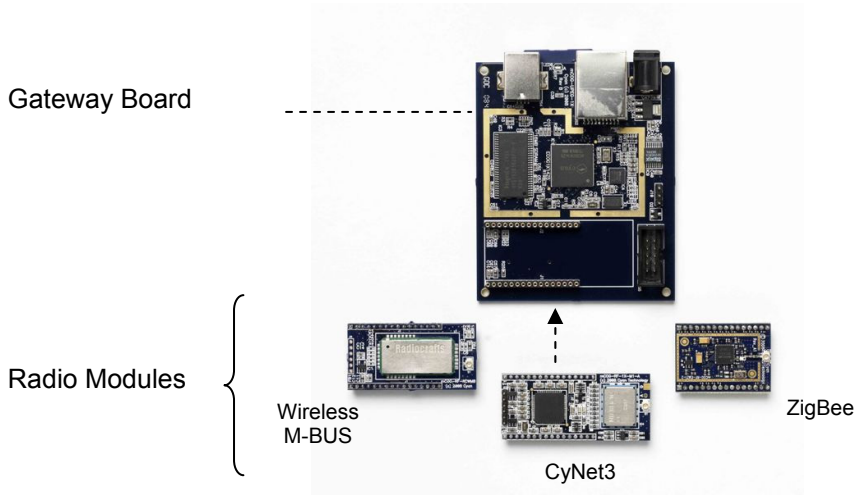
The Gateway Evaluation kit is a development environment for wired-to-wireless connectivity applications. The kit includes the following:

- Gateway board (motherboard) with USB & Ethernet connectors
- A radio module (daughter board) – which is radio-standard-specific
- Embedded software development suite, CyanIDE 2
- Debug adaptor (to provide the MCU debug connection for the CyanIDE 2 debugger)

The development kit provides a fast-start for OEMs wishing to implement and integrate USB, Ethernet, and other wired communication functionality, into their products.

Different or new radio standards can be accommodated by changing the radio daughter board and a firmware update.

CyanIDE 2 includes radio-specific software peripherals to enable rapid switching over to different radio standards (for example, from Wireless MBus to ZigBee).



Module versions of the evaluation kit, which plug into the OEM's proprietary motherboard, are available for requirements where further access to microcontroller device pins is needed.

High-volume OEMs wishing to integrate and modify the gateway board circuitry (for example, to support multiple/emerging/proprietary radio standards) should contact Cyan for a manufacturing package.

Cyan supplies microcontrollers, board-level gateway products (with RF according to the wireless standard), s/w protocol stacks, and low-cost development tools/boards.

2 PC and Cable Requirements

These notes guide first-time users through:

- Installation of CyanIDE 2.
- Connecting-up the gateway board, the eICE debug adaptor and the PC.
- Selecting an example project, building and downloading the application, and running the demonstration.

CyanIDE 2 installs on a PC running Windows XP or Vista. The PC must have the following available:

- 1GB of free disk space.
- CD-ROM drive.
- One Ethernet port (for use in example projects).
- Two USB ports (one for connecting the eICE debug adaptor, one for use in example projects).
- A serial port ***or*** an additional USB port with a USB-serial converter cable (to display "printf" status/debug messages from example projects) – ideally one per each gateway board being used.

The use of a **powered** USB hub is suggested.

The PC should also have installed:

- Internet Browser.
- Adobe Reader.
- Terminal Emulator program.
- WinZip (or similar, to unzip files).

In order to run the example projects, the following may also be required:

- 5V PSU. (Optional, if the supply from the eICE debug adaptor, itself USB-powered, is not sufficient. This may exhibit itself by a failure of the debugger at download time.)
- Ethernet cable (for gateway board to PC connection).
- USB flash drive (for the embedded web server projects).
- USB adaptor cable to allow the USB flash drive to be connected to the USB peripheral connector on the gateway board.

3 Installation of CyanIDE 2

3.1 CyanIDE 2 Version Notes

The Gateway Evaluation kit requires CyanIDE 2.1.1 or a later version. CyanIDE is supplied on the CD included in the kit.

The CD contains the complete suite of software development tools for Cyan microcontrollers and full documentation on the development kit boards.

Cyan does not release patches but releases complete updated versions of CyanIDE. These are made available for download on the Cyan website. Developers should regularly check the Cyan web site for the latest version.

3.2 Installation Notes

Insert the CD in the drive and it should autoplay.

If it does not, then go to **My Computer,** right-click on **Devices with Removable Storage** and select **Autoplay.**

Follow the prompts to install CyanIDE.

(A previous installation of CyanIDE 1.4 can co-exist with CyanIDE 2.1.1.
A previous installation of an earlier version of CyanIDE 2 can co-exist with CyanIDE 2.1.1.)

IMPORTANT: Close all other applications before starting set-up.

4 Connecting-Up

The target system is shown, in diagram form, for reference at the end of this section. The diagrams may be useful when following the instructions below.

4.1 Target System Connections

Connect-up as follows:

1. Fit the radio module to the gateway board.
    a. The radio module plugs into the two 16-pin headers.
    b. The antenna connector is adjacent to the 10-way debug connector.
2. Connect the eICE adaptor to the gateway board using the ribbon cable.
3. Connect the eICE adaptor to the USB cable (for connecting to the PC) – DO NOT CONNECT THE USB CABLE TO THE PC AT THIS TIME.
4. If an example project is to be run, the “printf” status/debug messages (displayed using a terminal emulator) are required. Connect a 3-way serial cable to J10 on the gateway board:
    a. If using the 3-way cable from the Cyan Cable kit, pin 1 is indicated by the arrow on the moulding of the connector. Pin 1 on the board header is nearest the debug connector – see diagram below.
    b. This cable should be connected to the PC serial port, or to a USB-Serial converter (if the PC has USB but no serial ports).

       (The COM port number should be noted for setting-up the terminal emulator; to check the port number, at the control panel, select: *System->Hardware->Device Manager->Ports (COM&LPT)*)
5. Connect the antenna to the radio module.
6. Check all connections are made, then connect the USB cable from the eICE adaptor to the PC. This powers-up the target system.

4.2 Target Power

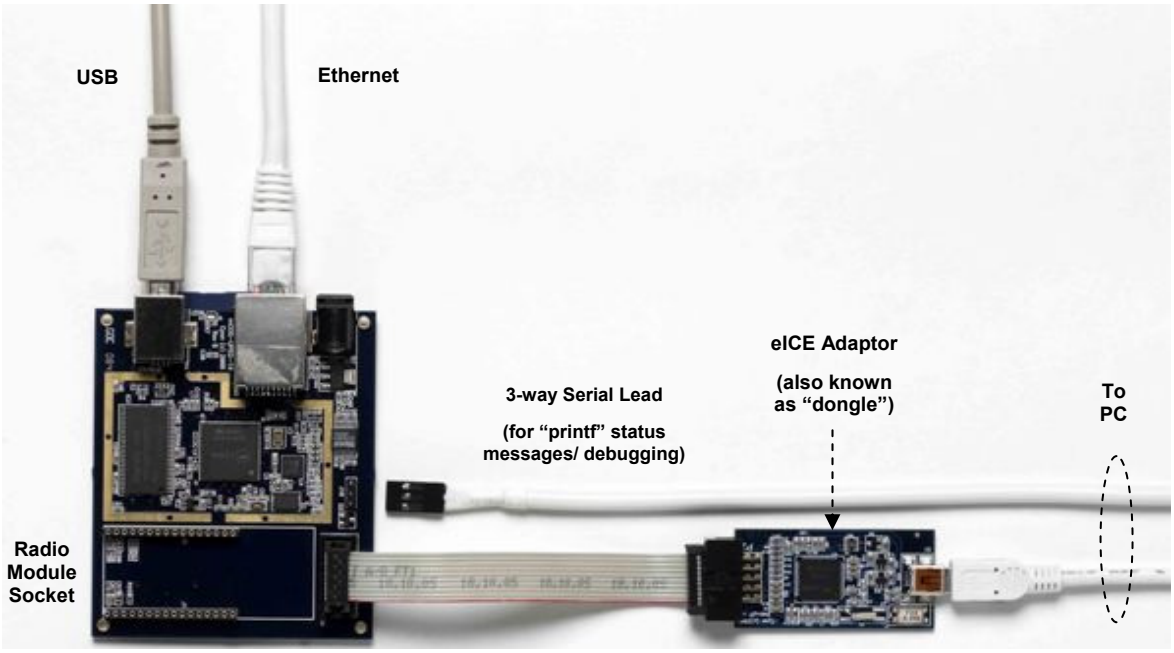
The gateway board is powered from the eICE debug adaptor, which in turn is powered from the PC USB port.

If the supply from the eICE adaptor is not sufficient to drive the gateway board, an external 5V power supply may be used. Simply connect the external supply to the d.c. jack on the gateway board. The on-board circuitry includes blocking diodes which eliminate the need for supply changeover links.

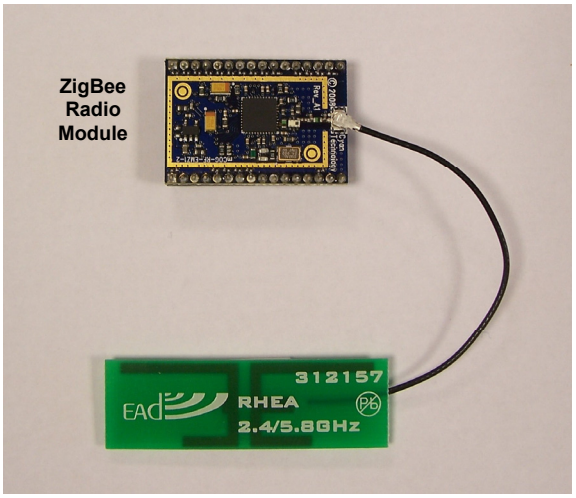
If the eICE adaptor is connected to the PC via a USB hub and does not connect reliably to the target gateway, then check the power supply voltage. A USB hub powered by a separate PSU is recommended.

Note: the module version of the gateway board, which plugs into the customer’s main board, requires a 3.3V supply connected through the module daughter board pin headers.
A “gateway module” has pin headers on the underside to allow it to plug into a motherboard.
A “gateway board” is for stand-alone use.

