



iDigi X4 Starter Kit

GETTING STARTED GUIDE

ZB Series



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OBJECTIVES

Upon completing this kit, you will be able to:

- Configure your gateway
- Create an account on iDigi.com
- Connect your gateway to iDigi.com
- Set up and configure your Drop-in Sensor Network
- Begin using iDigi Dia (Device Integration Application)
- View sensor data locally on your gateway
- View sensor data via iDigi.com



Drop-in networking

As an integral part of the Drop-in Networking strategy, the Python development environment is incorporated by Digi into each gateway. Digi's integration of the open Python scripting language provides customers a truly open standard for complete control over connections to devices, manipulation of data, and event-based actions. For more information about the Digi Python custom development platform, visit our Python portal today at:

<http://www.digi.com/technology/drop-in-networking/pdr.jsp>

iDigi Dia

Also available is a device connection application called iDigi Dia (Device Integration Application). iDigi Dia software runs on the Digi family of gateway devices. Dia simplifies developing custom applications for remote monitoring and sensor networking. Dia is written in the Python programming language and can easily be extended to accommodate additional requirements. Dia can be executed on a PC for prototyping when a suitable Python interpreter is available.

QUESTIONS?

For technical assistance with your Drop-in Network, call:

1-800-903-8430 (US Only)

Digi contact numbers outside US

Country	Toll Free Number
Argentina	00-800-3444-3666
Australia	0011-800-3444-3666
Brazil	0021-800-3444-3666
China North	00-800-3444-3666
China South	00-800-3444-3666
France	00-800-3444-3666
Germany	00-800-3444-3666
Hong Kong	001-800-3444-3666
India	000-800-100-3383
Israel	00-800-3444-3666
Italy	00-800-3444-3666
Japan	For calls from KDD fixed land-line phones: 010-800-3444-3666 From KDD public and mobile phones: 001-010-800-3444-3666 For non-KDD phones: 122-001-010-800-3444-3666
Korea	002-800-3444-3666
Mexico	001-800-903-8430
Netherlands	00-800-3444-3666
New Zealand	00-800-3444-3666
South Thailand	001-800-3444-3666
Spain	00-800-3444-3666
United Kingdom	00-800-3444-3666

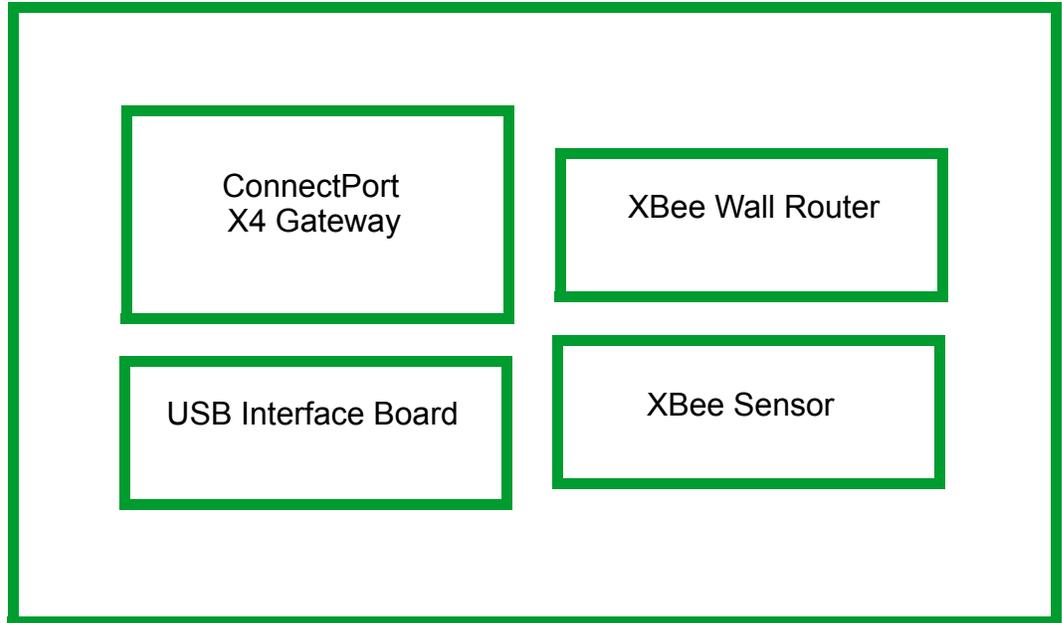
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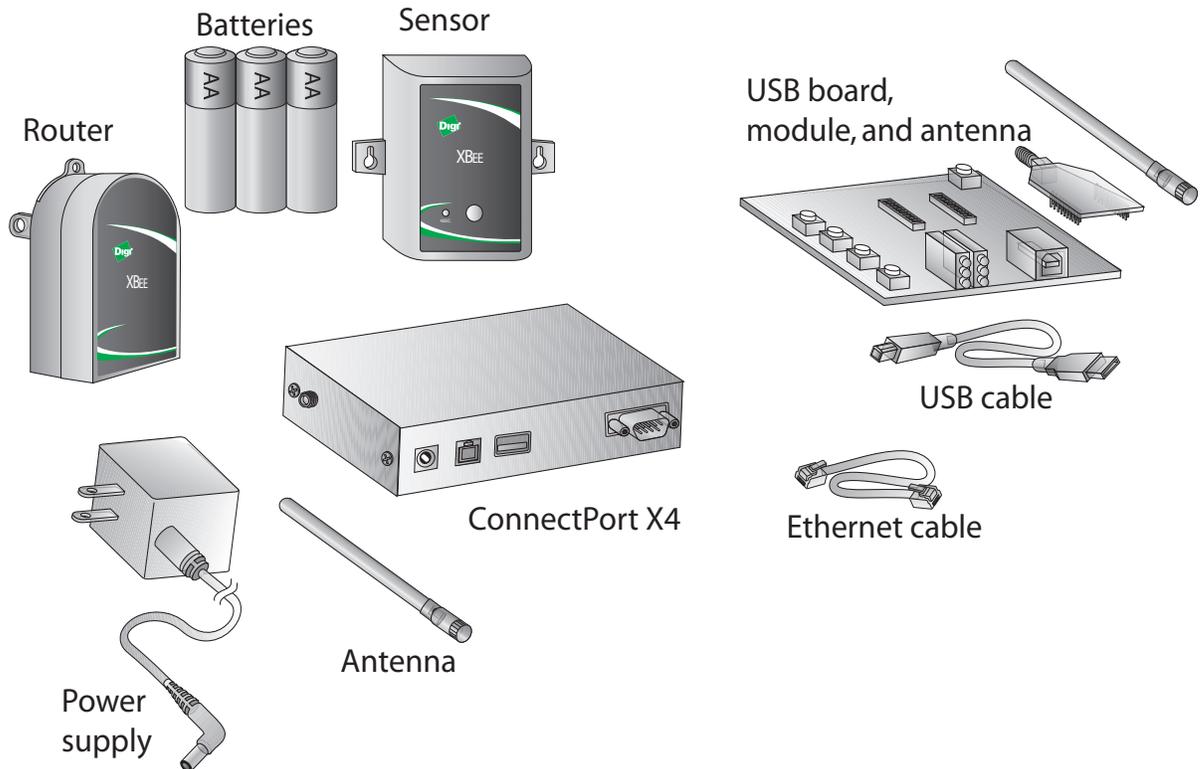
Starter Kit components, requirements, and resources

Kit components

The iDigi X4 Starter Kit contains several boxes:



Within the boxes will be the following components:



PC requirement

To run the kit, you will also need:



A personal computer,
connected to the Internet.

Resources

The following downloads are available at www.idigi.com.

- USB Development Board Windows Driver
- Digi Device Discovery Application
- iDigi Dia (Device Integration Application)
- Python - version 2.4.X (follow link to Python site)

Go to www.idigi.com and refer to the following on-line documents for detailed information on accessing and utilizing your starter kit and data.

[iDigi Dia Getting Started Guide](#)

[iDigi Dia Developer's Guide](#)

[iDigi Web Services Getting Started Guide](#)

[iDigi.com Web Services and Device Management Overview](#)

Product configurations



Digi ConnectPort X gateways are available in multiple configurations: XBee-to-Ethernet, XBee-to-WiFi, and XBee-to-Cellular. The latter two configurations enable end-to-end wireless device connectivity.

Additional products

iDigi BL4S100 Add-On Kit - Enables the addition of wireless embedded control to a ZigBee network via the iDigi platform. Featuring the Rabbit BL4S100 Single Board Computer, intelligent I/O can be implemented to the iDigi platform and easily programmed via the included Dynamic C development software. Supervisory tasks can be remotely managed and localized I/O control can be added to any device that is part of the ZigBee network. For more information see:

http://www.rabbit.com/products/iDigi_bl4s100_add-on_kit/

Introduction to iDigi

The iDigi Platform is a Machine Relationship Management (MRM) delivery platform, the next step in the machine-to-machine (M2M) technology revolution. It supplies the fundamental components for enterprise applications and remote machine assets (devices) to easily work together. The iDigi Platform is based on industry-standard protocols and open technology for customers and partners to extend specifically for their industry. The result is faster to market and the lowest cost of ownership.

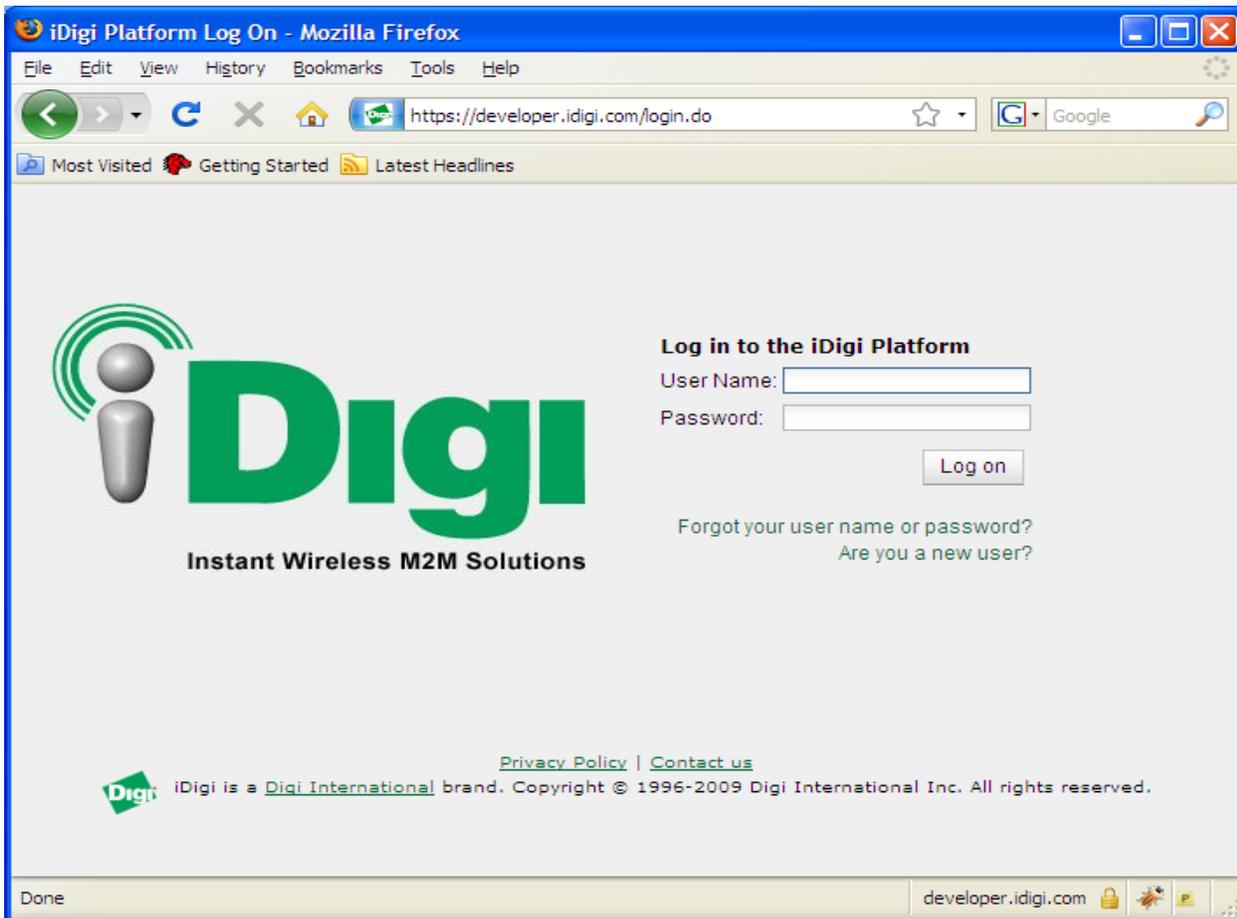
The iDigi Platform is an on-demand service. There are no infrastructure requirements. Remote devices and enterprise business applications connect to the iDigi Platform via standards-based Web Services. The user is able to simply connect to the iDigi Platform and get to work.