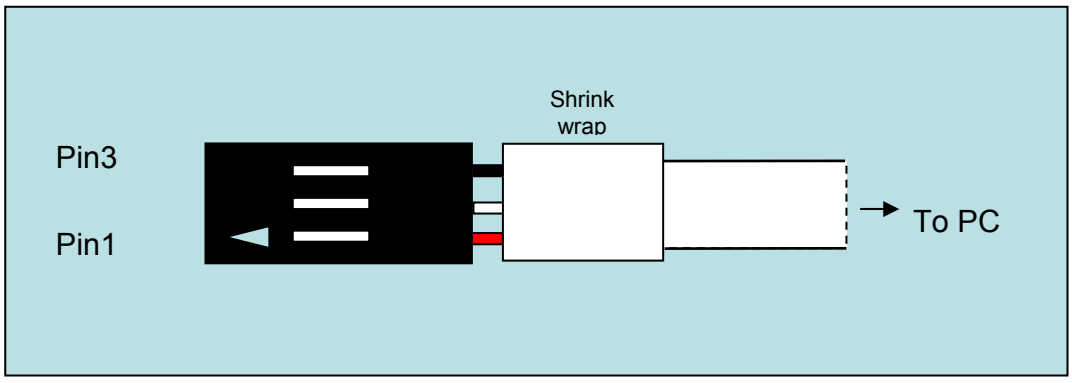
4.3 Connection Overview Diagrams



System Connection Overview



Module / Antenna Connection



3-way Serial Cable (as in Cyan Cable kit) – Connector Close-up View

5 Summary of Example Projects

Built into CyanIDE 2 are example projects for the Gateway, including:

- Basic Ethernet and USB demo projects.
- USB peripheral, host and mass storage applications.
- TCP/IP examples using the open source uIP stack, including:
  - Embedded webserver, FTP, FAT filing system.
- Cyan Cy-Net 3, a wireless mesh network protocol, using an ISM-band Micrel MICRF6x0 RF transceiver (requires an mCOG-RF-1X-M1 of the selected frequency).
- Wireless M-Bus, an industrial and utility metering radio protocol, using a Radiocrafts RC1180 module (requires an mCOG-RF-RCWMB).
- ZigBee utility metering example using an Ember EM260 device (requires an mCOG-RF-EMZ1-2).

Note: The Cyan mCOG-xxx radio modules are listed on www.cyantechnology.com.

6 ZigBee Example Projects

6.1 Overview

6.1.1 Radio Module

It is assumed a ZigBee daughter board, an mCOG-RF-EMZ1-2 (using an Ember EM260), is fitted to the gateway board.

6.1.2 Projects Summary

CyanIDE 2 includes the following example projects:

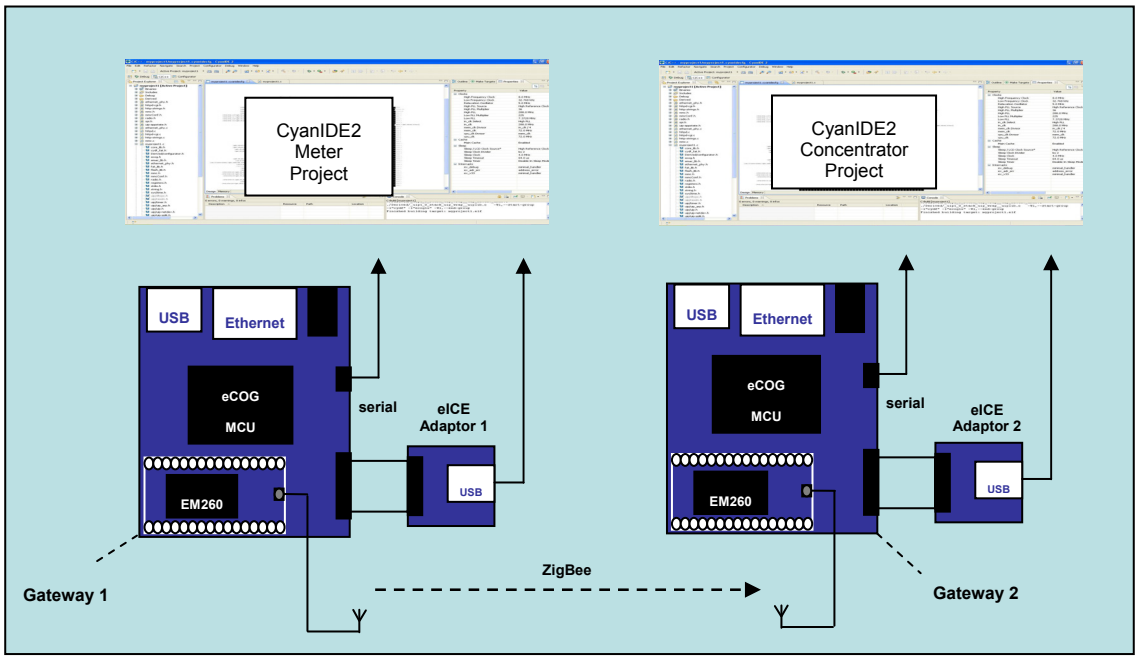
- Concentrator – the gateway receives data over-the-air via the EM260
- Meter – the gateway sends data over-the-air via the EM260
- Gateway – data received via the EM260 is combined with an embedded web page and served via Ethernet and TCP/IP to a PC browser
- Sink Demo – the gateway acts as a concentrator and receives over-the-air data from an Ember EM260 SPI/UART Breakout board fitted with an EM260 radio daughter board.

To demonstrate the Concentrator, Meter and Gateway projects requires two Cyan Gateway boards.

Further details on the Ember boards are in Appendix B.

6.1.3 Using Two Gateways - System Overview

The system comprises:



Gateway 1 linked via ZigBee to Gateway 2

6.1.4 Antenna Fitting Note

It is recommended appropriate antennas are fitted to both mCOG modules.

If no antennas are fitted, then the boards will have to be positioned very close together but a working system is not guaranteed.

7 Meter and Concentrator Example Projects

7.1 Overview

It is assumed there are two gateway boards and two eICE adaptors.

- Gateway1 is used as a meter.
- Gateway2 is used in two ways, firstly as a concentrator (to receive data over the ZigBee link), and secondly as a gateway, to receive the data, and to serve an embedded web page (from internal flash memory) using Ethernet and TCP/IP to a web browser running on a PC.

CyanIDE 2 is invoked and connected to gateway1 using eICE adaptor1. (eICE adaptor2 is not connected to the PC at this time.)

eICE adaptor2 is then connected to the PC. CyanIDE 2 is invoked for a second time such that a separate instance is running on the PC. It is connected to gateway2 using eICE adaptor2.

(This order is the simplest mechanism for ensuring the correct instance of CyanIDE 2 is connected to the correct gateway board.)

7.2 Steps / Procedure

The steps for the meter and concentrator projects are:

- Invoke CyanIDE 2.
- Connect only the eICE adaptors and update if required.
  Their IDs must be different.
  The firmware must be the latest version.
- Connect up gateway1 and eICE adaptor1.
  Ensure gateway2 and eICE adaptor2 are disconnected from the PC.
- Create and build the CYDF ESZP EM260 meter project.
- Using the Configurator, note the serial port configuration for the terminal emulator.
- Invoke the terminal emulator and configure.
- Download (to gateway1) and run the meter project to ‘main’ (where execution breaks).
- Resume execution and confirm project title is displayed by the terminal emulator.
- Suspend execution.
  At this point gateway1 is ready to act as a meter emulator. Now for gateway2.
- Connect up gateway2 and eICE adaptor2
- Invoke CyanIDE 2 to obtain two instances running on the PC
- Create and build the CYDF ESZP EM260 concentrator project
- Using the Configurator, note the serial port configuration for the terminal emulator
- Invoke the terminal emulator, to obtain two instances running on the PC, and configure
- Download (to gateway2) and run the concentrator project to ‘main’ (where execution breaks)
- Resume execution and confirm project title is displayed by the second terminal emulator instance
- At this point, gateway2 is up-and-running
- Restart the meter project on gateway1 – the gateway2 terminal emulator should display data from gateway1.

7.3 eICE Adaptors – ID and Firmware Version check

Connect eICE adaptor 1 to the PC. Ensure only one eICE adaptor is connected to the PC. It should not be connected to a gateway board at this time.

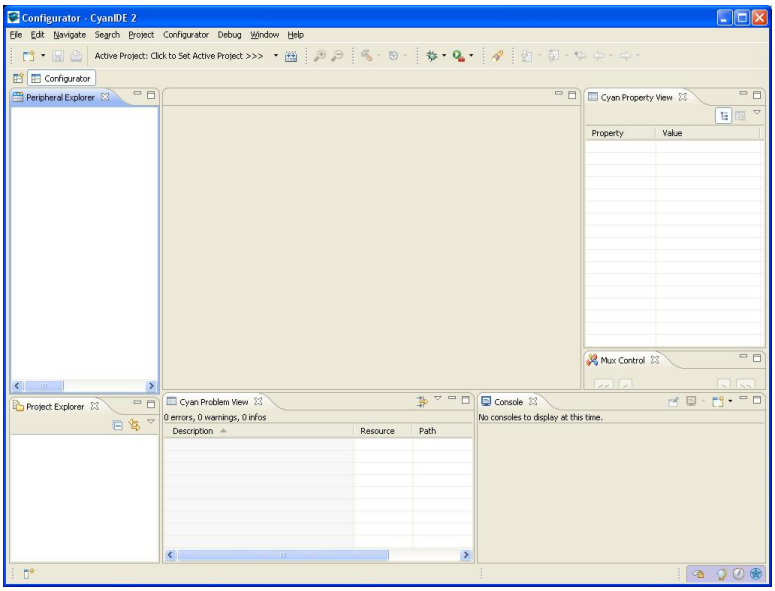
Invoke CyanIDE 2 - from the shortcut on the desktop or from the program list.

At the prompt to enter a workspace, use the default (or enter a preferred alternative workspace).

Click **OK to** bring up the **Welcome** screen. This is only displayed automatically on the first invocation. (On subsequent invocations, it can be accessed from the Help menu.)

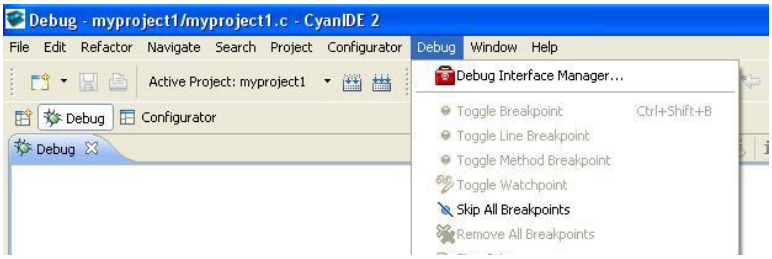
Close the Welcome window - click on X in the **Welcome** tab. (The developer is encouraged to explore the Overview, First Steps or Web Resources, by clicking on the central icons).

The **Workbench** is displayed, typically as shown below.