For a list of on-line documents that provide more information about iDigi, see "Resources" on page 8.

Create an account on iDigi.com

To get started, set up an account on the iDigi Platform as follows.

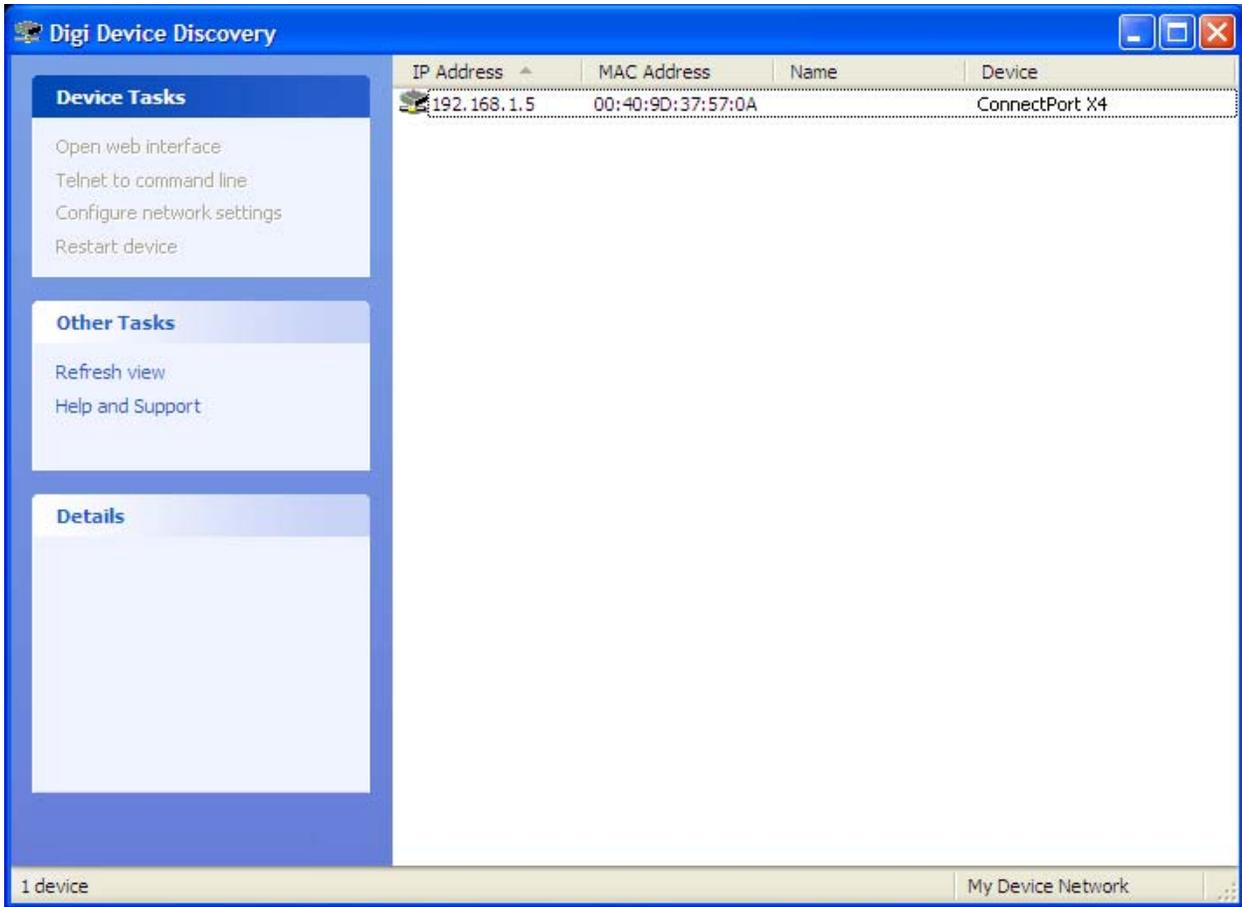
1. Navigate to <http://www.idigi.com>.
2. Click on the iDigi Platform Login button.
3. Click on the "Are you a new user" link and create your account.



Configure the gateway

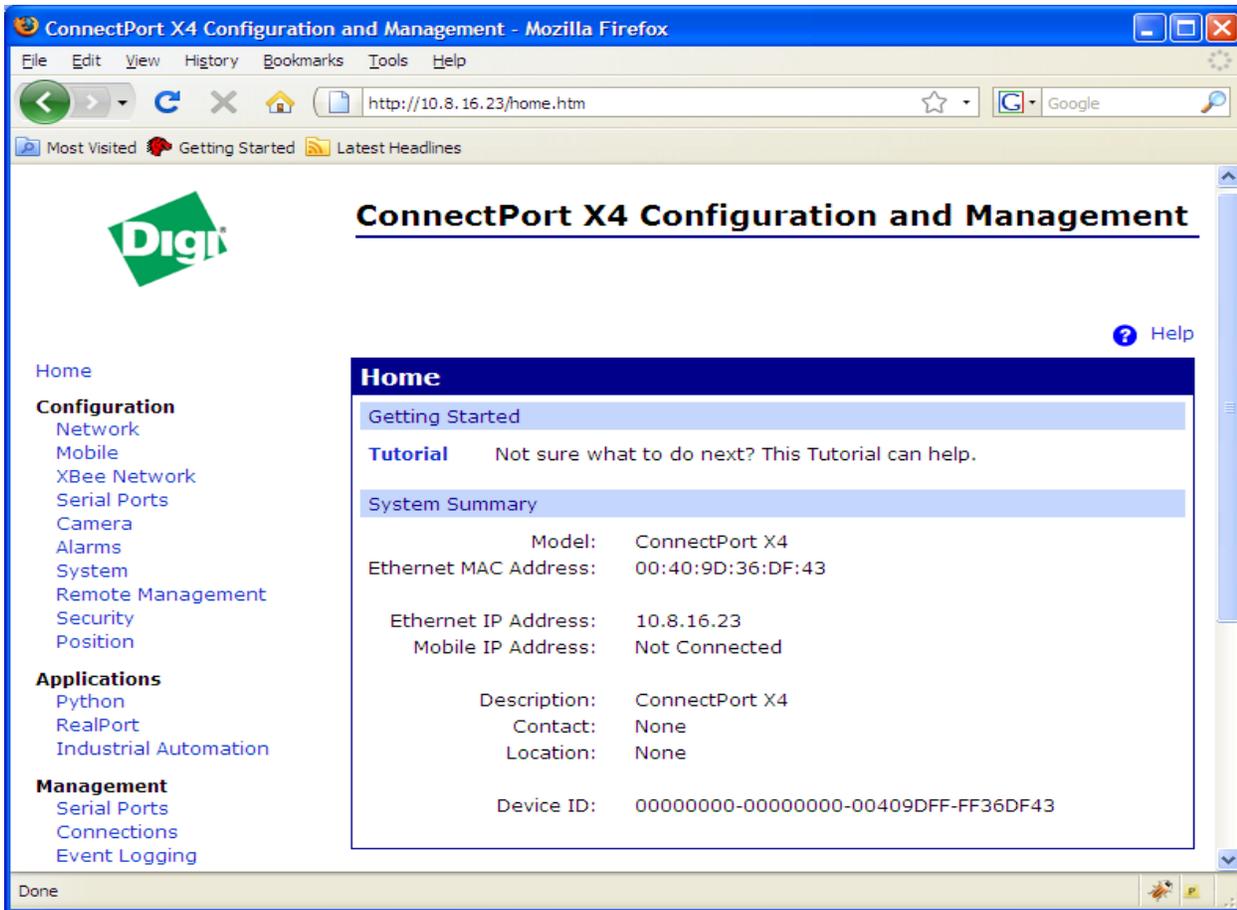
Connect and power on the ConnectPort X4

1. Open and unpack the box labeled ConnectPort X4 Gateway.
2. Connect the power supply to the X4 gateway and connect the power supply to an outlet.
Note (International version only): Connect the power supply to a power cable (not included), and the power cable to an outlet.
3. Attach the antenna to the X4 gateway.
4. Connect an Ethernet cable from the X4 gateway to your hub or switch that provides access to the Internet.
5. Use the downloaded Digi Device Discovery application to find the X4 gateway on your network.



Note: This is a sample IP address. Your IP address will be based upon your network.