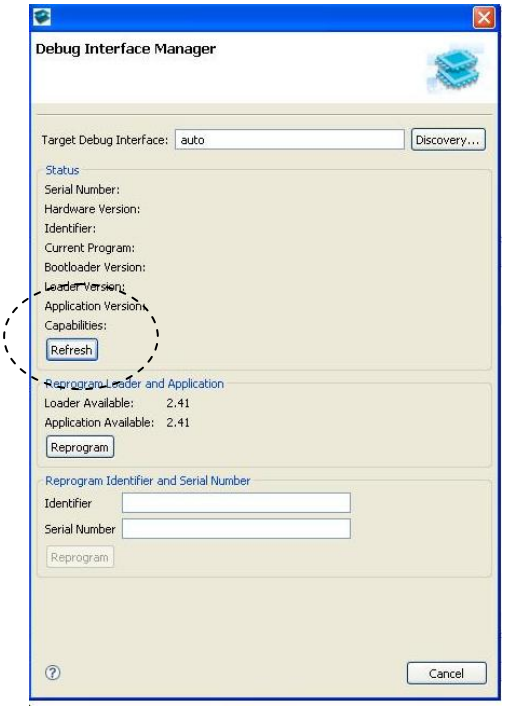


The **Workbench** presents a **perspective** (simply a group of views) to the user. Note there are 3 perspectives regularly used, **Configurator, C/C++,** and **Debug.** These are used later when building the projects.

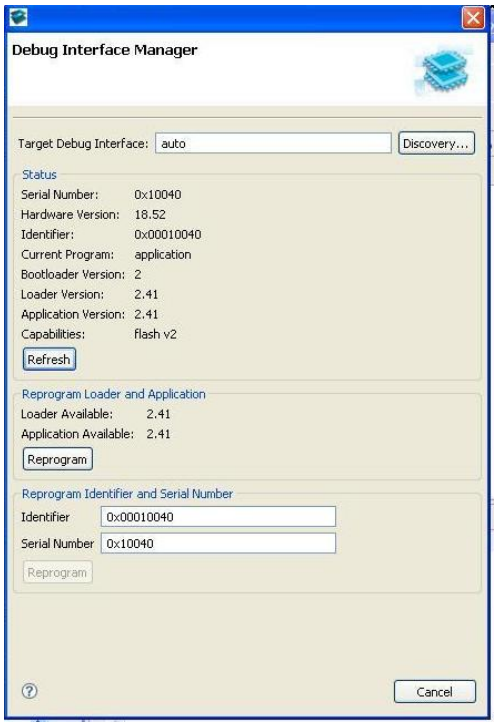
Select the Debug Interface Manager….



And click on **Refresh**



A typical resulting display is shown below.



If either the **Loader Version** or the **Application Version** are less than the available versions, click on **Reprogram** to update the firmware in the adaptor.

Note the **Serial Number** and **Identifier.**

Remove the USB cable from adaptor1 and fit to adaptor2.

Click on **Refresh.**

If the **Serial Number** and **Identifier** are the same as the first adaptor, edit the values and **Reprogram.**

Note: If the Debug Interface Manager reports an error, then close the Manager and re-try.

(Appendix A describes the Debug Interface Manager in more detail.)

Disconnect the eICE adaptor from the USB cable.

Close and Exit from CyanIDE 2.

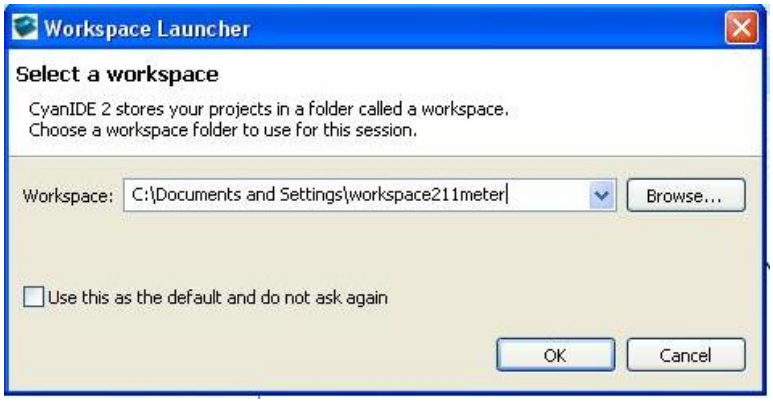
7.4 Create and Build the Meter Example Project 1

7.4.1 Connect-up and Invoke CyanIDE

Ensure gateway1 is connected to the PC as shown in section4.

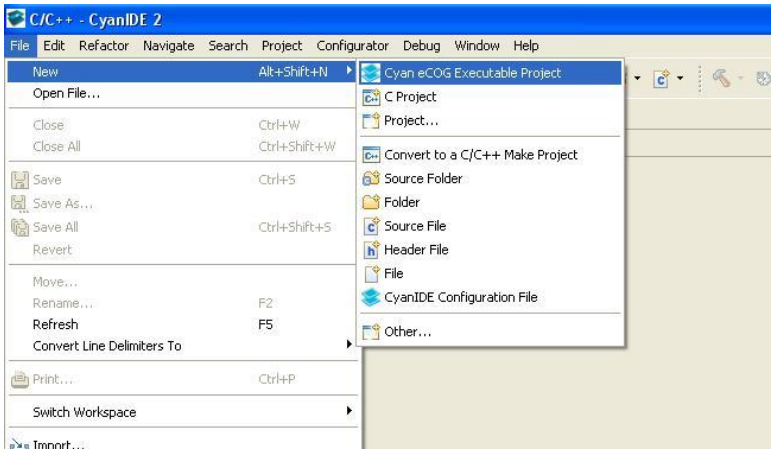
Connect eICE adaptor1 to gateway1 (using the ribbon cable) and connect to the PC. (Ensure eICE adaptor2 is disconnected from the PC).

Invoke CyanIDE 2.1.1 (or later version) and select a workspace to be used only for the meter project, e.g. workspace211meter.



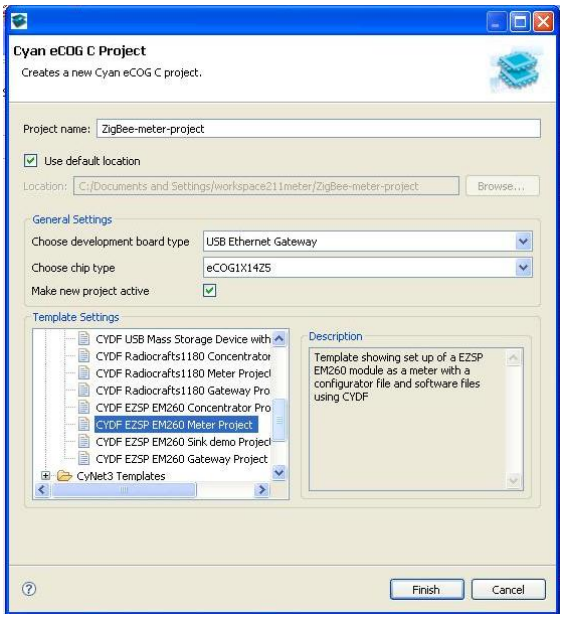
7.4.2 Create the Meter Project

Select 'File -> New -> Cyan eCOG Executable Project'



This opens a window to create a new project.

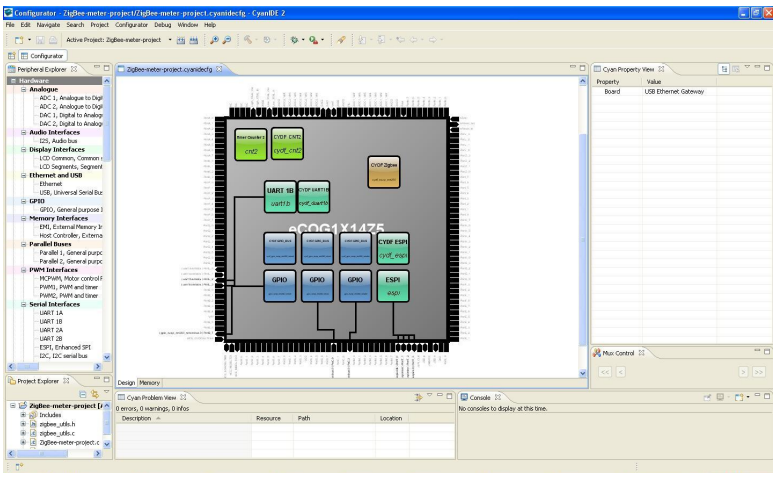
Enter a meaningful project name, for example “ZigBee-meter-project”, select the USB Ethernet Gateway as the development board type and the CYDF EZSP EM260 meter project template….



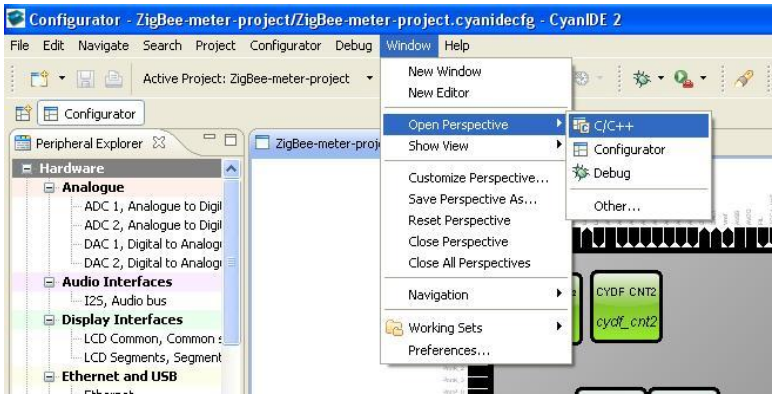
.. then click “Finish”.

Normally the **Configurator** perspective is then displayed, depending on the previous workspace window arrangement. (If not, then it can be opened using ‘Window->Open Perspective->….’).

The eCOG1X canvas should be displayed – if not, then double-click on the .cyanidecfg file in the **Project Explorer** view.

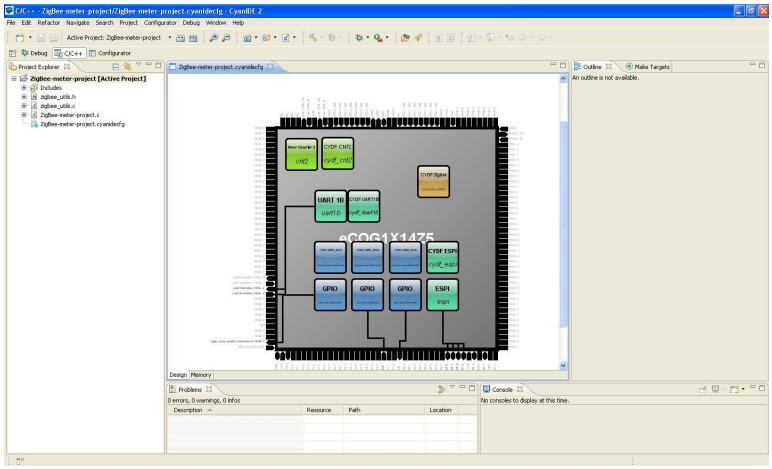


Using Window->Open Perspective->…., open the **C/C++ Perspective** and the **Debug Perspective**.