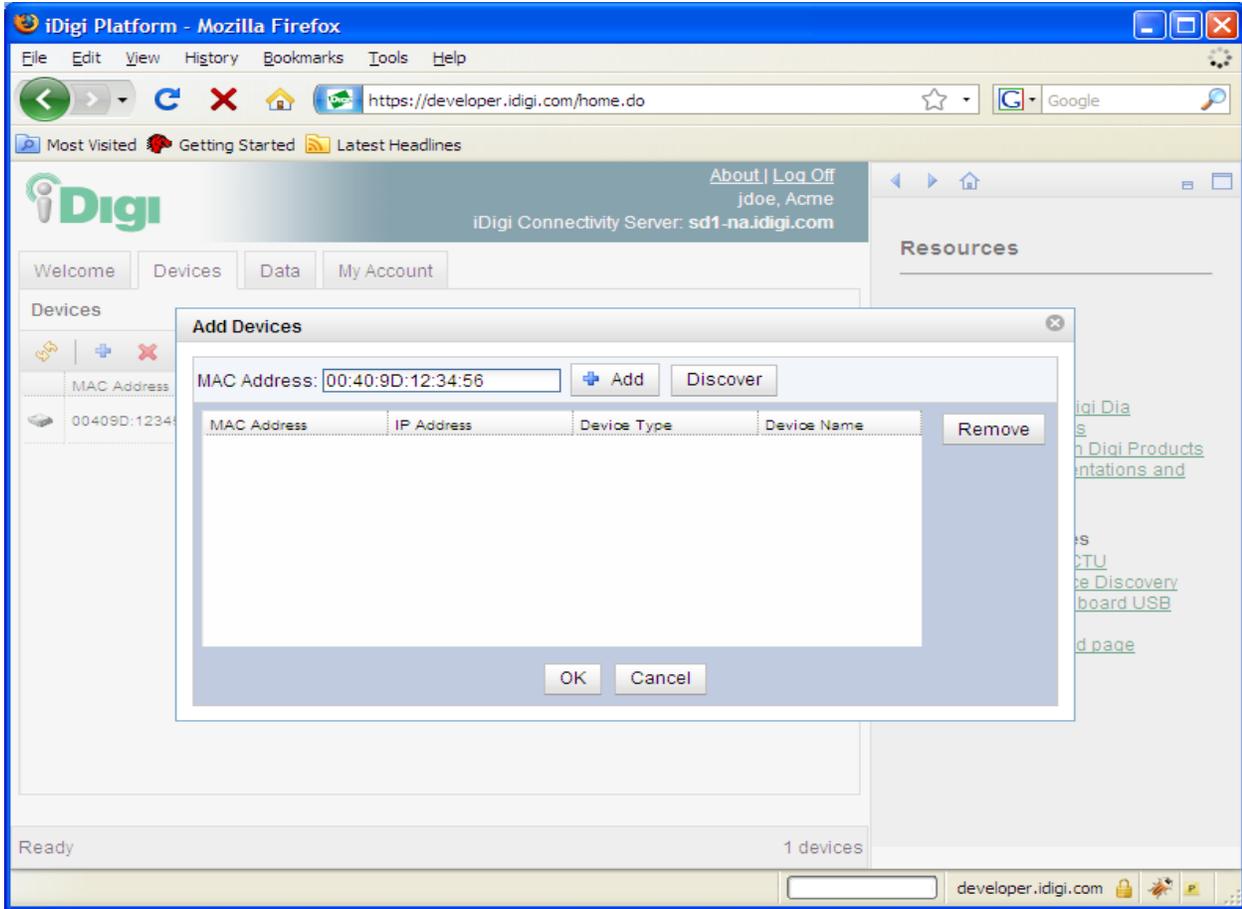
6. Double click on the gateway which will bring you to the web interface.



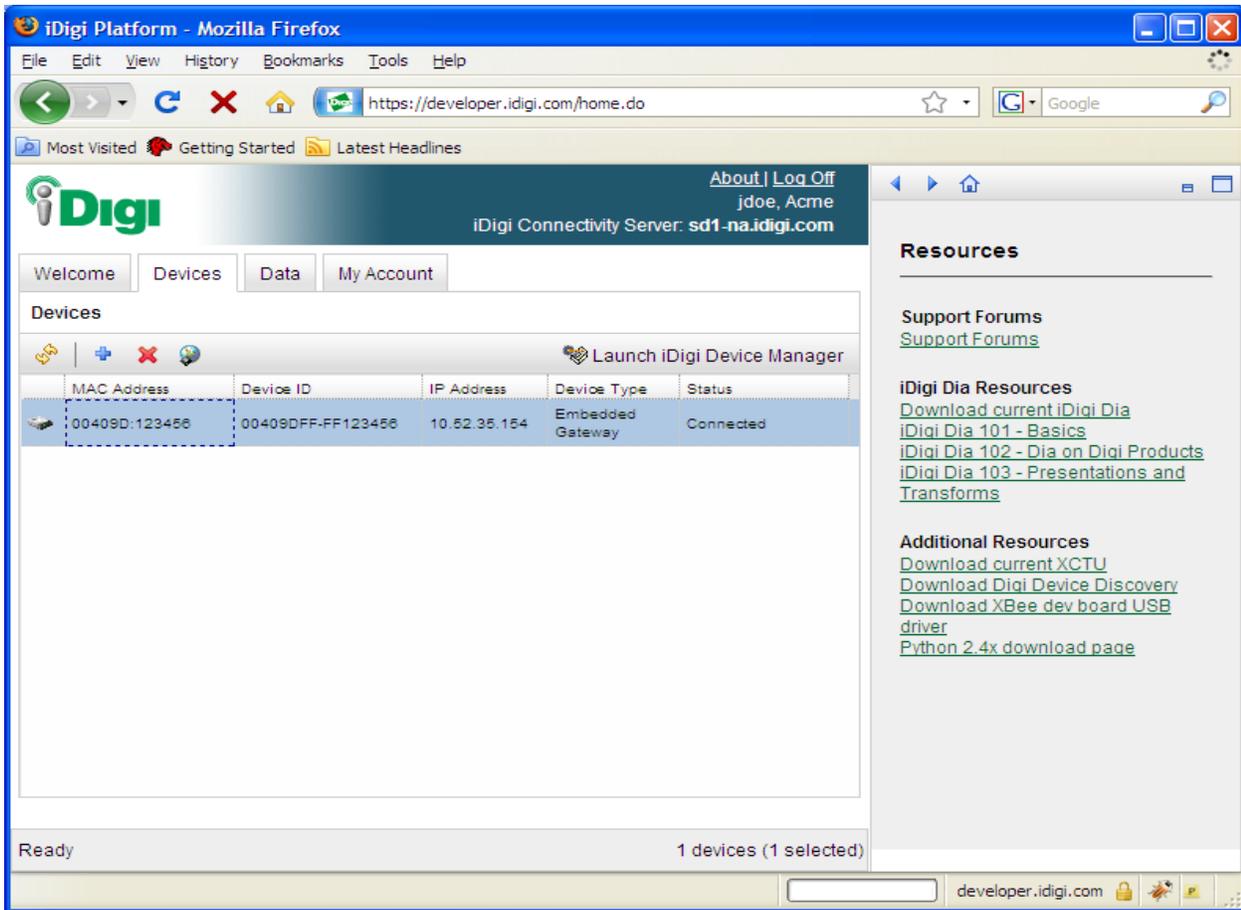
Add gateway to iDigi.com device list

To add a gateway to the device list, follow these steps.

1. Log into the iDigi.com user portal using the username and password you just created.
2. Select the **Devices** tab.
3. Click the  button to bring up the **Add Devices** dialog and type in the MAC address of your gateway that can be found on the top label of the gateway module.



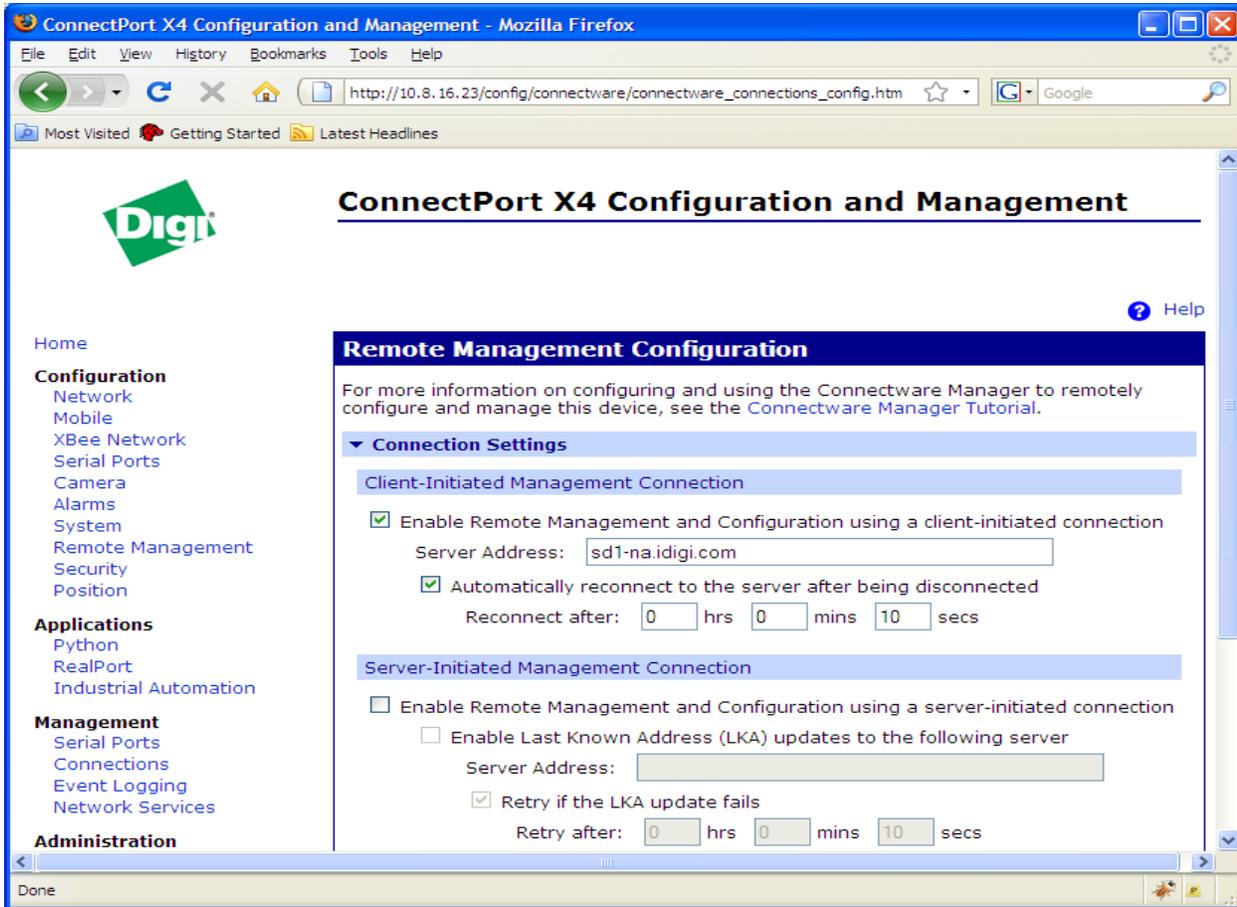
4. Ensure your device is now displayed in the devices list as shown below:



Configure your gateway to connect to iDigi.com

To configure your gateway and connect to the iDigi Platform, follow these steps:

1. Switch back to the web UI for your gateway and select **Remote Management** from the **Configuration** section.
2. Enter the URL of the iDigi Platform connectivity server (e.g. sd1-na.idigi.com). You can find this URL from the iDigi Platform user portal screen header near the top of the screen under **About | Log Off**.
3. Click the check box labeled **Automatically reconnect to the server after being disconnected**.



Configure your XBee Network

Associating each component to the gateway

Use the following steps for associating each component to the gateway.

1. Power on component.
2. Confirm association is required by clicking the Ident button once.
3. Watch the Associate LED on the X4 gateway.
4. If the LED blinks rapidly for one second, the component is associated with the gateway.
5. If the LED behavior does not change, click the Ident button four times, the associate LED will go solid for a few seconds and should start blinking.
6. Return to step two above and repeat as needed until each component associates with the network.

Note: See “LED Indications” on page 34.

USB board

Set up the USB board

1. Open and unpack the box labeled USB Interface Board.
2. Install the XBee module on the USB Interface Board.
3. Attach antenna to the XBee module.
4. Unzip the USB Driver package to a directory of your choice and note that location.
5. Connect the XBee module to a PC using a USB cable. The **Found New Hardware Wizard** dialog box is displayed.

The USB interface board is a "plug-and-play" device that should be detected by the PC automatically.

6. After the USB interface board is detected, a wizard for installing USB drivers is launched.

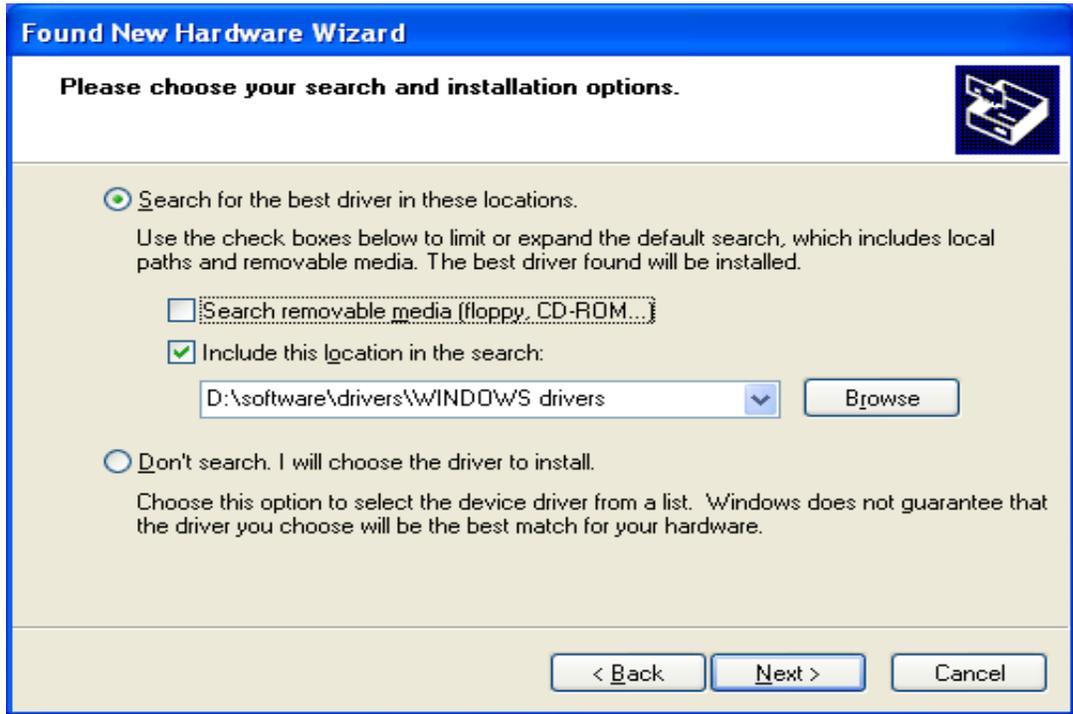
USB interface

To interface between the modem and a PC, two drivers must be installed: a USB driver, and a virtual COM port driver that makes the USB port look and perform like a physical COM port.

Use the downloaded USB Driver package and follow these steps:

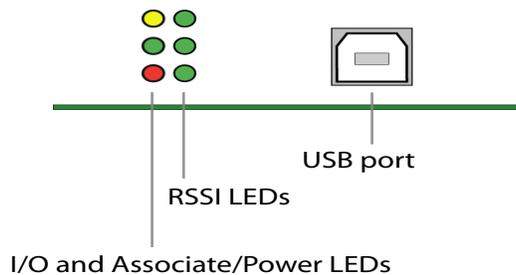
1. On the first screen, select **No, not this time** when asked to allow Windows Update to search for software in order to save time in the installation process.
2. Select **Install from a list or specific location (Advanced)**; then click **Next**.

3. Select **Search** for the best driver in these locations and Include this location in the search, and then enter the location to where you expanded the USB driver package in step 1.



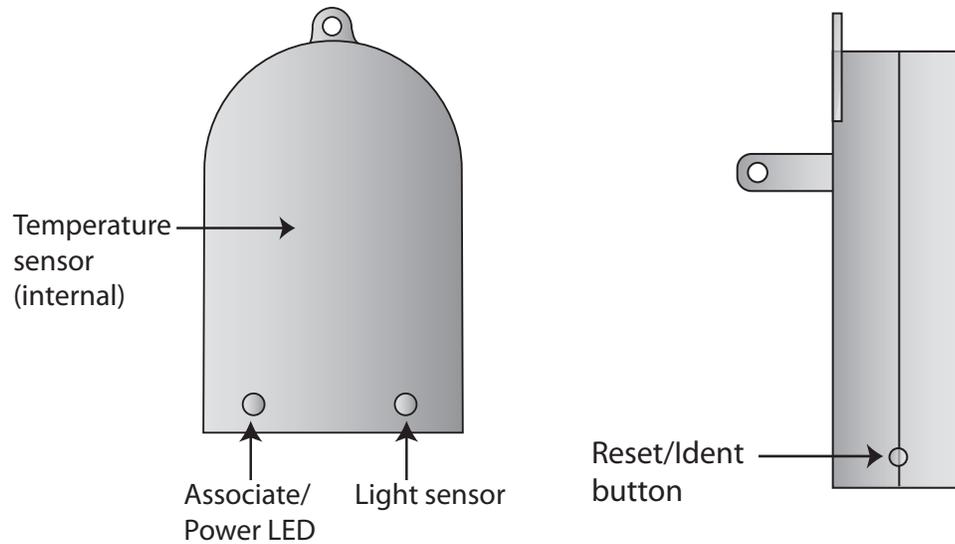
A Hardware Installation Windows Logo Testing alert box is displayed.

4. Click **Continue Anyway**.
5. Click **Finish**.
6. You are prompted to install another driver, the virtual COM port driver.
7. Repeat steps 3 through 6.



8. Refer back to "Configure your XBee Network" on page 15 for steps on associating the interface board with the gateway.

XBee Wall Router



Associate the wall router with the gateway



1. Plug the XBee Wall Router into an outlet.
2. Refer back to "Configure your XBee Network" on page 15 for steps for associating the router with the gateway.

XBee Sensor



The XBee Sensor family is a group of XBee-enabled, battery-powered sensors incorporating an RF module. As a part of Digi's Drop-in Networking solutions, XBee-enabled sensors read real-time data from sensors such as temperature, humidity, and light.

Associate XBee Sensor with the gateway

1. Install batteries by removing the two outer case screws and inserting batteries according to the polarity diagram printed on the board. Device power is indicated by the green **ASSC** LED on the front panel of the XBee Sensor.
2. Refer back to "Configure your XBee Network" on page 15 for steps for associating the sensor with the gateway.

Sensor LEDs, buttons, and integrated sensors

XBee Sensors have one button and one LED.

XBee Sensor /L/T models have integrated light and temperature sensors.

XBee Sensor /L/T/H models have integrated light, temperature, and humidity sensors.

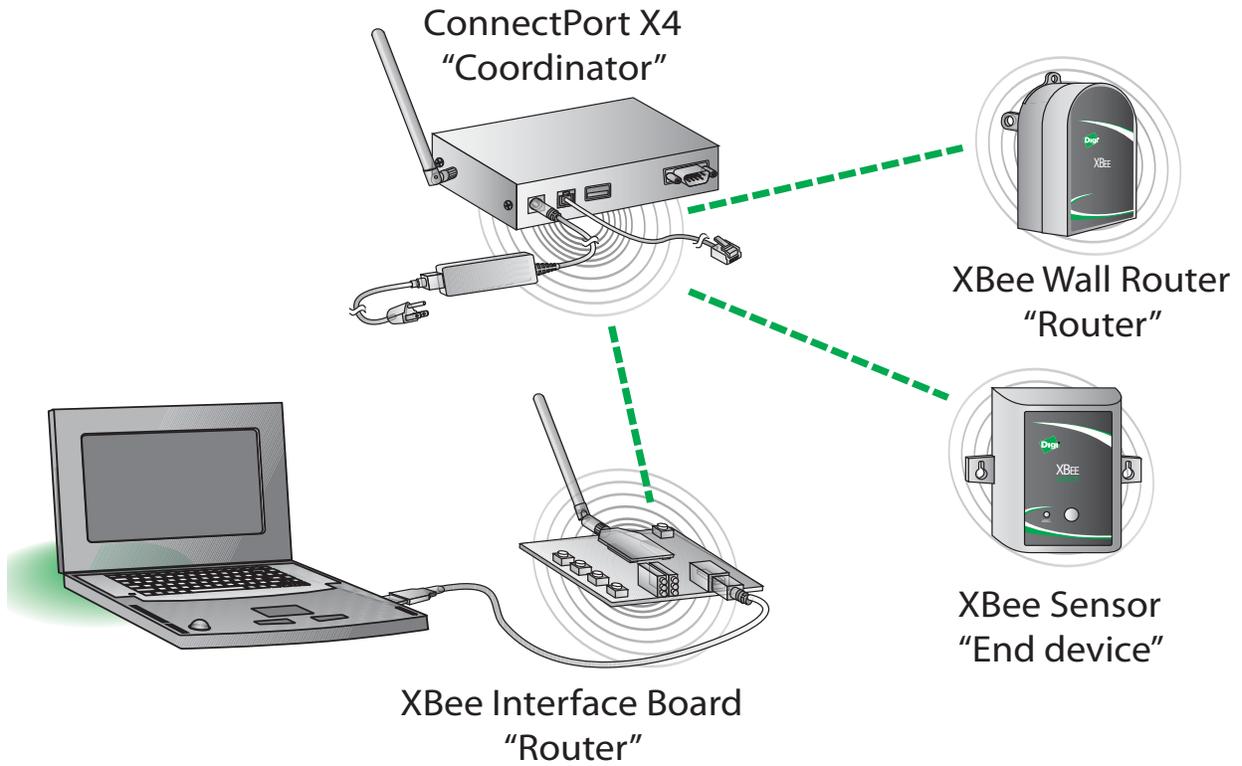


Sensor power

Alkaline Battery Model: This product is powered by three AA batteries (1.5V).