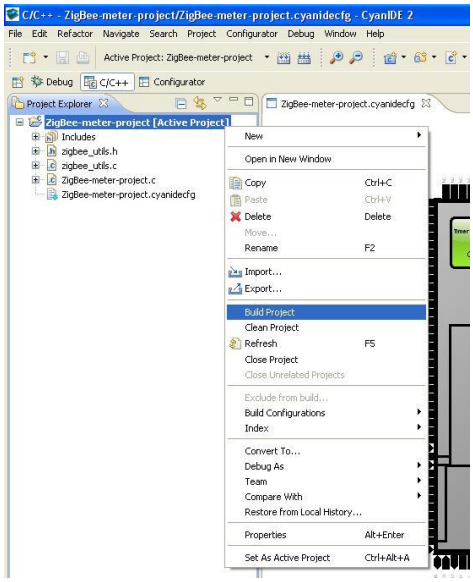


7.4.3 Build the Project

Select the **C/C++ Perspective** – the following should be displayed.



In the **Project Explorer** view, right-click on the **active project** and select **build project**.

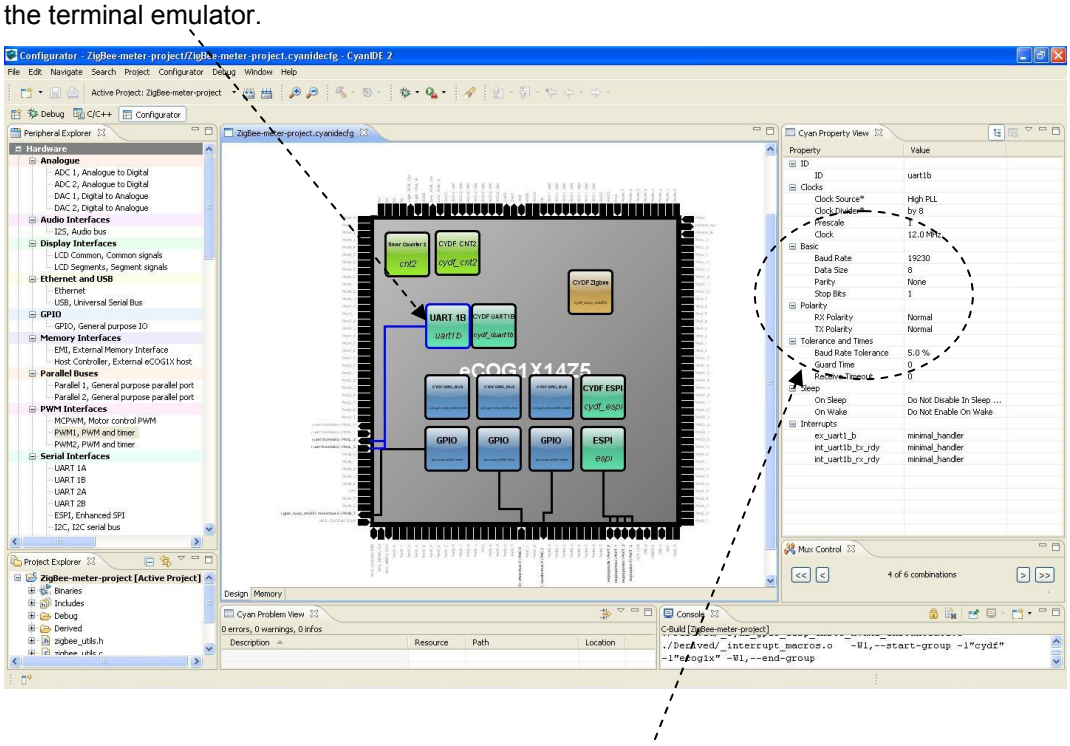


The build progress is displayed in the **Console** view (lower right hand corner).

7.4.4 Determine the Serial Configuration

Return to the **Configurator Perspective**.

Click on **UART1B** in the canvas – this is used to transmit any output from printf statements to the terminal emulator.



Note the serial port configuration displayed in the **Property** view (used to set-up the terminal emulator).

In this example, the configuration is 19230 baud, 8 data bits, no parity, 1 stop bit.

7.4.5 Invoke the Terminal Emulator

Invoke the terminal emulator program.

Ensure the gateway 3-pin serial cable is connected to the selected COM port.

(COM port numbers on the PC can be checked using the Device Manager - reached via the control panel->System->Hardware->Device Manager-> Ports (COM & LPT))

Ensure the serial configuration of the terminal emulator is set to the configuration determined from the Configurator.

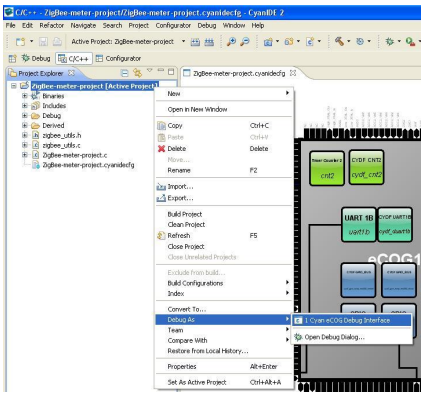
7.4.6 Download and Run the Meter Project to 'main'

Return to the C/C++ Perspective.

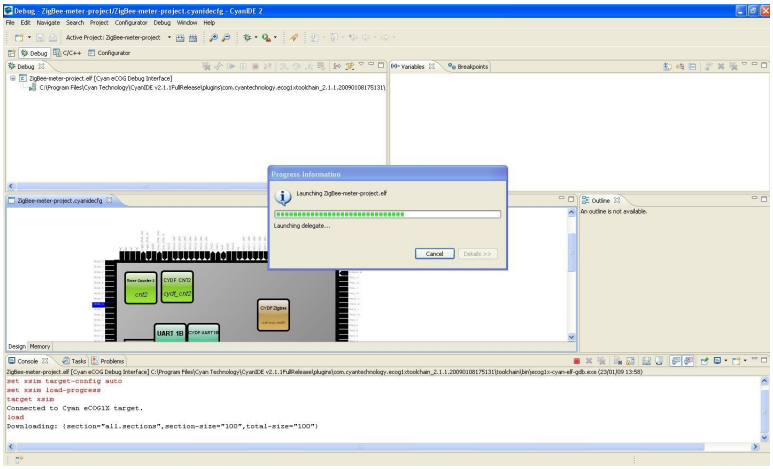
The next step is the **Debug** operation, which combines

- Download to target.
- Programming of flash memory on the target eCOG microcontroller.
- Invocation of the debugger (GDB).

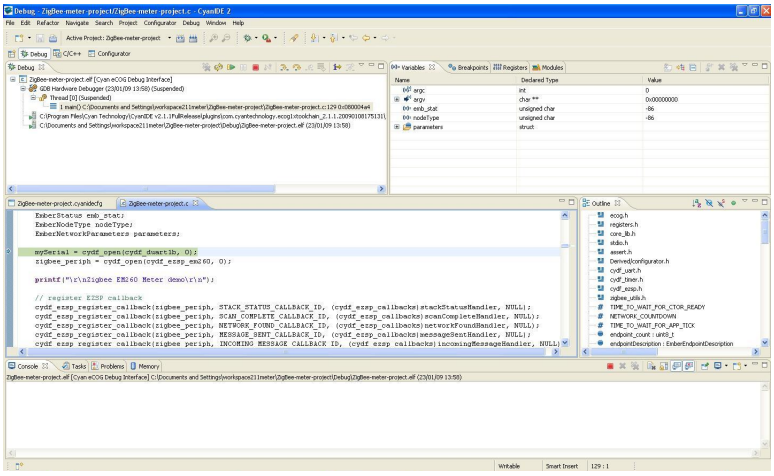
Right click on the active project and select "Debug As->Cyan eCOG Debug Interface".



CyanIDE connects to the target board via the eICE adaptor, downloads the .elf file, …

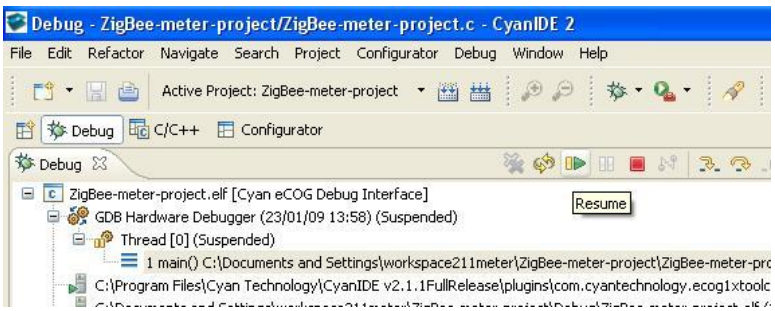


… executes the program to 'main', and then breaks.



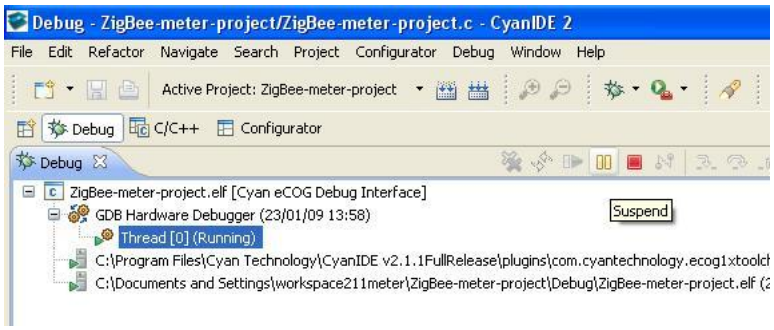
7.4.7 Run to Output Project Title

Select **Resume**.



Observe the project title on the terminal emulator display .

Suspend execution of the program (click on the double vertical yellow bars).



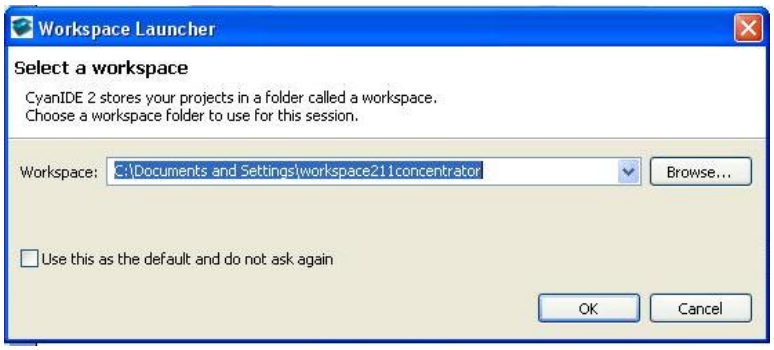
7.5 Create and Build the Concentrator Example Project 2

7.5.1 Connect-up, and Invoke CyanIDE 2

Ensure gateway2 is connected to the PC as shown in section4.