System diagram

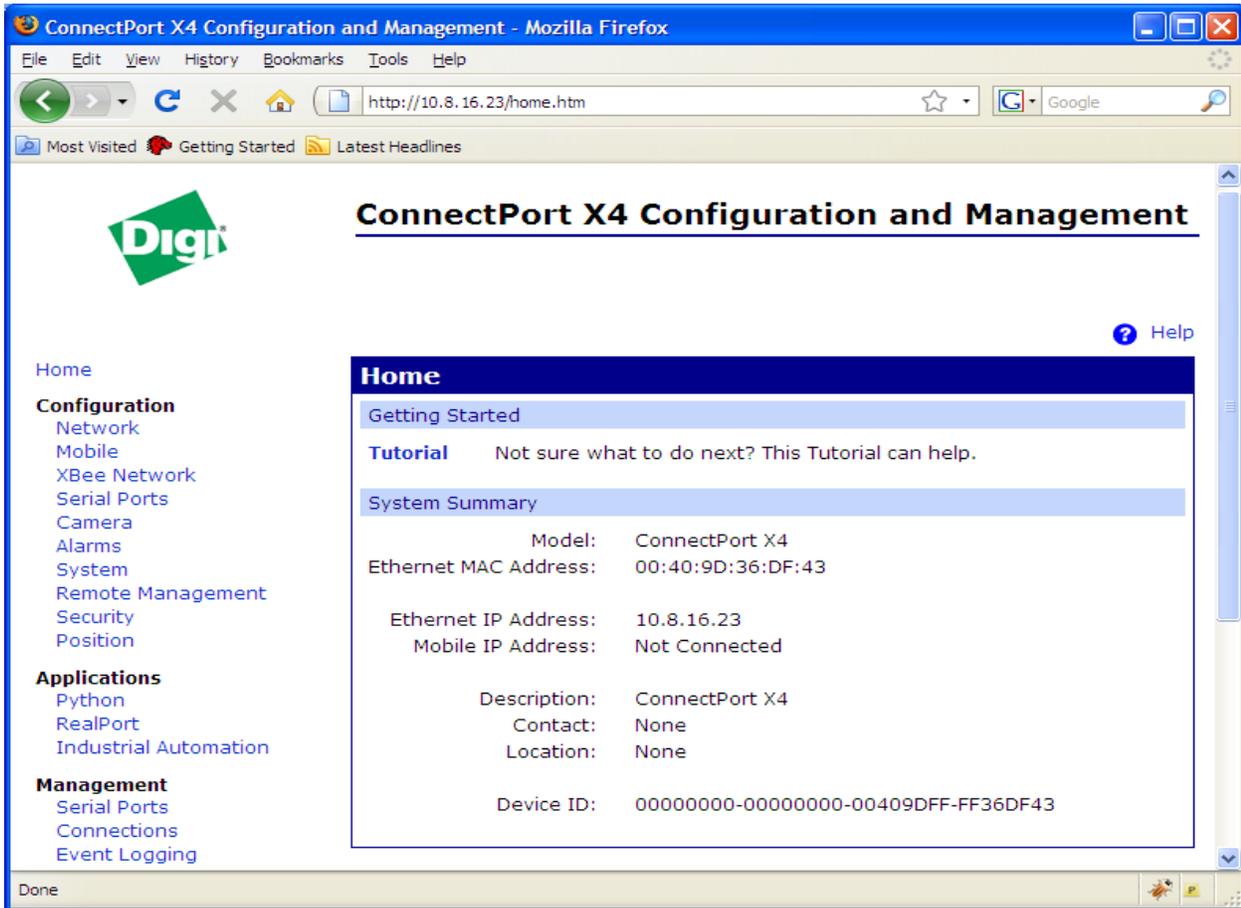
Your starter kit should appear as below:



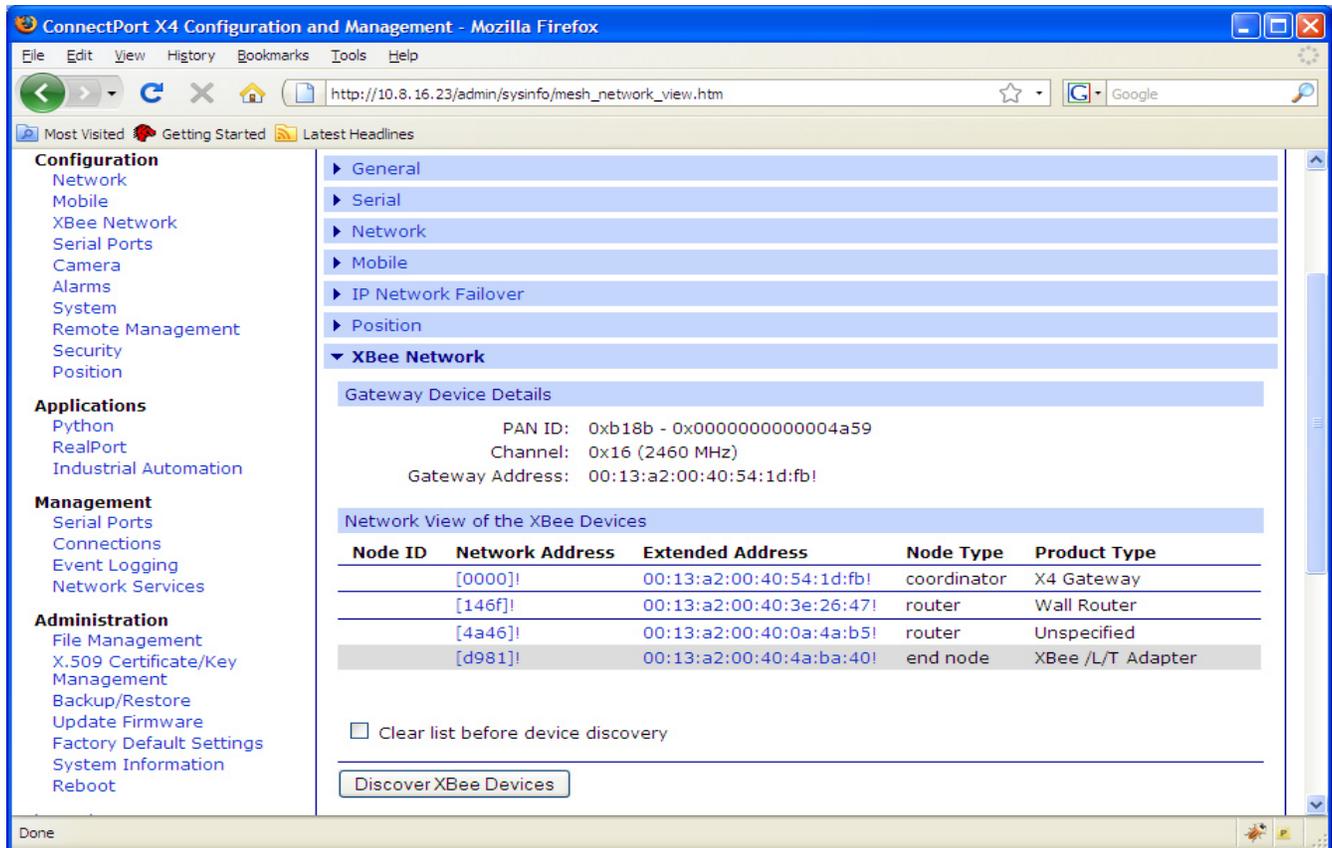
View nodes via local gateway using web interface

The USB interface board, the XBee Wall Router, and the XBee Sensor are known as nodes. In this task you will see a network view of the nodes from the gateway web interface.

1. First, return to the home page of the gateway web interface as shown below:



2. From the menu on the left side, select **Administration > System Information**.
3. In the list of System Information links on the **System Information** page, click **XBee Network**.



4. The XBee Network page is displayed. It shows several settings for the XBee module inside the gateway, followed by a network view of the XBee devices, or nodes. Initially, this page will not show any nodes aside from the coordinator.

To discover nodes:

- Check **Clear list before device discovery** checkbox. This check box clears any previously read and displayed network information from the gateway's cache before the device discovery operation occurs.
- Click the **Discover XBee Devices** button.

In the **Node Type** column, the XBee module attached to the gateway is listed as the **coordinator**. The XBee interface board and XBee Wall Router are listed as **routers**. The XBee Sensor is listed as the **end node**.

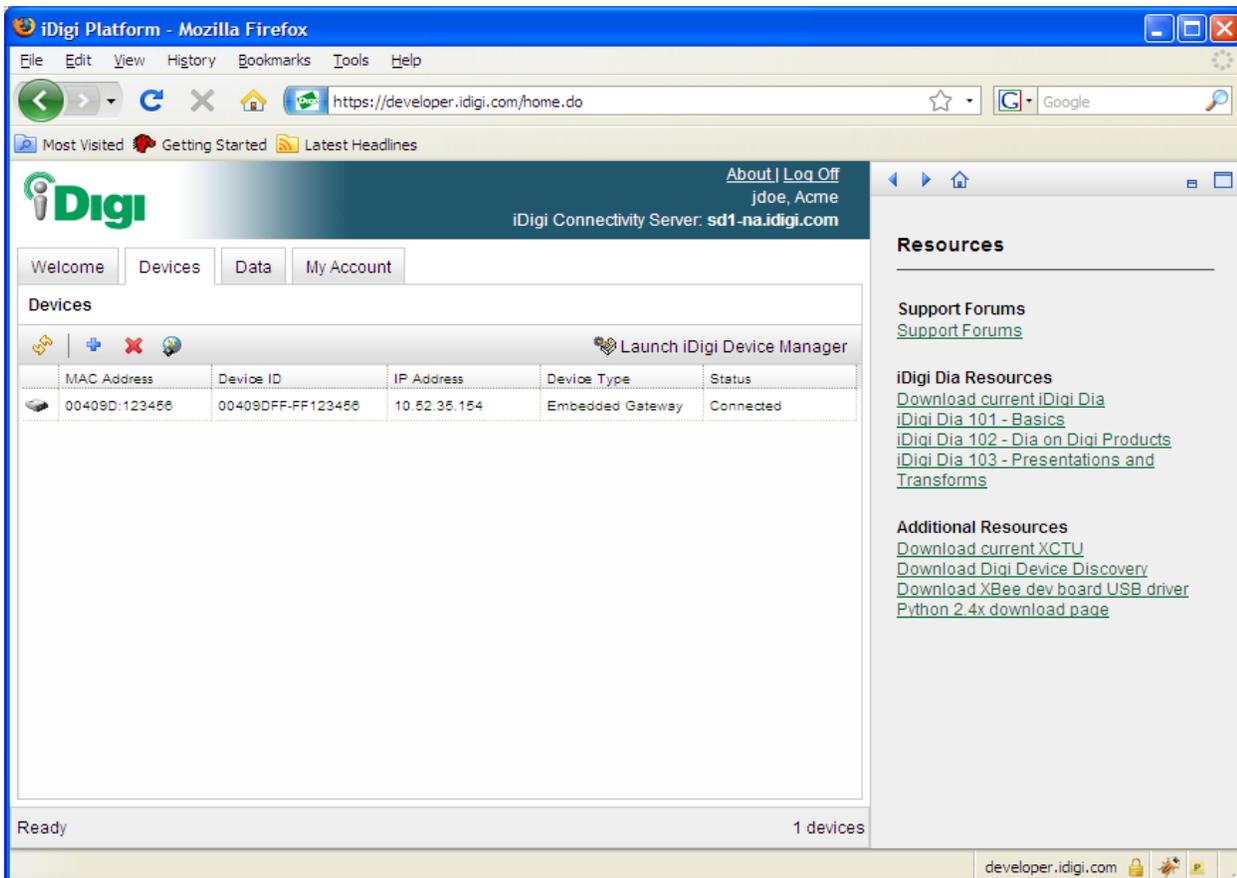
View and manage network via the iDigi Platform

In addition to being able to view your XBee network locally from the gateway's web user interface, you may view and manage your network remotely using the iDigi Platform.

Viewing your network remotely allows you to have access to your gateway regardless of the type of network on which it resides. As long as your gateway is able to get out to the Internet, you will be able to access it from the iDigi Platform.

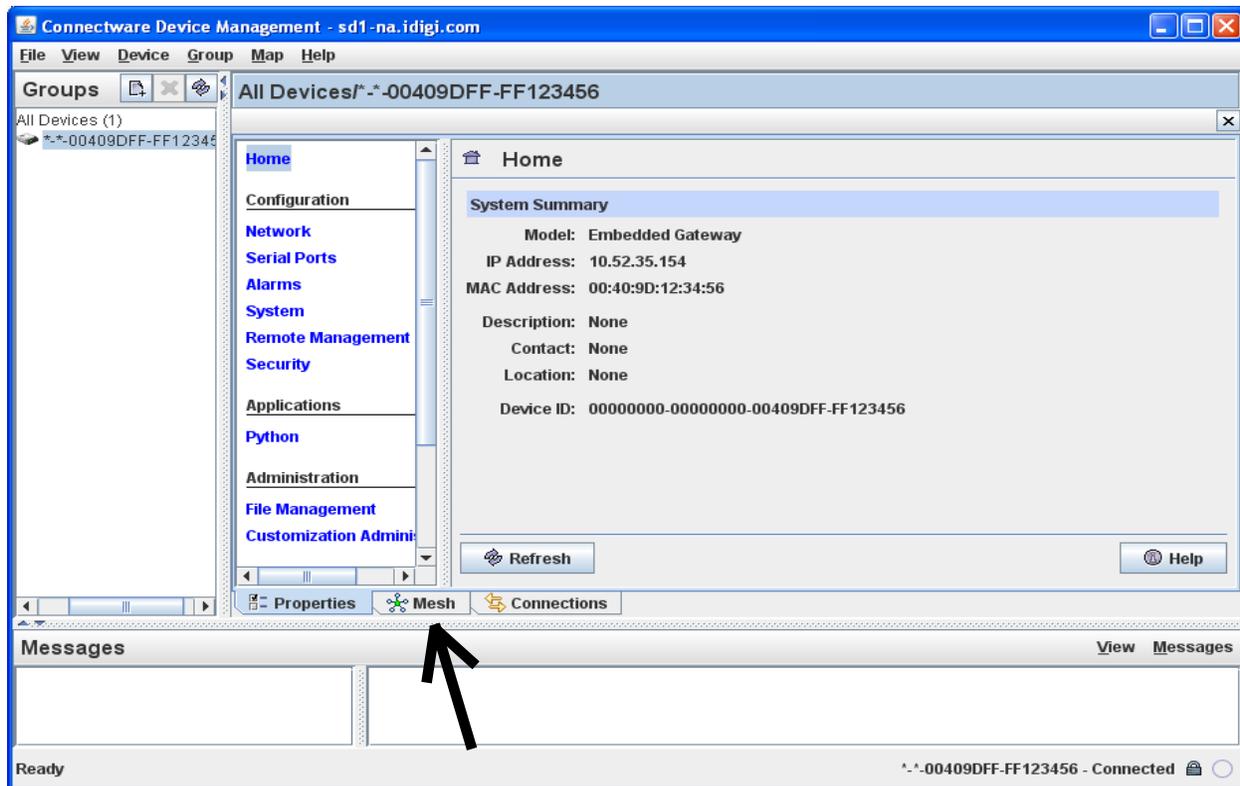
1. Log into or return to the iDigi Platform home page.
2. When prompted for a username and password, enter the same username and password you used to log into the iDigi Platform
3. Select the **Devices** tab.
4. Click **Launch Device Manager**.

Once the Device Management Application loads, you will see the device you added to the iDigi Platform.

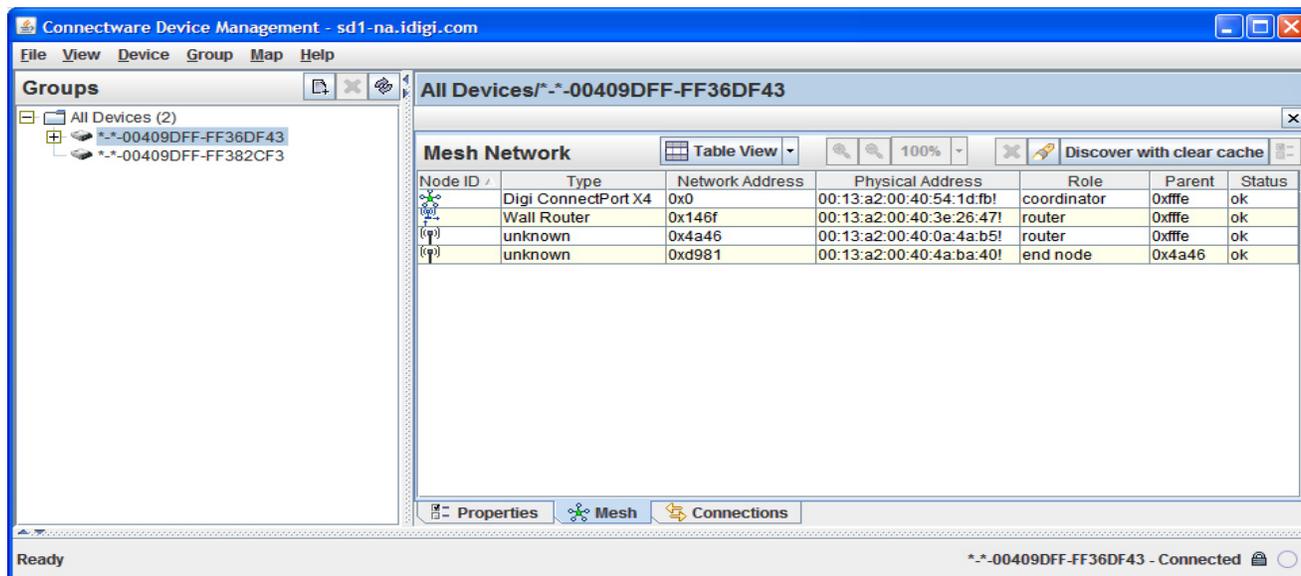


5. Double-click on the row containing your device which will open a properties view.

Note: This is the same configuration information that is available in the web user interface. You are able to configure your device remotely in the same way as you would locally.



- Click on the **Mesh** tab and you will see a list of the nodes that make up your XBee device network.



If you wish to get more information about a specific node, simply double-click on the row associated with that node and you will be presented with a properties page for that node.

Note: For more information on accessing your data go to www.idigi.com and refer to the following documents within the developer section:

[iDigi Dia Getting Started Guide](#)

[iDigi Dia Developer's Guide](#)

[iDigi Web Services Getting Started Guide](#)

[iDigi.com Web Services and Device Management Overview](#)

Configure and install the iDigi Dia Green Demo application

Configure and install Python 2.4

The Python programming language needs to be installed on your personal computer in order to be able to use the Digi Device Integration Application. Digi products use Python version 2.4.3 and therefore the version of Python installed on your computer must be from the Python 2.4 series. Ideally, Python version 2.4.3 should be used. It may be downloaded from the Python website:

<http://www.python.org>

Note: You may have multiple major versions Python installed on your system at any one time. For example, an installation of Python 2.4 has no problems coexisting with an installation of Python 2.5. If you do have multiple versions of Python installed, take care to know which version of Python is being executed when running the iDigi Dia. If you are having difficulty, make sure to consult your system PATH variable, etc.

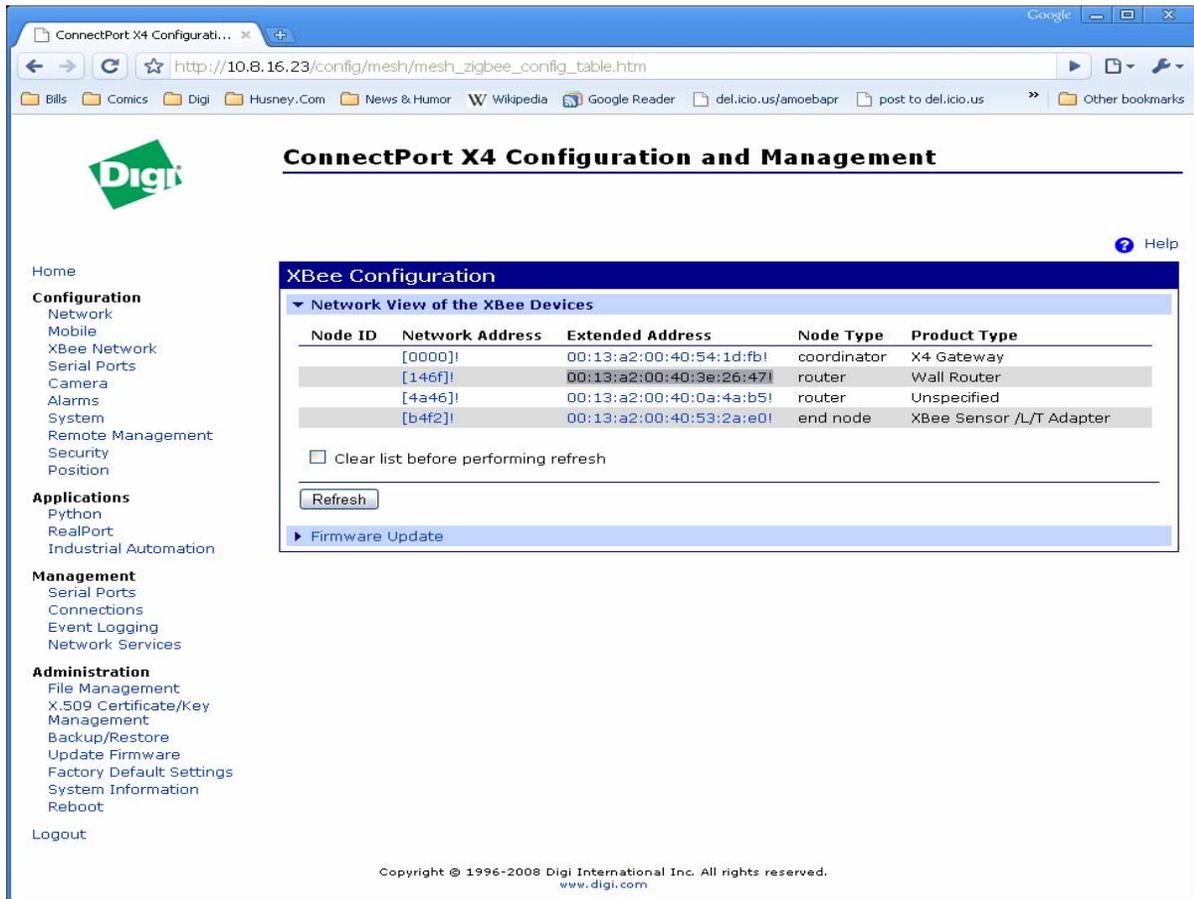
Installing the iDigi Dia Green Demo

1. Go to www.idigi.com and download the iDigi Dia from the resources section.
2. You will need to enter the username and password you established when signing up for your iDigi account.
3. Extract the ZIP file to a directory on your hard drive (e.g. c:\idigi_dia).
4. Open a Windows command prompt by clicking the Windows **Start** menu button and selecting **Run**. Then type **cmd** and click **OK**.
5. Change directories into your iDigi Dia installation. For example:

```
C:\Users\Joe> cd \idigi_dia
C:\idigi_dia>
```
6. Open a text editing application (e.g. wordpad).
7. Open the configuration file for the iDigi Green Getting Started Demo located in the idigi_dia\demos\green_getting_started folder called `green_getting_started.yml`.
8. Underneath the **devices** section you will find a configuration entry for each XBee-based device included with the iDigi Starter Kit. The **extended_address** field must be modified for each device in order for

the iDigi Dia program to be able to find and configure each device when the application is executed on the gateway.