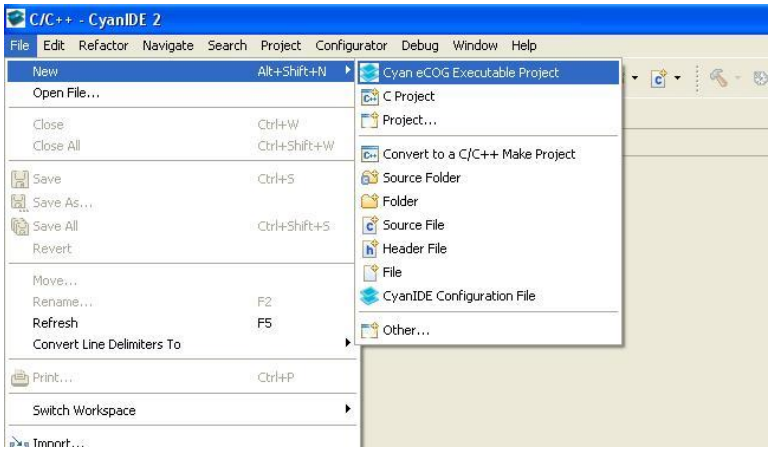
Connect eICE adaptor2 to gateway2 (using the ribbon cable) and connect to the PC.

Invoke CyanIDE 2 and select a workspace to be used only for the concentrator project, for example “workspace211concentrator”.



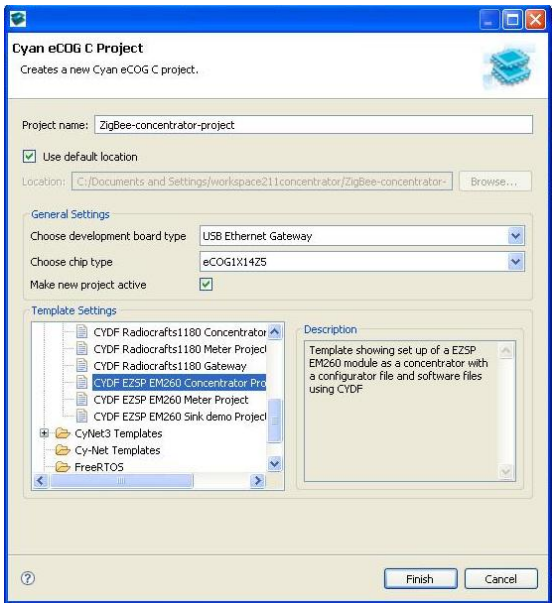
7.5.2 Create the Concentrator Project

Select ‘File -> New -> Cyan eCOG Executable Project’



This opens a window to create a new project.

Enter a meaningful project name, for example “ZigBee-concentrator-project”, select the USB Ethernet Gateway as the development board type and the CYDF EZSP EM260 concentrator project template…



.. then click “Finish”.

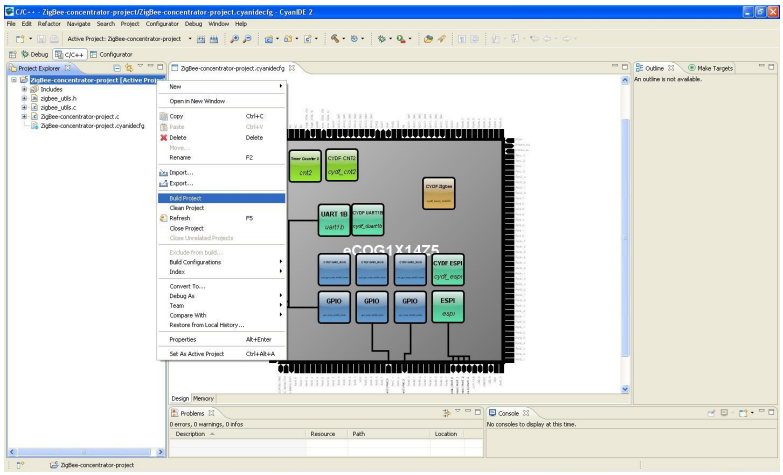
The **Configurator** perspective is displayed. (If not, then it can be opened using ‘Window-> Open Perspective->.’).

The eCOG1X canvas is also displayed – if not, then double-click on the .cyanidecfg file in the **Project Explorer** view.

7.5.3 Build the Project

Select the **C/C++ Perspective**.

In the **Project Explorer** view, right-click on the **active project** and select **build project**.

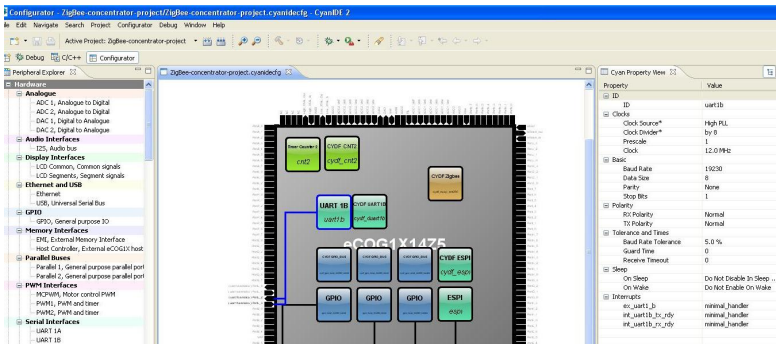


The build progress is displayed in the **Console** view (lower right hand corner).

7.5.4 Determine the Serial Configuration

Use the same procedure as used for the meter project:

- Return to the **Configurator Perspective**.
- Click on **UART1B** in the canvas – this is used to transmit printf statements to the terminal emulator



Note the serial port configuration displayed in the **Property** view. In this example, the configuration is 19230 baud, 8 data bits, no parity, 1 stop bit.

7.5.5 Invoke the Terminal Emulator

Invoke the terminal emulator program such that a second separate instance is running.

Ensure the gateway2 3-pin serial cable is connected to the selected COM port.

(COM port numbers on the PC can be checked using the Device Manager - reached via the control panel->System->Hardware->Device Manager-> Ports (COM & LPT))

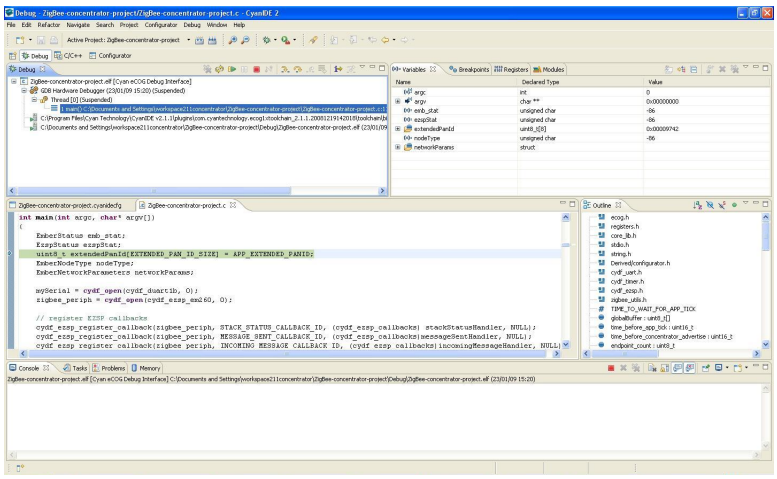
Ensure the serial configuration of the terminal emulator is set to the configuration determined from the Configurator.

7.5.6 Download and Run the Concentrator Project to 'main'

Return to the C/C++ Perspective.

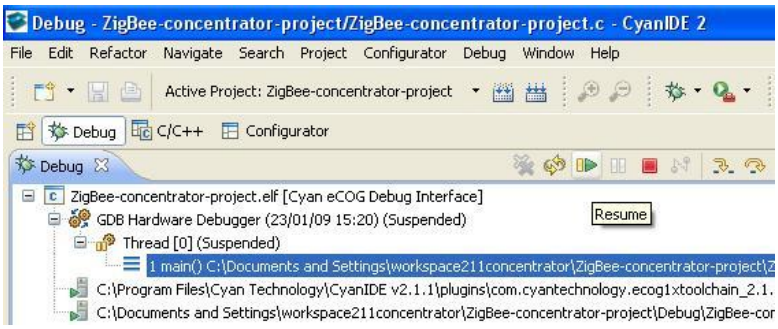
Right click on the active project and select "Debug As -> Cyan eCOG Debug Interface".

CyanIDE connects to the target board via the eICE adaptor, downloads the .elf file, executes the program to 'main', and then breaks.



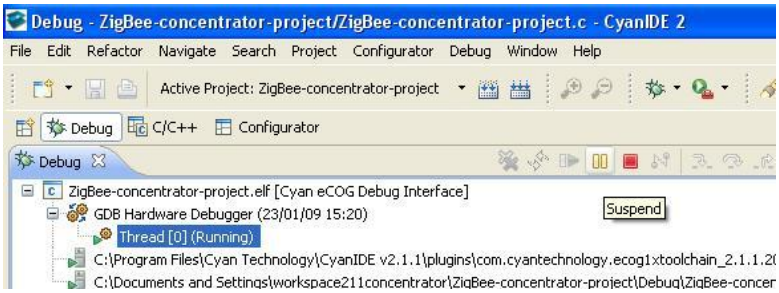
7.5.7 Run to Output Project Title

Select **Resume**.



Observe the project title on the terminal emulator display.

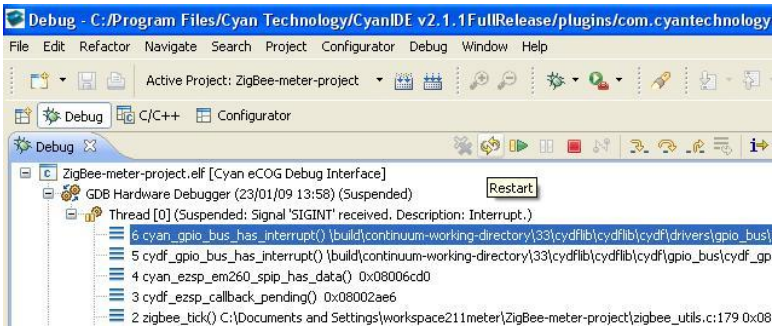
Suspend execution of the program (click on the double vertical yellow bars).



At this point, both the meter project and the concentrator projects are suspended.