9. In order to find these extended addresses, load the Web UI of the gateway and click on XBee Network underneath the Configuration heading. There you will find a list of nodes, their product type (e.g. "Wall Router") and their associated extended address (e.g. "00:13:a2:00:40:3e:26:47!").



10. Save your modified configuration file and switch back to the console window.

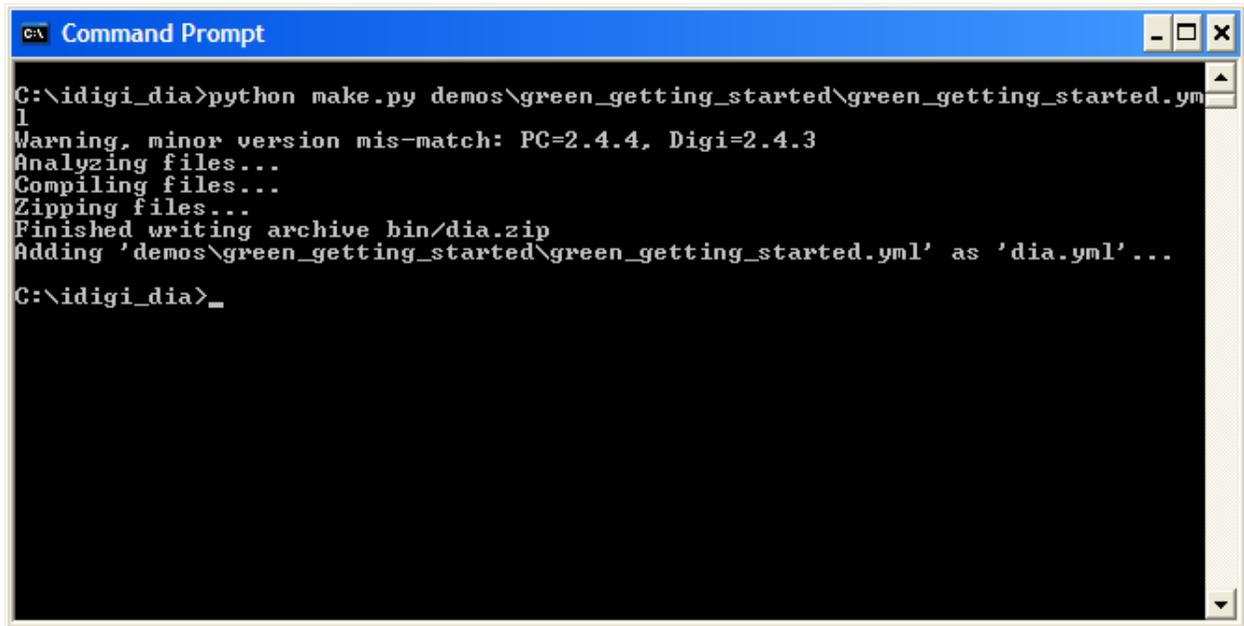
Build your iDigi Dia program

When you see the following console prompt, it is time to build your iDigi Dia program:

```
C:\idigi_dia>python.exe make.py demos green_getting_started\green_getting_started.yml
```

Note: If python.exe is not in your PATH, you may need to use the direct path to your python executable such as

```
C:\Python24\python.exe
```

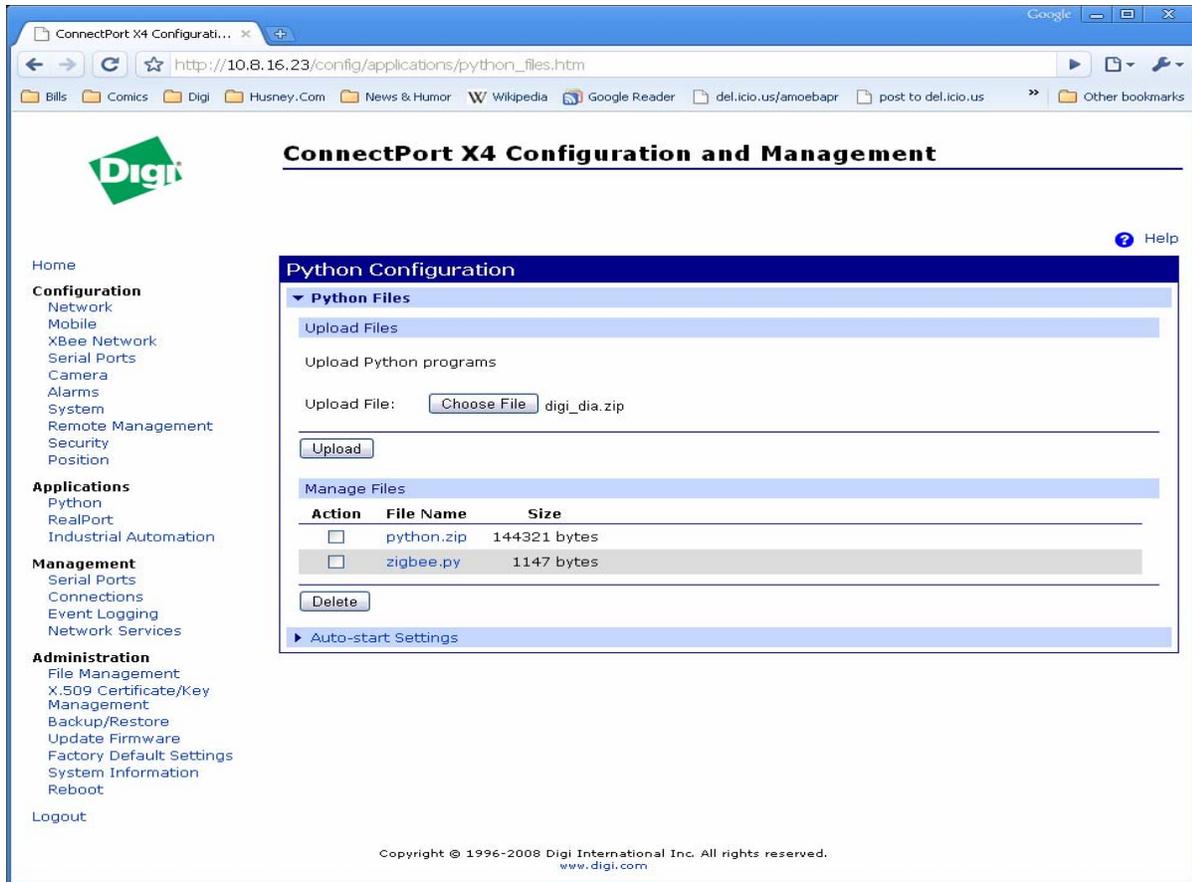


```
C:\idigi_dia>python make.py demos\green_getting_started\green_getting_started.yml
Warning, minor version mis-match: PC=2.4.4, Digi=2.4.3
Analyzing files...
Compiling files...
Zipping files...
Finished writing archive bin/dia.zip
Adding 'demos\green_getting_started\green_getting_started.yml' as 'dia.yml'...
C:\idigi_dia>_
```

The build process will produce a file named **dia.zip** in the **bin** subdirectory of the iDigi Dia installation.

Now upload this file to the gateway device.

1. Via the Web UI, click on the Python link underneath the Applications heading.
2. Click **Choose File** and navigate to find your **dia.zip** file (e.g. C:\idigi_dia\bin\dia.zip)
3. Click **Upload**. The page will refresh when the upload is complete with a message indicating that the file was uploaded successfully.



Uploading iDigi Dia application files

We will also need to upload the **dia.py** file. It is used to start the iDigi Dia program on the gateway. It is located in the root of the iDigi Dia installation.

- Repeat steps 1 and 2, uploading the **dia.py** file (rather than the **dia.zip** file).

iDigi Dia Green demonstration

Once the files have been uploaded, it is time to start the iDigi Dia Green demonstration application.

- Open a telnet connecting to your device either by right clicking on the device from the Digi Discovery application or by using your own telnet client.

- At the prompt type:

```
#> python dia.py
```

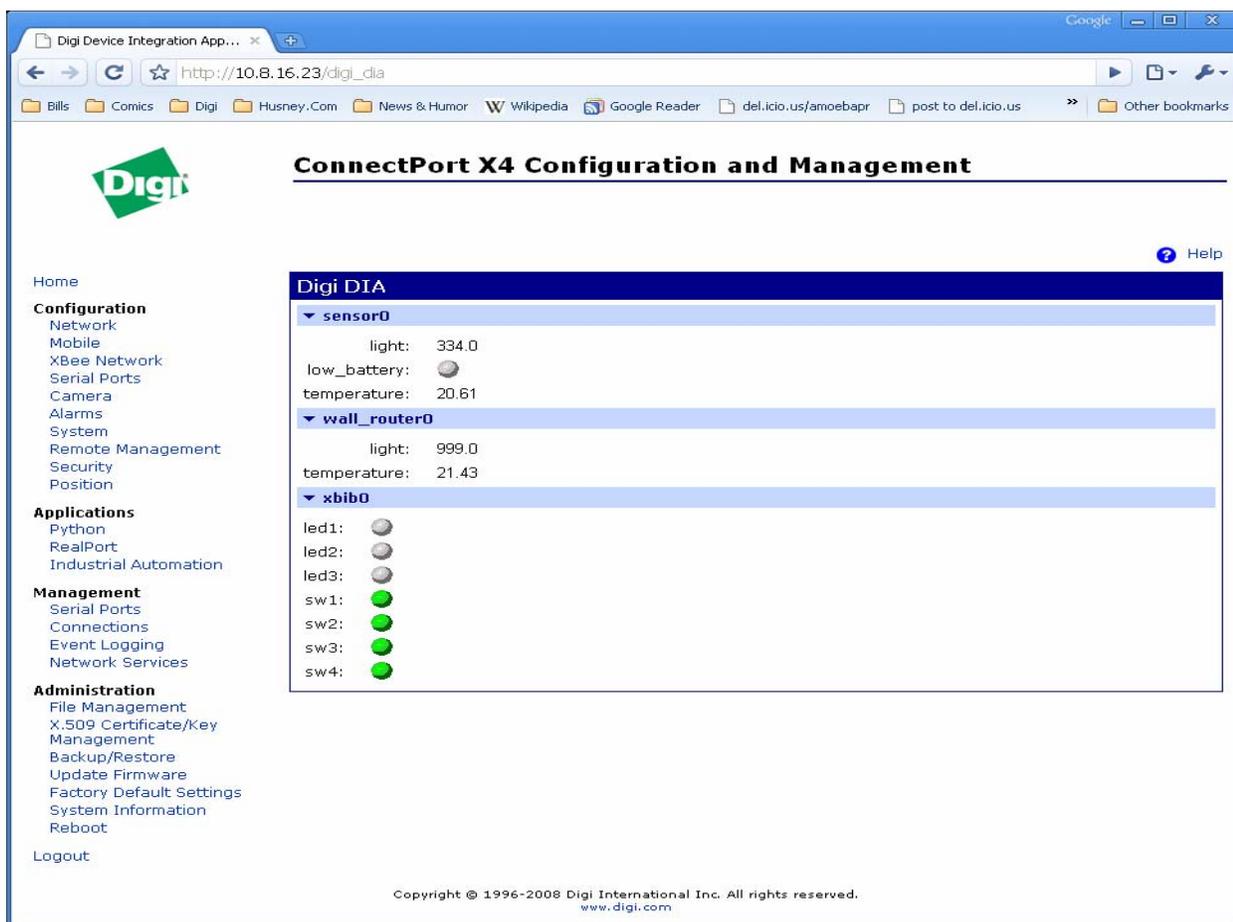
As your application begins, it will print some trace messages. Shortly, your application will print the message **Core services started**. You may also see some trace messages indicating that samples are arriving from one of your sensors.