7.6 Resume the Projects

Return to the meter project and in the CyanIDE 2 Debug Perspective click on **Restart.**



The program executes and breaks at ‘main’. Select **Resume.**

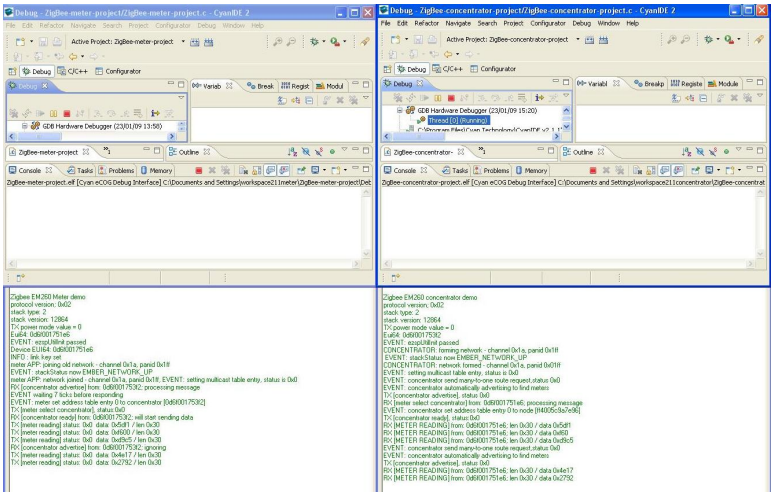
Return to the concentrator project and in the CyanIDE 2 Debug Perspective click on **Restart**.

The program executes and breaks at ‘main’. Select **Resume.**

The terminal emulator for the meter project displays transmitted data and status information.

The terminal emulator for the concentrator project displays received data and status information.

The PC screen display is typically:



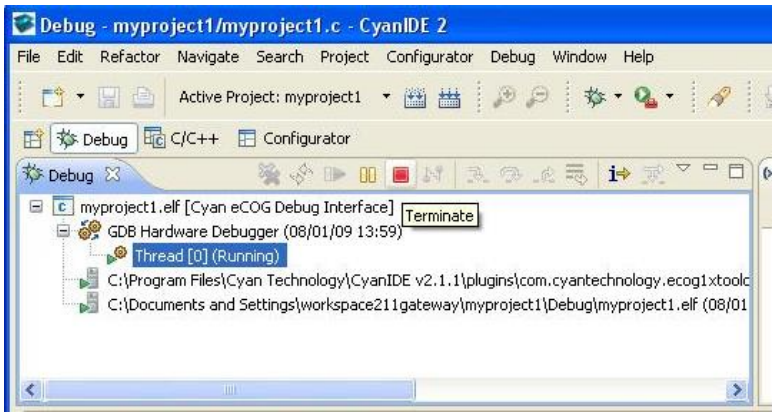
7.7 Terminate and Close

If the third example project, the gateway project (which receives data, and serves an embedded web page to a browser running on a PC) is now to be run.

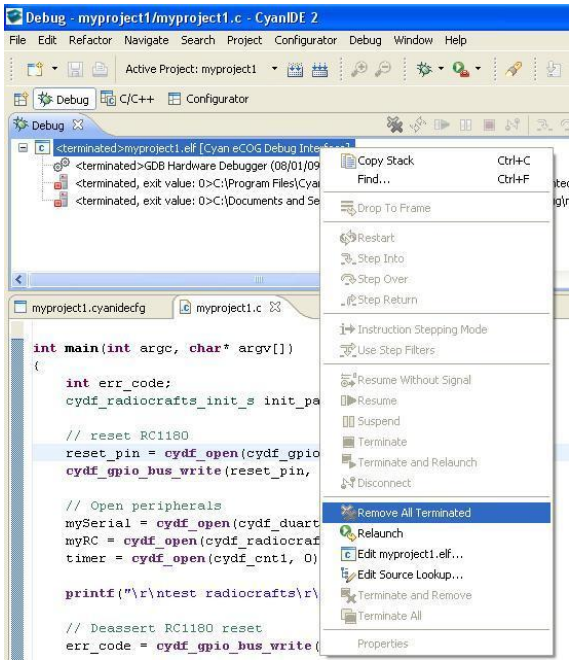
- **Suspend** the meter project (in the debug view, select the double-yellow-bar button).
- **Terminate** and close the concentrator project.

If no further projects are to be run, terminate both projects.

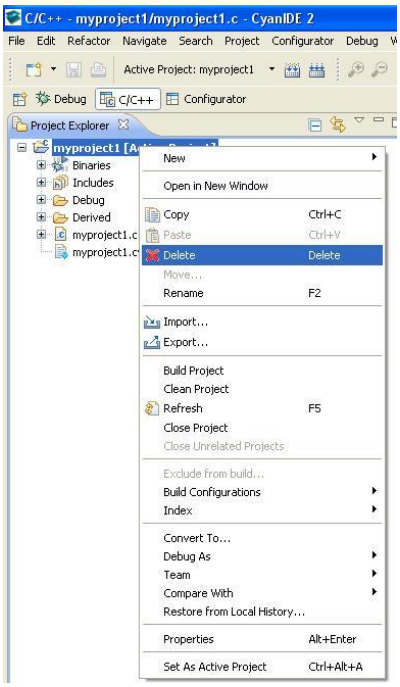
Terminate a project using **Terminate** (red square button) in the **Debug View**.



Then right-click on the terminated .elf file and select **Remove All Terminated**.



Return to the **C/C++ Perspective,** right-click on the project and select **Delete.**



Ensure the project contents are deleted.

This completes the running of the Concentrator example.

8 Gateway Embedded Web Server Example Project

8.1 Overview and Assumptions

In this project, one Cyan Gateway acts as a meter emulator and transmits data; a second Cyan Gateway acts as a meter concentrator, receives and outputs the data to the terminal emulator. The gateway also serves an embedded web page to a browser over Ethernet using fixed IP addresses. This web page displays data received from the meter emulator gateway.

It is assumed:

- The user has already run the meter emulator and meter concentrator example projects above and is familiar with creating and building CyanIDE projects.
- The eICE adaptors have unique IDs and the latest firmware.
- CyanIDE 2 is running the meter emulator example project – and is currently suspended.

The steps to run the gateway project are:

- Ensure eICE adaptor2 is connected to the PC.
- Ensure gateway2 is connected, including the Ethernet cable to the PC.
- Create and build the gateway project.
- Select the Configurator Perspective.
- Note the IP address settings (for the PC and for the browser).
- Note the serial port settings (for the terminal emulator).
- Ensure the terminal emulator is configured and running.
- Download onto gateway2, run to 'main' and resume execution when it pauses at the first breakpoint.
- Invoke the browser, enter the IP address and display the embedded web page.
- Resume code execution on gateway board 1 to transmit data.
- Refresh the browser display to get the data from board 1 displayed.

8.2 Create and Build the Gateway Project

Ensure eICE adaptor2 is connected to the PC.

Ensure gateway2 is connected-up, including the Ethernet cable to the PC.

Invoke a second instance of **CyanIDE 2.1.1.**

Select a **workspace** for this project only, for example "workspace211-gateway".

Select **'File->New->Cyan eCOG Executable Project'**.

Enter a project name (or use the default), select the USB Ethernet Gateway as the development board type and the **CYDF EZSP EM260 Gateway** project template.

The **Configurator** perspective should then be displayed. (If not, then it can be opened using 'Window->Open Perspective->.'). Also open the **C/C++** and **Debug** perspectives.

Build the project.

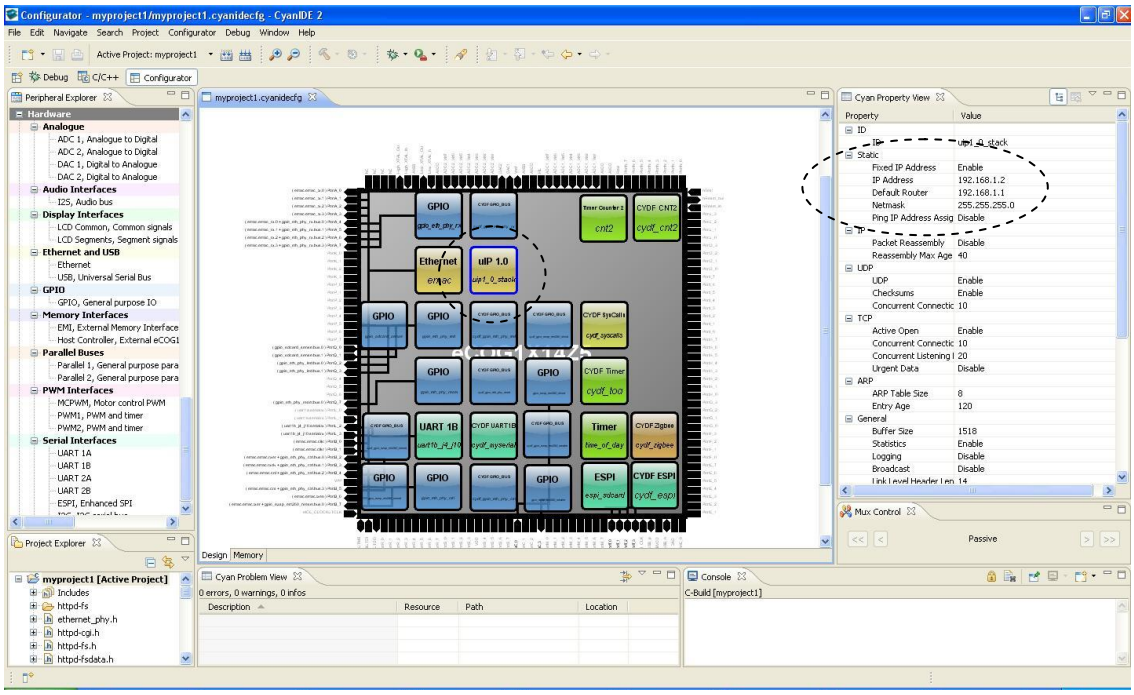
8.3 PC Network Configuration

Select the **Configurator** perspective. Ensure the eCOG1X canvas is displayed. (If not, in the Project Explorer view, double-click on the .cyanide.cfg file.)

Click on the **uIP 1.0** software peripheral, and its properties are displayed in the **Property** view (upper right).

The **IP Address** (192.168.1.2) is the IP address of the gateway.

The **Default Router Address** (192.168.1.1) is the address to be used for the PC network configuration.



Now:

- In the PC's **Control Panel…**
- ..select **Network Connections**.
- Right-click on **Local Area Connection** to display the **Properties…**
- … and scroll down to **Internet Protocol** and click on it.
- Select **Properties**…
- … then **Use the following IP address** to fix the IP address
- … and set an appropriate **IP address** (refer to the CyanIDE 2 **Property** View).

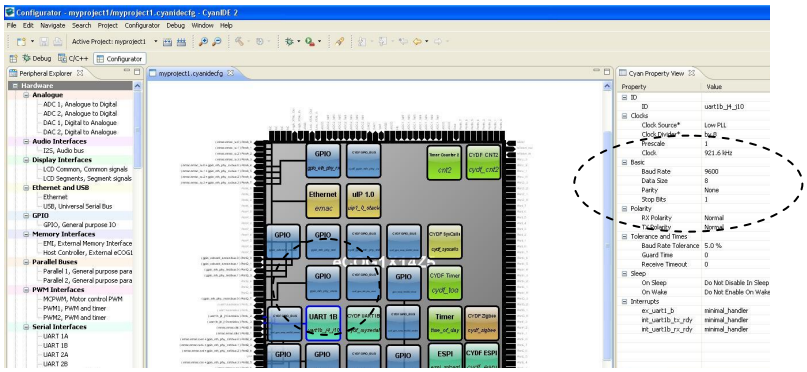
  (The PC should be set to the default router address; in the above screen shot this is 192.168.1.1)
- … and also set the **subnet mask** to that shown in the **Property** view
- … and click **ok**
- … and close **Local Area Connection Properties**

IMPORTANT: For the new network settings to take effect, you must perform the **click ok** and **close** steps above.

8.4 Terminal Emulator

In the **Configurator Perspective**, click on the **UART1B** peripheral. Its properties are displayed in the **Property** view (upper right). In this screen shot, the baud rate is 9600 baud.

Ensure the terminal emulator is connected to gateway2.



8.5 Download and Execute

Return to the CyanIDE **C/C++** perspective.

Download the project to gateway2, allow the program to execute and break at 'main'. (Right click on the active project and select "Debug As -> Cyan eCOG Debug Interface")

Click **Resume**; the terminal emulator typically displays:

8.6 Run the Meter Emulator Project

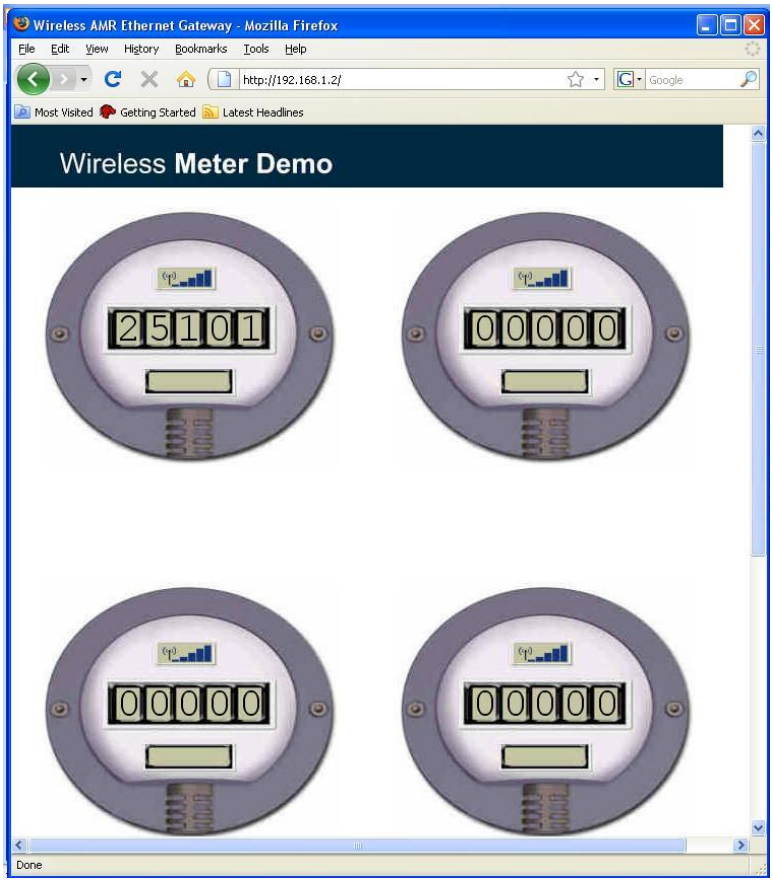
Ensure gateway board 1 is running the **Meter Emulator** project. If the program is suspended, click **Resume** in the **Debug Perspective.**

Typical terminal emulator displays are shown below, with the gateway1/meter project output shown on the left, and the gateway2/gateway project output shown on the right.

8.7 Display Web page

At the PC, run **Internet Explorer** or any other web browser, using the **IP address** of the gateway board 2 (192.168.1.2 in the example shown in the screen shots), and the web page is displayed. The top left meter displays data sent by the meter project.

Wait for a short period (a few seconds) and then click refresh on the browser to update the meter readings.



This completes the gateway embedded web server project.

8.8 Terminate and Close

Select the **Debug Perspective**.

Terminate the project (using the red square button).

Right-click on the terminated .elf file and select **Remove All Terminated**.

Return to the **C/C++ Perspective,** right-click on the project and select **Delete.**

Ensure the project contents are deleted.

Repeat for the meter project.

8.9 Changing the Web Page Data

The subfolder <*httpd-fs*> of this project contains the HTML files that are served by the http web server. These HTML files are included in the project as fixed binary data, stored as constant data in the eCOG1X internal flash memory. To change the web page content, first modify the HTML source files as required. Then use the PERL script *DOSMakeFS.pl* (distributed with this example application) to convert the HTML source files into binary data, stored in the C source file *httpd-fsdata.c*.

To find out the size of the static file system data for each web page, build the project and open the generated ELF file and search for a symbol corresponding to one of the html files, for example *data_404_html*. The following shows an example:

```
0000045e l     O .ecog1.const 000000ab data_404_html
```

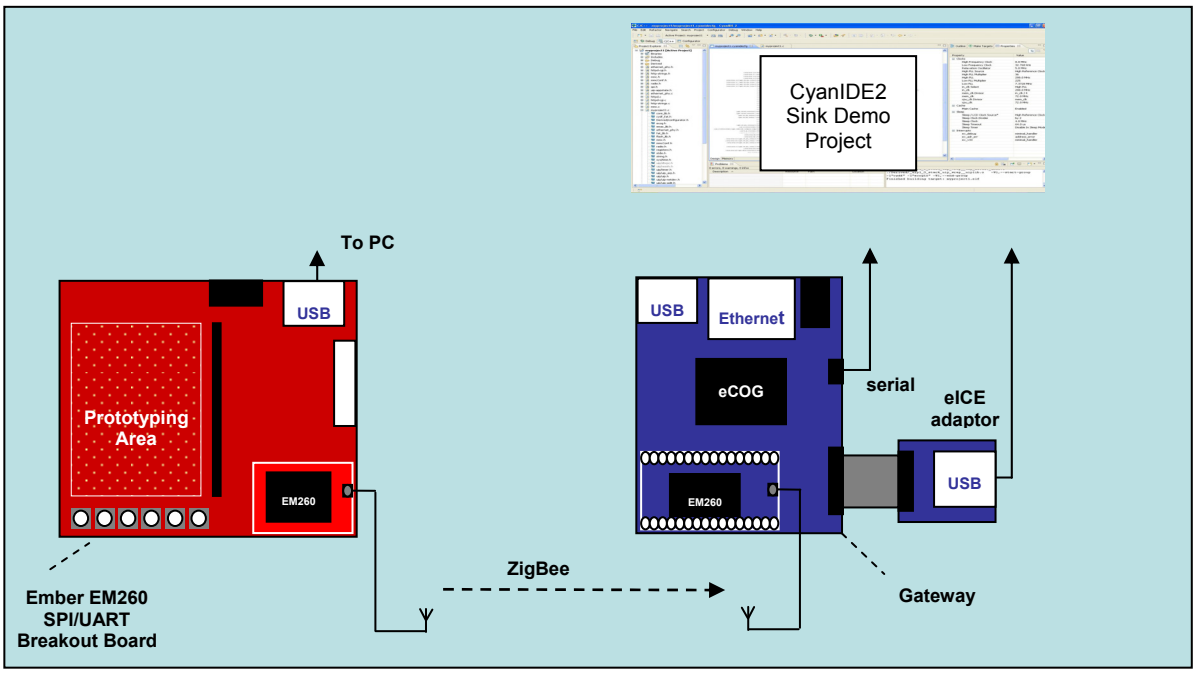
This indicates that the *data_404_html* web page data occupies 0x00ab bytes in the constant data area of internal flash.

A suitable PERL script interpreter is ActivePERL, which is available as a free download from ActiveState at <www.activestate.com> for AIX, HP-UX, Linux, Mac OS X, Solaris and Windows.

9 Sink Example Project

9.1 System Overview and Assumptions

In this project, an Ember EM260 Breakout board acts a meter emulator and transmits data; a Cyan Gateway acts as a meter concentrator and receives and outputs the data to the terminal emulator.



Ember EM260 (acting as a Meter) linked via ZigBee to Gateway (acting as a Concentrator)

(See Appendix B for further information on the Ember board.)

It is assumed:

- The user has already run the meter emulator and meter concentrator example projects above and is familiar with creating and building CyanIDE projects.
- The user has available an Ember EM260 SPI/UART Breakout board fitted with an Ember EM260 SPI/UART radio communication module (RCM).

The steps to run the sink project are:

- Ensure only one gateway board and eICE adaptor are connected to the PC.
- Create and build the sink project.
- Select the Configurator Perspective.
- Note the serial port settings (for the terminal emulator).
- Ensure the terminal emulator is configured and running.
- Download onto gateway, run to ‘main’ and resume execution when it pauses at the first breakpoint.
- Connect a USB cable to the PC and to the Ember Breakout board.
- Wait for a short period (this may be 30 seconds approx).
- Data from the Ember Breakout board is received by the gateway and displayed on the terminal screen.

9.2 Create and Build the Sink Project

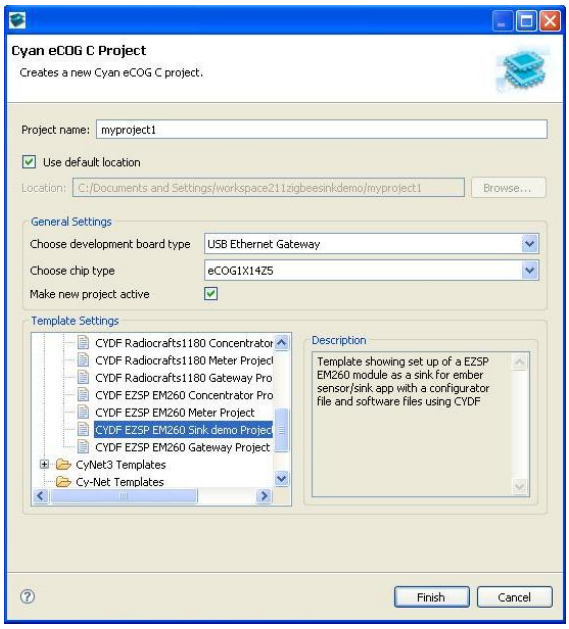
Ensure an eICE adaptor is connected to the gateway and to the PC.