- Click in the URL bar of your web browser and enter the following URL:

```
http://[IP address of your gateway]/idigi_dia
```

Note: Do not enter a trailing / after **idigi_dia** in the URL.

8. You will be presented with a live web presentation of the data from your sensor network:



iDigi Green Application

You may also interact with the console interface of your iDigi Green Dia program.

1. Open a telnet application and connect to port 4146 of the ip address of your gateway. For example, from a Window's console type:

```
C:\idigi_dia>telnet <ip_of_your_gateway> 4146
```

2. You will be presented with the following welcome from the Dia console interface:

```
Welcome to the iDigi Device Integration Application  
CLI.
```

```
=>>
```

3. You may type **help** at the prompt to see a list of commands you may execute at the console. One example command is **channel_dump** which allows you to see a snapshot of your sensor network in a textual form:

```

=>> channel_dump
Device instance: sensor0
Channel      Value      Unit      Timestamp
light        290.0     lux       2009-03-05 16:38:34
low_battery  False     C         1970-01-01 00:00:00
temperature  20.61     C         2009-03-05 16:38:34

Device instance: wall_router0
Channel      Value      Unit      Timestamp
light        994.0     lux       2009-03-05 16:38:34
temperature  21.43     C         2009-03-05 16:38:34

Device instance: xbib0
Channel      Value      Unit      Timestamp
led1         Off        C         1970-01-01 00:00:00
led2         Off        C         1970-01-01 00:00:00
led3         Off        C         1970-01-01 00:00:00
sw1          True       C         2009-03-05 16:30:50
sw2          True       C         2009-03-05 16:30:50
sw3          True       C         2009-03-05 16:30:50
sw4          True       C         2009-03-05 16:30:50

```

4. You may investigate other commands such as **channel_get** and **channel_set** at this point in order to retrieve and set individual channels.

For example, to turn on an LED on the development board you may type:

```
=>> channel_set xbib0.led1 On
```

Display live sensor data via the iDigi Platform

The iDigi Dia demo application is pre-configured to utilize two messaging components of the iDigi Platform.

1. SCI (Server Command Interface)
2. Temporary data cache for gateway

The SCI messaging option allows you to make web services requests at any time in order to retrieve the latest samples directly from the gateway. Your web services requests are passed via the iDigi Platform to the iDigi Dia running on your gateway. The Dia responds immediately to the request with the appropriate data.

SCI utilizes the Digi RCI protocol to send web services requests and to receive responses. This option is included in the demo configuration file (`green_getting_started.yml`) under the Presentations section as follows:

```

# Enable the Dia framework to answer web-service
requests from ConnectWare:
- name: rci
driver: presentations.rci.rci_handler:RCIHandler
settings:
  target_name: idigi_dia

```

The temporary data cache option provides a mechanism for the gateway to autonomously collect and upload samples to the iDigi Platform for later retrieval by a web services client application. This option is included in the

demo configuration file (green_getting_started.yml) under the Presentations section as follows:

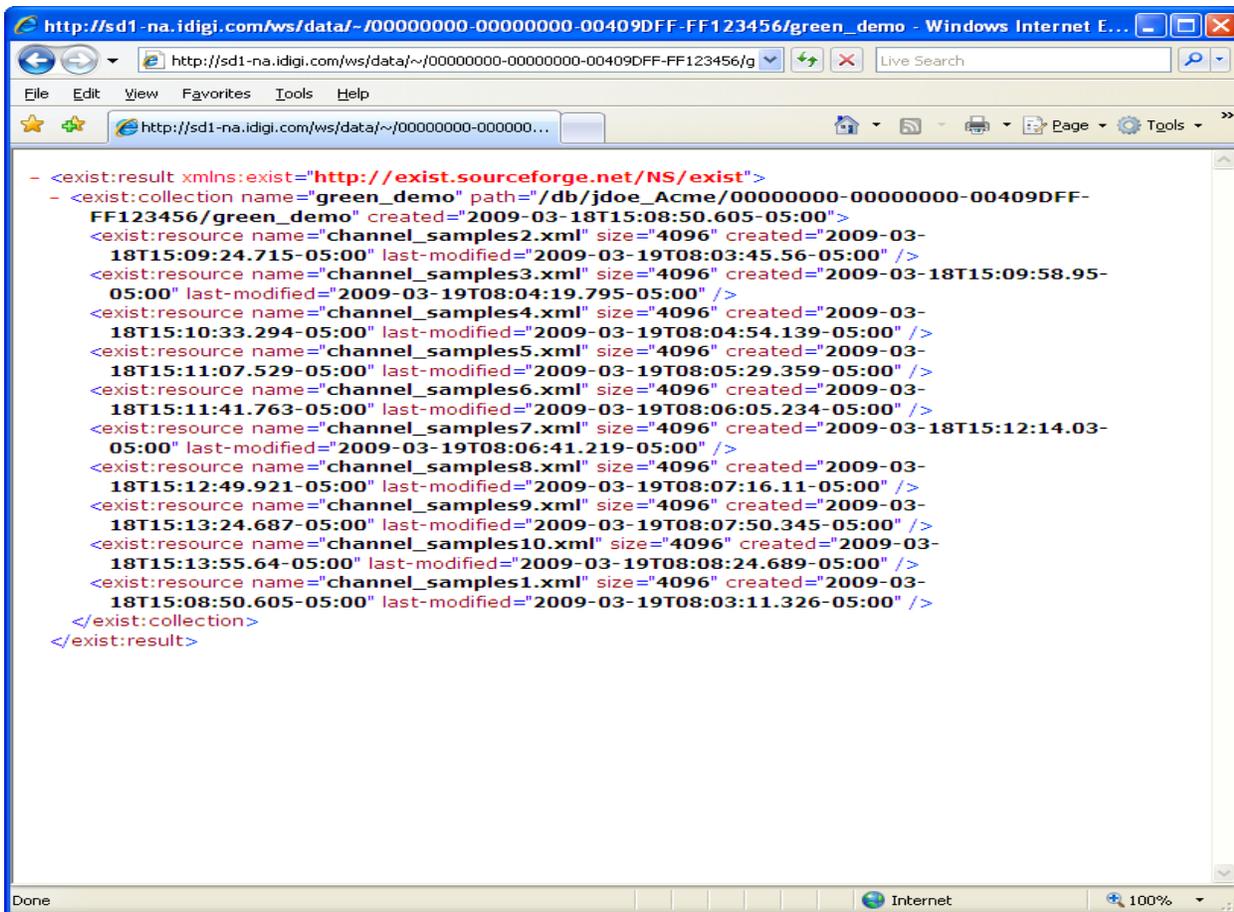
```
# Upload data to the ConnectWare XML database using
the thresholds
# given below:
- name: cwm_exist
driver: presentations.cwm_exist.cwm_exist:CWMEexist
settings:
  interval: 60
  sample_threshold: 25
  collection: green_demo
  file_count: 10
  filename: channel_samples
```

The quickest way to perform a test web services request to view data from your gateway is to use your web browser to query the temporary data cache on iDigi.com for your device. To do that, enter the following URL into your browser's address bar:

```
http://sd1-na.idigi.com/ws/data/~/[your device
ID]/green_demo
```

Your device ID is a 128-bit hex number based on your gateway's MAC address with the first 8 octets being padded with 00. Example: If your gateway's MAC address is 00:40:9D:36:DF:43, your device ID would be 00000000-00000000-00409DFF-FF36DF43.

Once you enter the URL containing your device ID (as illustrated above), you will be prompted for a username and password. Use the same username and password that you created when you set up your iDigi.com test account. You should then see a list of XML files under the "green_demo" collection.



Note: Some web browsers, such as Chrome and Safari, may not display the data due to the lack of XML style information so we recommend Internet Explorer or Firefox. Another way end users may view the data would be to click on the Data tab in the iDigi Platform user portal.

Append the URL string in your browser location bar with one of the file names:

```
http://sd1-na.idigi.com/ws/data/~/[your device ID]/green_demo/channel_samples1.xml
```

You will see data from the same set of channels that you viewed in the previous step:

For more information on obtaining your data go to [iDigi.com](http://www.idigi.com) and refer to the "iDigi.com Web Services Getting Started Guide."

LED Indications

The following LED indications apply to the XBee interface board, the XBee Sensor, and the XBee Wall Router.

Button press	Network association	Action
Single	Associated	<ul style="list-style-type: none"> If node is asleep, wakes unit for 30 seconds. Sends a Node Identification broadcast transmission. <p>All devices that receive this transmission will blink their Associate LED rapidly for 1 second.</p> <p>All API devices that receive this transmission will send a Node Identification frame out their UART (universal asynchronous receiver/transmitter) (API ID 0x95).</p>
	Unassociated	<ul style="list-style-type: none"> If node is asleep, wakes unit for 30 seconds. Blinks a numeric error code on the Ascc LED, indicating the cause of join failure. <p>1 blink: Scan found no PANs.</p> <p>2 blinks: Scan found no valid PANs based on current SC (Scan Channel) and ID (PAN ID) settings.</p> <p>3 blinks: Valid Coordinator or Routers found, but they are not allowing joining (NJ expired).</p> <p>7 blinks: Node Joining attempt failed.</p> <p>10 blinks: Coordinator Start attempt failed.</p>
Two	Associated	Temporarily enables joining on the Wall Router and the entire ZigBee network for 1 minute (if the XBee module's NJ command setting is less than 255). If joining is permanently enabled on a module (NJ = 255), joining remains permanently enabled, and this button press has no effect.
Four	Associated/ Unassociated	Node leaves PAN, if associated, and restores default parameters, then re-attempts to join a network. Default PAN ID is 0x0.
Hold for five seconds	Associated/ Unassociated	Performs a hardware reset.



PN (1P): 90001060 A