Invoke **CyanIDE 2.1.1.**

Select a **workspace** for this project only, for example “workspace211sinkdemo”.

Select **‘File->New->Cyan eCOG Executable Project’**.

Enter a project name (or use the default), select the USB Ethernet Gateway as the development board type and the **CYDF EZSP EM260 Sink demo** project template.



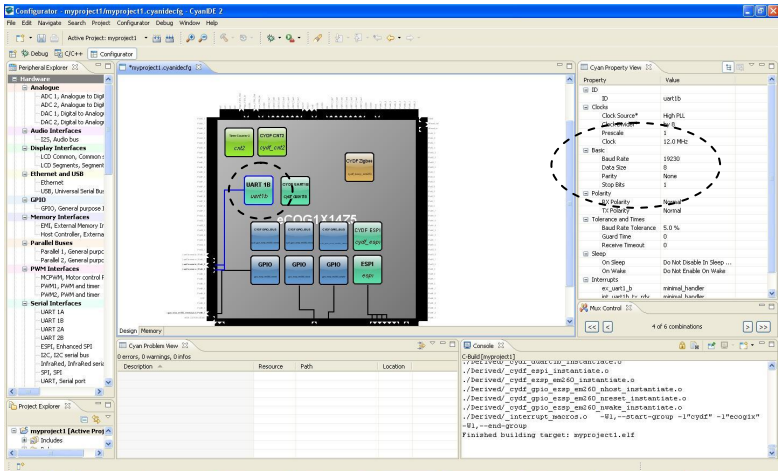
The **Configurator** perspective is then displayed. (If not, then it can be opened using ‘Window-> Open Perspective-> ….’). Also open the **C/C++** and **Debug** perspectives.

Build the project.

9.3 Terminal Emulator

In the **Configurator Perspective**, click on the **UART1B** peripheral. Its properties are displayed in the **Property** view, (upper right). In this screen shot, the baud rate is 19k2baud.

Ensure the terminal emulator is connected to the gateway.



9.4 Download and Execute

Return to the CyanIDE **C/C++** perspective.

Download the project to gateway2, allow the program to execute and break at 'main'. (Right click on the active project and select "Debug As -> Cyan eCOG Debug Interface")

Click **Resume**, the terminal emulator typically displays:

9.5 Connect the Ember EM260 SPI/UART Breakout board

Connect the Ember Breakout board to the PC using the USB cable – this will power-up the board.

Wait a few seconds (approximately 30 seconds).

Data received from the Breakout board is received by the gateway and displayed on the terminal emulator.

This ends the sink demo project.

9.6 Terminate and Close

Select the **Debug Perspective**.

Terminate the project (using the red square button).

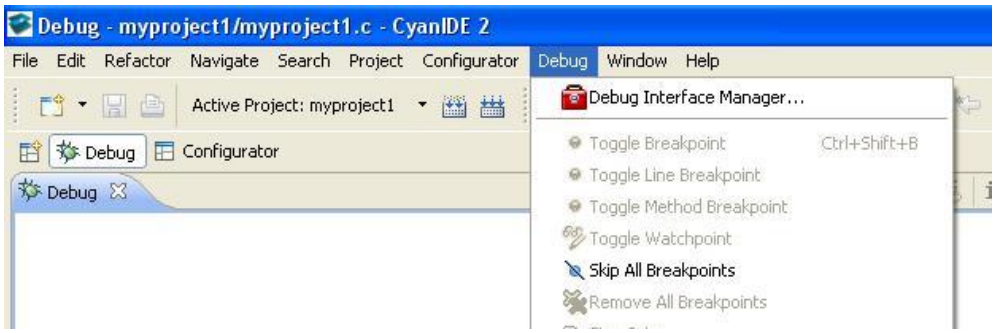
Right-click on the terminated .elf file and select **Remove All Terminated**.

Return to the **C/C++ Perspective,** right-click on the project and select **Delete.**

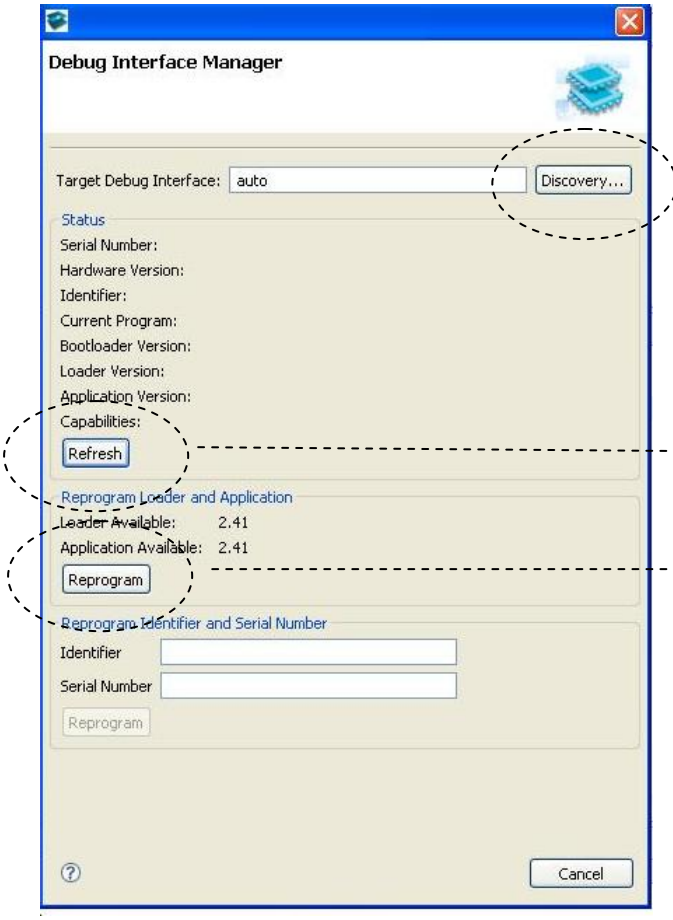
Ensure the project contents are deleted.

Appendix A eICE Adaptor (Dongle) Update / ID Setting

The firmware of the eICE adaptor is updated using the Debug Interface Manager in CyanIDE 2. Invoke CyanIDE 2 and, in any perspective, select **Debug->Debug Interface Manager**.



The Debug Interface Manager, when opened, appears as below.



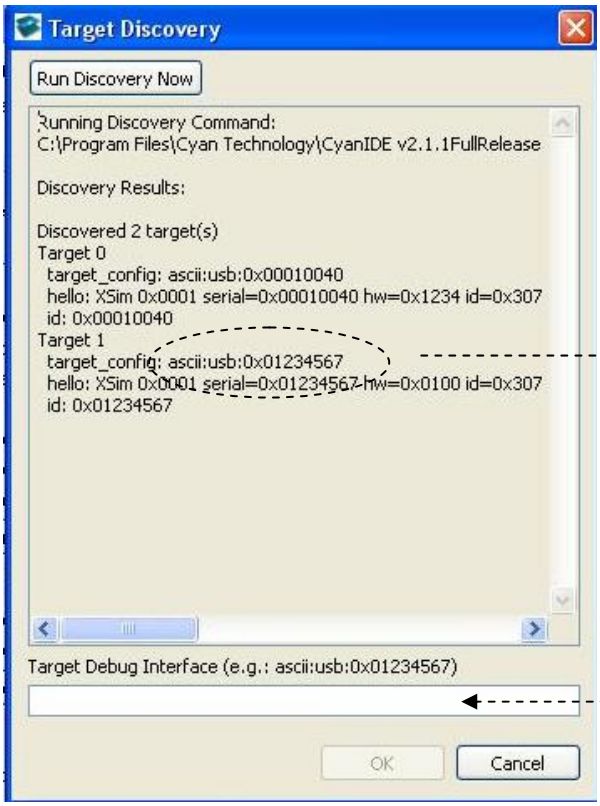
Use this button, if you have more than one eICE adaptor connected to your PC, to identify the connected adaptors.

Use this button to read the status of the connected adaptor

Use this button to download and update the firmware version

If you have only one eICE adaptor connected, then leave **auto** as the entry in **Target Debug Interface** and click on **Refresh** or Reprogram as required.

If you have more than one eICE adaptor connected, then selecting **Discovery->Run Discovery Now** typically gives:



This can be copied……

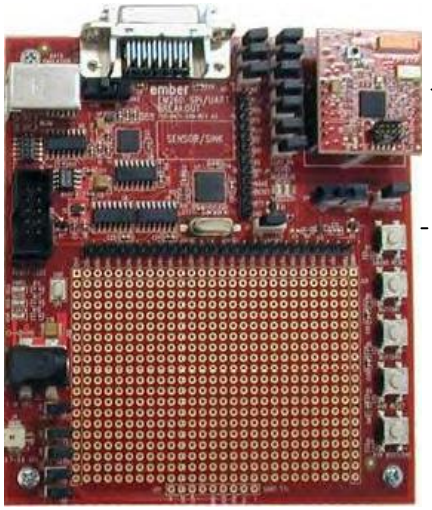
……and pasted here. Clicking **OK** will return you to the previous screen where the Identifier and Serial Number may be changed, if required

IMPORTANT: If you have two or more eICE adaptors both set to the same Identifier and Serial Number (for example, set to the shipped default), then an error is reported. Simply

- Disconnect all adaptors but one.
- Run the discovery command to get the current Identifier and Serial Number.
- Return to the Debug Interface Manager window.
- Type in a unique Identifier and Serial Number.
- Click on Reprogram.

Appendix B Ember EM260 Breakout Board

The example sink demo project was developed using:



- Ember EM260 SPI/UART radio communication module (710-0401-000)

Fitted to:

- Ember EM260 SPI/UART Breakout board (710-0471-000)

The EM260 SPI/UART breakout board switch settings:

- SW1 set to ‘SPI’
- SW2 set to ‘USB’

The breakout board is powered when the USB port is connected to a PC.

The board operates in a stand-alone mode and starts transmitting data on being powered-up.

Note: Ember supplies different variants of breakout board. The breakout boards are also subject to revision. Assuming an EM260 device is used, it is expected that other variants and versions of the breakout boards may be used without issue, but no warranties as to correct project operation can be provided and support may be limited.

Document References:

- EM260 SPI/ UART Breakout Board Technical Spec, document number 120-2006-000.

Further information is available on:
http://www.ember.com/products_documentation.html